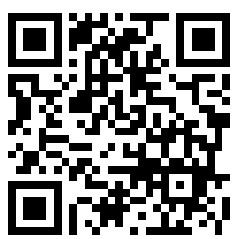

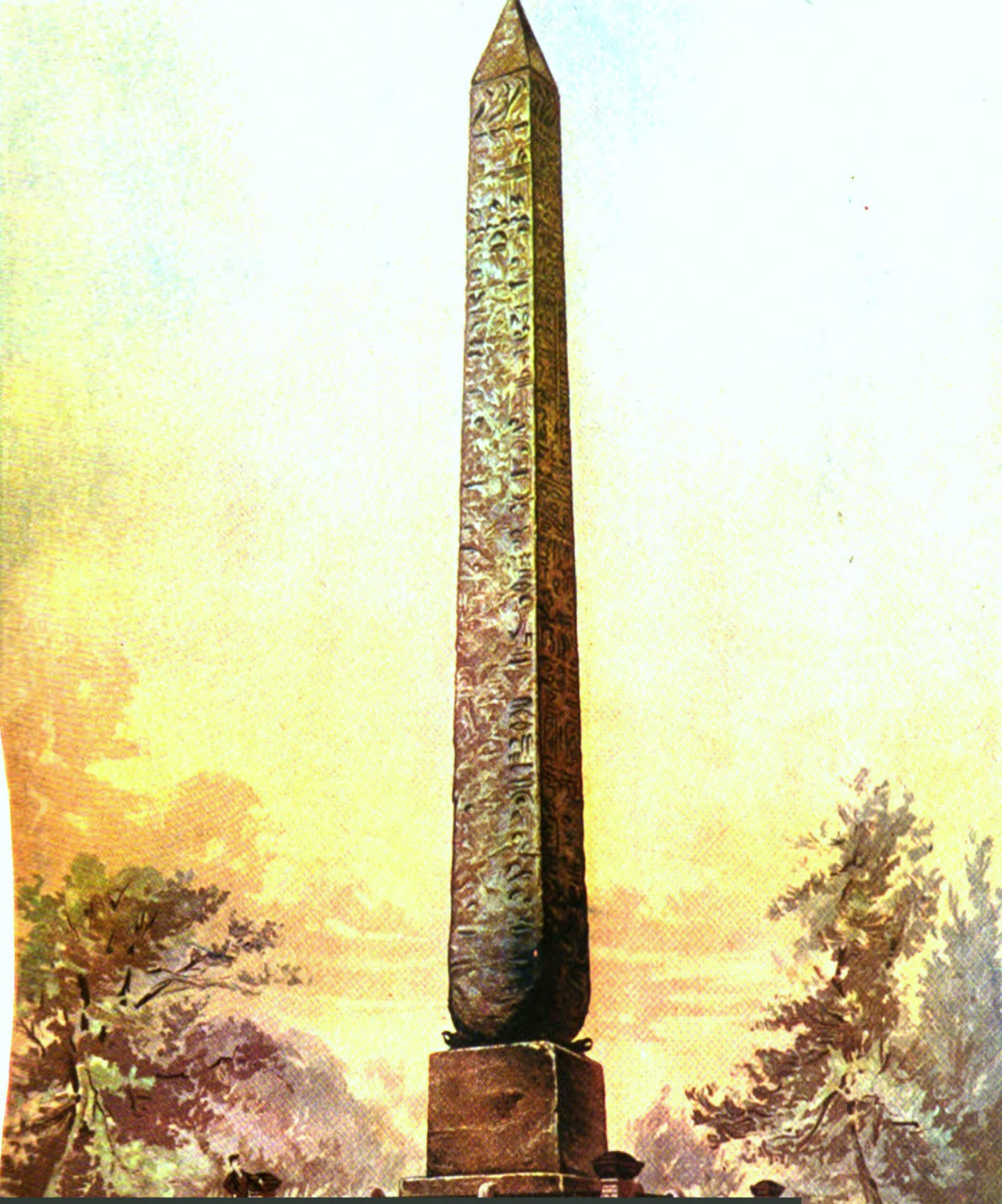

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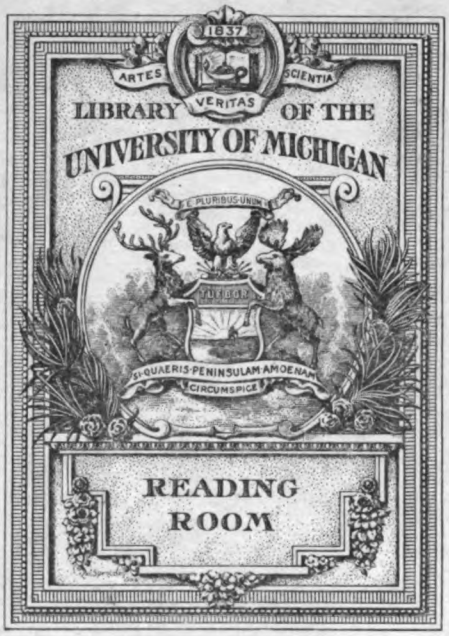

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IN VOLUME FIVE

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KEY TO PRONUNCIATION.

ā	far, father
ā	fate, hate
a or ă	at, fat
ā	air, care
ạ	ado, sofa
à	all, fall
ch	choose, church
ē	eel, we
e or ĕ	bed, end
ė	her, over: also Fr. *e*, as in *de; eu*, as in *neuf;* and *oeu*, as in *boeuf, coeur;* Ger. *ö* (or *oe*), as in *ökonomie.*
ẹ	befall, elope
ē	agent, trident
ff	off, trough
g	gas, get
gw	anguish, guava
h	hat, hot
h or H	Ger. *ch*, as in *nicht, wacht*
hw	what
ī	file, ice
i or ĭ	him, it
ı̂	between e and i, mostly in Oriental final syllables, as, Ferid-ud-din
j	gem, genius
kw	quaint, quite
ṅ	Fr. nasal *m* or *n*, as in *embonpoint, Jean, temps*
ñ	Span. *ñ*, as in *cañon* (căn'yŏn), *piñon* (pēn'yŏn)
ng	mingle, singing
nk	bank, ink
ō	no, open
o or ŏ	not, on
ô	corn, nor
ȯ	atom, symbol
ọ	book, look
oi	oil, soil; also Ger. *eu*, as in *beutel*
ö or oo	fool, rule
ou or ow	allow, bowsprit
s	satisfy, sauce
sh	show, sure
th	thick, thin
ṫh	father, thither
ū	mute, use
u or ŭ	but, us
ú	pull, put
ü	between u and e, as in Fr. *sur*, Ger. *Müller*
v	of, very
y	(consonantal) yes, young
z	pleasant, rose
zh	azure, pleasure
' (prime), " (secondary)	accents, to indicate syllabic stress

THE ENCYCLOPEDIA AMERICANA

Clarence Harbor, a bay on the west coast of Alaska. about 50 miles southeast of the Cape Prince of Wales. An Eskimo village is situated on the shore of the bay; and the United States government established a reindeer park nearby, with the intention of providing food for the natives.

Clarence Island, an island south of South America and west of Tierra del Fuego; lat. 54° 10′ S.; lon. 71° 20′ W. It is of rocky formation, and the coast is indented with numerous bays.

Clar'endon, Edward Hyde, EARL OF, English statesman: b. Dinton, Wiltshire, 18 Feb. 1608; d. Rouen, France, 9 Dec. 1674. He commenced his political career in 1640, when he was returned to Parliament. In this Parliament he argued in favor of a grant to the king, which was successfully opposed by Hampden. He was returned to the Long Parliament (November 1640) by the borough of Saltash, and laid aside his legal business to devote himself to his parliamentary duties. At first he acted with the more moderate of the popular party, but soon found reason to change his course. A dread of democracy seems first to have led him to oppose his former friends, but his speeches and votes soon attracted the notice of the court, into the favor of which he passed. He was offered the solicitor-generalship, which he declined, but agreed, at the king's request, to consult with his regular advisers, Falkland and Colepepper. Hyde was an honest and independent supporter of the royal authority, disposed to make moderate concessions to the popular demands, and in no way responsible for the rash measures of the king, which were often taken without consulting any of his advisers. Upon the breaking out of the civil war he attached himself to the king's party, became chancellor of the exchequer and member of the privy-council; and after vainly attempting to bring about a reconciliation between the contending parties, was appointed by the king to wait upon the Prince of Wales, who was first sent with an army to the west. Afterward, on the continued ill success of the royal party, he retired to Jersey. Here he remained for two years, while the prince was in France, and during that time began his 'History of the Rebellion.' He likewise composed at Jersey the various writings which appeared in the king's name as answers to the manifestoes of the Parliament. On the capture of the king, Hyde received orders to rejoin the Prince of Wales, but was becalmed and taken prisoner by pirates from Ostend. In September 1649 he rejoined Charles at The Hague, who sent him to Madrid to see if any assistance could be obtained from the Spanish court. On the failure of this negotiation he retired to Antwerp, but soon resumed the business of the exiled court, of which he continued to be the most trusted adviser, first at Paris, and afterward at The Hague, where Charles II. appointed him lord-chancellor of England in 1657. After Cromwell's death Edward Hyde contributed more than any other man to the success of the measures which placed Charles II. on the throne. He subsequently possessed the entire confidence of the king, who loaded him with favors. In 1661 he was made peer, and Baron Hyde, Viscount Cornbury, and Earl of Clarendon. Many events occurred to disquiet him in the licentious court of Charles II.; among these was the marriage of the Duke of York, the king's brother, to his daughter. The Duke, while at Breda, the residence of his sister, the Princess of Orange, became acquainted with Anne Hyde, Clarendon's eldest daughter, maid of honor to the princess, and married her secretly 3 Sept. 1660 to legitimize their first child, born on 22 October. Anne was acknowledged as Duchess of York in December 1660, and two daughters, Anne and Mary, were the fruit of this marriage, both of whom ascended the British throne. In 1663 Lord Bristol made an attempt to impeach the chancellor in Parliament, which, though some of the acts of Clarendon's administration were questionable, proved unsuccessful. The Duke of Buckingham, moreover, was continually laboring to make the chancellor ridiculous in the eyes of the king, and his station as prime minister made the nation regard him as answerable for all the faults of the administration. The ill success of the war against Holland, the

sale of Dunkirk, and other events, excited public indignation. The king's displeasure was changed into hatred when he saw his plan of repudiating his wife and marrying Lady Stuart defeated by Clarendon, who effected a marriage between this lady and the Duke of Richmond. The king deprived him of his offices, and an impeachment for high treason was commenced against him. The lords refused to imprison him on a general accusation by the Commons. This gave rise to a dispute between the two houses, to end which Clarendon retired to Calais, leaving an exculpatory letter to the lords, which they communicated to the Commons, who ordered it to be burned by the common hangman. The lords still refused to join in his attainder, but agreed with the Commons in an act of banishment and incapacity. The hatred of the nation pursued him even to the Continent. At Evreux he was attacked by some British sailors, dangerously wounded, and with difficulty rescued from their hands. He lived six years at Montpellier, Moulins, and Rouen, at which latter place he died. His remains were afterward carried to England, and buried in Westminster Abbey. Lord Clarendon, as long as he was minister, was the friend and supporter of the king against the factious, and the defender of his country's freedom against the abuse of the royal power. Ingratitude and prejudice the more easily ruined him, as his stern and proud character prevented his gaining friends. Among his many writings, the most important is the 'History of the Rebellion, from 1641 Down to the Restoration of Charles II.' It is a very able work, although not free from prejudices. Consult Lister, 'Life of Lord Clarendon' (1838).

Clarendon, George William Frederick Villiers, 4TH EARL OF, English statesman: b. 12 Jan. 1800; d. 27 June 1870. By his mother Lord Clarendon was indirectly related to the Hydes, the family of the great Earl of Clarendon, author of the 'History of the Rebellion.' He was educated at Cambridge, entered the civil service at an early age, and in 1833 was appointed minister-plenipotentiary to the court of Madrid. He was instrumental in negotiating a treaty, signed in 1834, called the Quadruple Alliance, in which the four contracting parties — England, France, Spain, and Portugal — agreed to unite in expelling Don Carlos and Don Miguel, pretenders to the Spanish and Portuguese crowns, from the peninsula, and was subsequently much consulted by the Spanish government.

In 1839 Lord Clarendon, having succeeded during the previous year to his uncle's title, returned home to take his seat in the House of Lords. In January 1840 he was appointed lord privy-seal; and was lord-lieutenant of Ireland from May 1847 to February 1852. The most notable events of the period were the great Irish famine, and the rebellion headed by Smith O'Brien, M.P., which ended in the defeat of the rebels by the police, after months of threatening and systematic publication of sedition in the newspapers which espoused their cause. Lord Clarendon's administration in regard to both of these difficulties has been deemed by dispassionate observers both firm and philanthropic; but his early popularity somewhat declined in Ireland, which was perhaps due to his impartiality in declining to favor the zealots either of the Roman Catholic or the Orange party. He became secretary of foreign affairs in 1853, retaining office until 1858. During this period the Russian war was brought to a successful termination, and Lord Clarendon, in conjunction with Lord Cowley, the British ambassador at Paris, conducted the peace negotiations at Paris as joint-plenipotentiary of Great Britain, and signed the Treaty of Paris 30 March.

In 1861 Lord Clarendon was sent as ambassador-extraordinary to the coronation of the king of Prussia; in 1868 was sent on a special mission to the Pope and the king of Italy. In the ministry of Mr. Gladstone, which succeeded Mr. Disraeli's, Lord Clarendon again occupied the post of foreign secretary, and continued in office till his death.

For the office of foreign secretary, which he held so long, Lord Clarendon was generally admitted to possess high qualifications; but it was complained, even by his admirers, that he adhered too long to the tradition of secrecy attaching to the foreign office. As a statesman he was remarkable rather for a liberality and largeheartedness, which gave a conciliatory tone to his negotiations with foreign powers, and for the undeviating rectitude of his conduct, than for any commanding qualities of intellect.

Clarendon, Ark., town, county-seat of Monroe County, situated on the White River, on the St. Louis & S., and the Arkansas M. R.R.'s, 58 miles southeast of Little Rock. It is a trade centre for lumber and agricultural products. The manufacturing of wagons, staves, and other articles of wood supplies the local demands. Pop. 2,000.

Clarendon, England, a lodge in Wiltshire, near Salisbury. It is noted chiefly for being the place where were written, in 1164, the 'Constitutions of Clarendon,' defining the limits between the jurisdiction of the civil and ecclesiastical courts. Henry II. called together the bishops and barons of his kingdom, and they held council at Clarendon.

Clarendon, Vt., a town in Rutland County, on the Rutland R.R., noted for its medicinal springs, the waters of which are of value in the treatment of kidney, liver, and skin diseases. Its industries are fruit-raising, dairying, and maple-sugar making. Pop. (1900) 911.

Clarendon, Colony of. This title represents a repeated effort to found the settlement near the mouth of Cape Fear River, N. C., later flourishing as Wilmington. If successful from the outset, it would have been a counterpart of Albemarle (N. C.), and Ashley River (S. C.), and very likely given us a State of Middle Carolina under some name. The first colony was of New Englanders, in 1660: they had trouble with the Indians and abandoned the place by 1663, leaving a post with a placard on it highly disparaging to the region. Early in October 1653, however, the river was explored for 150 miles by Sir John Yeamans, a Cavalier adventurer from Barbadoes. He was delighted with the country, cared nothing for other people's opinions of it, and asked the lords proprietors of Carolina for a grant. They gave it, made him governor of it, and in May 1665 he returned with several hundred settlers from Barbadoes. But Yeamans had wider interests, and could not stay with the colony — from 1672 to 1674 he was governor of Carolina; trade was insufficient

for more than the northernmost and southernmost settlements; and Clarendon (so named from the famous Lord Clarendon, one of the proprietors) was gradually abandoned, ending with 1690.

Clarendon, Constitutions of, a code of laws adopted in the 10th year of Henry II. (1164), at a council of prelates and barons held at the village of Clarendon, in Wiltshire, in January of that year. These laws, finally digested into 16 articles, were brought forward by the king as "the ancient customs of the realm," and were enacted as such by the council. They consisted, however, partly at least, of reforms introduced by the king himself. Ten of the articles were condemned, and six allowed by Pope Alexander III. The six articles approved of were of comparatively slight importance, mostly confirming the privileges of the ecclesiastical order; among the condemned articles the most important were the first, providing that disputes between laymen and ecclesiastics as to advowsons should be tried in the king's court; third, that ecclesiastics accused of any offense against justice should be answerable to the civil courts for the civil offense, and to the ecclesiastical courts for the ecclesiastical offense; fourth, that ecclesiastical dignitaries should not go out of the kingdom without the king's leave; eighth, that appeals should be made from the court of the archbishop to the king's court, and should not go further (that is, to the Pope) without the king's consent; ninth, that in the event of a dispute between a layman and an ecclesiastic as to whether the civil or ecclesiastical court should have jurisdiction in certain cases of tenure of property, the tribunal should be determined by the king's chief justice upon a recognition of 12 lawful men; 12th, that pleas of debt should belong to the king's jurisdiction. Notwithstanding the entreaties of the other prelates, and in defiance of the king, Becket, after a momentary appearance of yielding, peremptorily refused his signature to the articles. After the murder of the archbishop, the king, on his reconciliation with the Pope in 1172, was compelled to promise the abolition of all laws and customs hostile to the clergy; and at the Council of Northampton in 1176 the constitutions of Clarendon were materially modified in favor of the ecclesiastical order.

Clarendon Press, Oxford, the name by which the press of the University of Oxford is distinguished. In January 1586 delegates *de impressione librorum* were appointed by the Convocation of the University. About this time Joseph Barnes was styled "Printer to the University," and others bore the title after him. In 1633 Archbishop Laud procured letters patent granting a large license in printing to the university, with a view to the publication of manuscripts from the Bodleian Library. The work was carried on from 1713 to 1830 in the building known as the Clarendon, the cost of which was defrayed partly from the sale of Lord Chancellor Clarendon's 'History of the Rebellion,' the copyright of which was given to the university. The management of the printing-office is committed to a board consisting of the vice-chancellor and 10 other members of Convocation, nominated by the vice-chancellor and proctors, as vacancies occur. Five are perpetual delegates, and five are nominated for a term of seven years. The south side of the present building (the additional accommodation required and opened) is appropriated to the printing of Bibles and prayer-books. The north, called the "learned" or "classical" side is assigned for the printing of university documents, books printed by authority of the delegates, and those sent in by private authors and publishers. Those printed for the university itself (but no others) bear on the imprint "E Typographeo Clarendoniano," or "At the Clarendon Press." Some admirable specimens of typography have been produced by the Clarendon Press.

Clarens, klä-räṅ, Switzerland, in the canton of Vaud, on the northeastern coast of Lake Geneva, about 50 miles from Geneva. The healthfulness of the climate, and the beauty of the place make it a resort for invalids. Tourists often visit it, for its being the scene of Rousseau's 'Nouvelle Héloise.'

Clares, Poor. See POOR CLARES.

Claret, a name originally given to wines of a light-red color, but now applied to the red wines imported from France, chiefly from Bordeaux. These wines vary in composition according to the locality, season, and age, but the produce of each vineyard usually retains its own peculiar characteristics. The most esteemed are those produced at the vineyards of Lafitte, Latour, Chateau Margaux, and others. Many of the clarets formerly sold in the United States were nothing more than the *vin ordinaire* used by the French peasants and working classes, but since the development of the California grape industry as good domestic claret can be obtained here as anywhere. A genuine claret should contain from 16 to 20 per cent of proof spirit.

Fictitious clarets were sometimes prepared by mixing a rough cider with a cheap French wine, and coloring with cochineal, logwood, elderberry, hollyhock, indigo, litmus, red cabbage, beet-root, or ros-aniline. To detect these coloring matters the following method may be adopted: Make a jelly by dissolving five grams of gelatine in 100 cubic centimeters of warm water, and pour it into a square flat mold. From this cake of jelly cubes about three fourths of an inch square are cut with a sharp, wet knife, and are immersed in the wine; they are taken out after 24 to 48 hours, washed slightly, and sections cut in order to see how far the coloring matter has penetrated. If the wine is pure, the color will be confined to the edges of the slice, or will not have penetrated more than an eighth of an inch. The coloring matters mentioned above permeate rapidly, and color the jelly.

Claretie, Arsène Arnaud, är-sān är-nō klăr tē, called **Jules,** zhül, French novelist and dramatist: b. Limoges 3 Dec. 1840. He has written a long series of very successful novels, the most noteworthy of them being: 'Madeleine Bertin' (1868); 'The Million' (1882); 'Monsieur the Minister' (1882); 'Noris, Manners of the Time' (1883); 'The American Woman' (1892). He wrote also some striking chapters of contemporary history, as 'The Revolution of 1870–1'; 'Paris Besieged'; 'Five Years After: Alsace and Lorraine Since Annexation.' His dramatic compositions relate mostly to the time of the great Revolution. He

became administrator of the Comédie Française in 1885, and was chosen member of the Academy in 1888.

Clar'ibel. (1) The bride of Phaon, as told in Spenser's 'Faerie Queene.' Philemon endeavors to injure her by false stories to which Phaon gives credit and kills Claribel. When he learns the deception he murders Philemon. (2) A poem by Tennyson.

Claribel, Sir, a knight who figures in Spenser's 'Faerie Queene.' One of four knights who fight for the false Florimel. Bretomart enters the combat with them; Arthur ends the fray, or it is "stinted" by him.

Clarification, the separation of the insoluble particles that prevent a liquid from being transparent. It may be performed by depuration, filtration, or coagulation. In the first of these operations the liquid is permitted to subside, without being in the least disturbed, until all the particles which were in suspension are precipitated; it is then decanted. This mode of clarification can be used only when the substance operated on is in a large quantity, or is of a nature not to be altered during the time necessary to complete the operation, and when its specific gravity is less than that of the particles which render it turbid. Filtration is a process by which a liquid is strained through a body, the interstices of which are small enough to stop the solid particles contained in it. Filters of wool, linen, paper, powdered glass, sand, or charcoal, may be used, according as the liquid is more or less dense, or of a nature to operate upon any one of these bodies. Clarification by coagulation is performed with the assistance of albumen (as isinglass or white of eggs) added to the liquor for this purpose, which, by the action of heat, of acids, etc., becomes solid, forms a mass, and precipitates the extraneous substances. Clarification is also now commonly effected by centrifugal machines.

Clarinda, Iowa, city, county-seat of Page County; situated on the Nodaway River, and the Chicago, B. & Q. R.R.; and is 45 miles east of the Missouri River. It is surrounded by an agricultural and stock-raising country, and contains carriage factories, brick works, flour-mills, iron works, and two banks. Valuable coal beds are near the city; also a State asylum for the insane. Pop. (1900) 3,500.

Clarinet, or **Clarionet,** a wind-instrument of the reed kind, with a trumpet-formed mouth, and played by holes and keys. Its scale, though including every semitone within its extremes, is virtually defective. Its lowest note is E below the F clef, from which it is capable, in the hands of good performers, of ascending more than three octaves. Its powers through this compass are not everywhere equal; the player, therefore, has not a free choice in his keys, being generally confined to those of C and F, which indeed are the only keys in which the clarinet is heard to advantage. The music for this instrument is therefore usually written in those keys. There are, however, B flat clarinets, A clarinets, D clarinets, B clarinets, and G clarinets; the three latter are not ordinarily used.

Clarion, a musical instrument of the trumpet kind, with a narrower tube and a higher and shriller tone than the common trumpet.

Clarissa Furiosa, a story by W. E. Norris, first published in 1896. It may be regarded in the light of a satire on the "New Woman," and is perhaps the least successful of the clever author's novels. The most of the story is taken up with the semi-public life to which the heroine devotes herself after she has separated from her husband. The workmanship is good, but the writer's want of genuine interest in his characters is felt.

Clarissa Harlowe, a novel by Samuel Richardson, published in 1751. It is a story of a noble-minded young woman, whose good reputation is compromised by her lover, Lovelace. The scene is laid in rural England of the first half of the 18th century. The story is largely told by letters exchanged between Clarissa and her confidante Miss Howe, and between Lovelace and his friend Belford. To the present-day reader, the tale seems slow and prolix; but it is a truthful picture of the conventions and ideals of its period, while it possesses a perennial life because it deals with some of the elemental interests and passions.

Clark, Abraham, American patriot: b. Elizabethtown, N. J., 15 Feb. 1726; d. Rahway, N. J., 15 Sept. 1794. He studied for the bar and practised in his native State with success. After serving as sheriff of Essex County, he was chosen a delegate to the Continental Congress in 1776 and signed the Declaration of Independence. He was a member of the Constitutional Convention of 1789, and aided in framing the Constitution of the United States.

Clark, Alexander, American clergyman and writer: b. Jefferson County, Ohio, 10 March 1834; d. Georgia 6 July 1879. He was editor of the 'Methodist Recorder' (1870–9). He wrote: 'The Old Log Schoolhouse' (1864); 'Workaday Christianity' (1870); 'Rambles in Europe' (1877); 'Ripples on the River,' verse.

Clark, Alonzo, American physician: b. Vermont 1 March 1807; d. New York 1887. He graduated at Williams College 1828, and at the College of Physicians and Surgeons, New York, 1835, entering at once upon the practice of his profession, of which he became an eminent member. He was professor of the theory and practice of medicine in the University of Vermont, of anatomy and pathology in the University of the City of New York, of pathology and practical medicine in Columbia University 1860–87, and dean of its medical faculty 1875–84. He was also president of the College of Physicians and Surgeons, and filled various offices in the societies and associations of which he was a member. Besides many contributions to medical periodicals, he published 'Presidential Address Before the New York State Medical Society' (1853); 'Lectures on Diseases of the Heart' (1884).

Clark, Alonzo Howard, American scientist: b. Boston 13 April 1850. He left his studies at Wesleyan University to enter the service of the United States Fish Commission, making a thorough study of the work. He has written: 'History of Fishery Industries of the United States'; 'Whales and Sea Fisheries'; 'History of the Mackerel Fisheries'; 'Food Industries of

the World.' Since 1881 he has been connected with the Smithsonian Institution.

Clark, Alvan, American astronomical-instrument maker: b. Ashfield, Mass., 3 March 1804; d. Cambridge, Mass., 9 Aug. 1887. He was at one time a portrait painter in Boston; but in 1844 his attention was turned to telescope making. Two years later he definitely adopted the business of astronomical-instrument making, and in time achieved a world-wide reputation. His famous telescopes include the Chicago 18½-inch, the Washington 26-inch, the Russian 30-inch, and the California 36-inch.

Clark, Alvan Graham, American astronomer: b. Fall River, Mass., 10 July 1832; d. Cambridge, Mass, 9 June 1897. He was a son of Alvan Clark (q.v.), and became associated with him under the firm name of Alvan Clark & Sons. In 1859 they began work on an object glass with an aperture of 18½ inches, which ultimately became the property of the Astronomical Society of Chicago. With this instrument Clark discovered the companion of Sirius, for which the French Academy awarded him the Lalande medal. Other telescopes constructed largely under his supervision were: that for the Naval Observatory, a 26-inch instrument with which Prof. Asaph Hall discovered the two satellites of Mars; the McCormick telescope for the University of Virginia; the great 30-inch one for the St. Petersburg Imperial Observatory; the powerful Lick telescope, with an aperture of 36 inches, at Mount Hamilton, Cal. (1886), with which Jupiter's fifth satellite was discovered; and finally, the greatest of his achievements as a maker, the wonderful Yerkes lens of 40 inches, the gift of C. T. Yerkes to the University of Chicago, and installed in the observatory at Lake Geneva, Wis. As an astronomer he made many discoveries of double stars.

Clark, Sir **Andrew,** Scotch physician: b. Aberdeen 28 Oct. 1826; d. London 6 Nov. 1893. He was educated at Aberdeen and Edinburgh. After an unusually brilliant career as a student of medicine at Edinburgh, he assisted Dr. Hughes Bennett and Dr. Robert Knox, the anatomist, and next had charge for four years of the pathological department at the Haslar Naval Hospital. After graduating at Aberdeen in 1854, he settled in London. He will live in remembrance as the "beloved physician" of George Eliot.

Clark, Anson Luman, American eclectic physician and surgeon; b. Clarksburg, Mass. 12 Oct. 1836. In 1858 he graduated as B.A. in Lombard University, and as A.M. in 1868 in medicine, at the Eclectic Medical Institute of Cincinnati, Ohio, in 1861. He served during the Civil War as assistant surgeon, and was a member of the House of Representatives of the 27th General Assembly of Illinois. Since 1868 he has filled the chair of Diseases of Women and Obstetrics in the Bennett Medical College of Chicago, Ill. He wrote 'Clark's Diseases of Women' (1878).

Clark, Champ, American politician: b. Anderson County, Ky., 7 March 1850. He was graduated at Bethany College and Cincinnati Law School, and in 1873–4, was president of Marshall College, W. Va. He has attained distinction as a Democratic campaign speaker, and since 1893 has been, with an intermission of one term, a member of Congress from Missouri.

Clark, Charles Dickson, American jurist: b. Laurel Cove, Tenn., 7 Oct. 1847. He was graduated at Cumberland University in 1875, and practised as a lawyer in his native State until 1895, when he was appointed judge of the United States court for the eastern and middle districts of Tennessee.

Clark, Charles Edgar, American naval officer: b. Bradford, Vt., 10 Aug. 1843. He entered the naval service in 1860; took part in the battle of Mobile Bay and in the bombardment of Fort Morgan; and was promoted captain in 1896. In March 1898 he took command of the battleship Oregon at the Mare Island navy yard, San Francisco, and when war with Spain was deemed inevitable, received orders to proceed to Key West, Fla., with all haste. After a voyage of over 14,000 miles, he joined the American fleet in Cuban waters on 26 May, and on 3 July commanded his ship at the battle of Santiago. In March 1899 he was assigned to duty at the League Island navy yard. He was promoted rear-admiral 16 June 1902.

Clark, Charles Heber ("Max Adeler"), American journalist: b. Berlin, Md., 11 July 1841. He is the editor of the 'Textile Record' in Philadelphia, and has written much on economic themes, but is best known to the general public as a humorist under the pseudonym Max Adeler. He has published: 'Out of the Hurly Burly'; 'Elbow Room'; 'The Fortunate Island'; 'Capt. Bluitt' (1902).

Clark, Daniel, Canadian pathologist: b. Granton, Scotland, 29 Aug. 1836. He went to Canada when a child; was graduated at Victoria University in 1858; and practised medicine in Ontario with great success. He has paid especial attention to mental diseases and the care of the insane. Since 1875 he has been at the head of the Provincial Asylum for the Insane at Toronto, and was later made professor of psychology and mental diseases in Toronto University. He was also twice elected president of the College of Physicians and Surgeons of Ontario. He has written 'Pen Photographs' (1873); 'Josiah Garth,' a novel.

Clark, Edson Lyman, American Congregational clergyman: b. Easthampton, Mass., 1 April 1827. He was graduated from Yale in 1853, and from Union Theological Seminary in 1858, and has filled several Congregational pastorates in New England. He has published: 'The Arabs and the Turks'; 'The Races of European Turkey'; 'Fundamental Questions, Chiefly Relating to the Early Hebrew Scriptures.'

Clark, Edward, American architect: b. Philadelphia 1822; d. Washington, D. C., 6 Jan. 1902. He studied architecture under Thomas W. Walter, and after serving as assistant, was made chief architect of the United States capitol in 1864, serving continuously till his death. He was a member of the leading architectural commissions of the national government, including that for the completion of the Washington monument.

Clark, Edwin Charles, English jurist: b. Yorkshire, England, 5 Nov. 1835. He was educated at Shrewsbury School and Trinity College, Cambridge, where he became scholar and Fellow.

He practised for a short time as a conveyancer in London, being called to the bar at Lincoln's Inn 1860. In 1873 he was appointed regius professor of civil law at Cambridge, where he is also a professional fellow of St. John's College. His books are: 'Early Roman Law: Regal Period' (1872); 'Analysis of Criminal Liability' (1880); 'Practical Jurisprudence: a Comment on Austin' (1883); 'Cambridge Legal Studies' (1888).

Clark, Francis Edward, American clergyman: b. Aylmer, Quebec, 12 Sept. 1851. He was graduated from Dartmouth College in 1873, and continued his studies at Andover Theological Seminary. He became pastor of a Congregational church at Portland, Maine, and there organized the first Young People's Society of Christian Endeavor 2 Feb. 1881. He was pastor of the Phillips Congregational Church in South Boston, Mass, 1883–7, and in 1887 was made president of the United Society of Christian Endeavor and also became editor of the 'Golden Rule,' the official organ of the society.

Clark, Frederick Thickstun, American novelist: b. Pennsylvania 1858. He has published: 'A Mexican Girl'; 'In the Valley of Havilah'; 'On Cloud Mountain'; 'The Mistress of the Ranch.'

Clark, George Hunt, American poet: b. Northampton, Mass., 1809; d. Hartford, Conn., 20 Aug. 1881. He was a frequent contributor to 'Putnam's,' 'Knickerbocker,' and other journals. His published poems include 'Now and Then'; 'The News'; and a collection of humorous and sentimental pieces, entitled 'Undertow of a Trade-Wind Surf.'

Clark, George Rogers, American pioneer: b. Monticello, Va., 19 Nov. 1752; d. near Louisville, Ky., 18 Feb. 1818. He studied surveying, and at 20 settled in Ohio, serving in the Indian wars of that time and region. He removed to Kentucky in 1775, procuring the organization of that Territory. On the outbreak of the Revolutionary War he led the patriot army on the frontier, campaigning vigorously against the British throughout Illinois, Ohio, and Kentucky. His success in this saved much territory to the colonies in the final treaty of peace with Great Britain. He subsequently supported the cause of the French of the Mississippi valley against the Spaniards. He fell into penury in his latter years, and died in neglect. See CLARK, WILLIAM (1770–1838).

Clark, Henry James, American naturalist and prose-writer: b. Easton, Mass., 22 June 1826; d. Amherst, Mass., 1 July 1873. He was associated in work with Agassiz for several years; and was professor in several leading colleges and universities. Among his many contributions to literature are 'Mind in Nature, or the Origin of Life (1863); 'Mode of Development of Animals' (1865); 'Claims for Scientific Property.'

Clark, Imogen, American novelist: b New York. She has published: 'Will Shakespeare's Little Lad' (1897); 'The Victory of Ezry Gardner' (1897); 'The Heresy of Parson Medlicott' (1900); 'God's Puppets' (1901).

Clark, J. Scott, American educator: b. Copenhagen, N. Y., 23 Sept. 1854. He was graduated from Syracuse University in 1877, was professor of rhetoric there, 1882–92, and has been professor of English in Northwestern University, Evanston, Ill., from 1892. He has published: 'A Practical Rhetoric' (1886); 'The Art of Reading Aloud' (1892); 'A Study of English Prose-Writers' (1898); 'A Study of English and American Poets' (1900).

Clark, SIR **James,** Scottish physician: b. Findlater, Banffshire, 14 Dec. 1788; d. Bagshot Park 29 June 1870. He studied medicine at the University of Edinburgh, and entered the navy as assistant-surgeon in 1809, and continued in the service till 1815, when he returned to Edinburgh. After devoting some time to foreign travel, he settled in Rome, where he continued to practise from 1818 to 1826. He returned to England in 1826, and became physician to the Duchess of Kent in 1835, and on the accession of Queen Victoria was appointed first physician in ordinary to the queen, and shortly afterward made a baronet. He retired from practice several years before his death, but continued till near the close of his life to act as consulting physician to the royal family.

Soon after his return to England Sir James Clark published, as a result of his continental observations, a work 'On the Sanative Influence of Climate' (1829), and in 1835 a 'Treatise on Pulmonary Consumption and Scrofula.'

Clark, James Gowdy, American balladist: b. Constantia, N. Y., 28 June 1830; d. Pasadena, Cal., September 1897. He was well known as a concert singer and song writer, and among his most popular songs are: 'Star of My Soul'; 'The Awakening'; 'The Beautiful Hills'; 'The Children of the Battlefield'; 'Freedom's Battle Hymn'; 'The Evergreen Mountains of Life'; and 'The Old Mountain Tree.'

Clark, John Bates, American economist: b. Providence, R. I., 26 Jan. 1847. He was graduated at Amherst in 1872, and has been prominent as a political economist since the publication of his 'Philosophy of Wealth'; 'Wages'; 'Capital and Its Earnings'; and 'The Distribution of Wealth.' In 1900 he became professor of political economy at Columbia University.

Clark, John Emory, American scientist: b. Northampton, N. Y., 8 Aug. 1832. He was graduated at the University of Michigan in 1856, and studied at Heidelberg. After serving in the Civil War as captain and colonel, he became professor of astronomy at Antioch College. Since 1873 he has been professor of mathematics at the Sheffield Scientific School of Yale University.

Clark, John Willis, English writer, registrar of the University of Cambridge from 1891. He is the author of 'Cambridge' (1880); 'Architectural History of the University and Colleges of Cambridge' (1882); 'Libraries in the Mediæval and Renaissance Periods' (1894); 'Augustinian Priory Observances' (1897); 'Old Friends at Cambridge and Elsewhere' (1900); 'The Care of Books' (1901).

Clark, Jonas Gilman, American philanthropist: b. Hubbardston, Mass., 1 Feb. 1815; d. Worcester, Mass., 23 May 1900. He began life as a carriage maker and acquired a fortune in business and real estate investments. He is noted as the founder of Clark University (q.v.), at Worcester, Mass., which he endowed with $2,000,000 in 1887. He also conferred gifts on his native town. He bequeathed $200.000 to

Clark University outright and $1,000,000 and the residue of his estate conditionally.

Clark, Joseph, English painter: b. Cerne Abbas, Dorsetshire, 4 July 1834. He was educated by "The Dorset Poet," William Barnes (q.v.), went to London at 18 and became a student at the Royal Academy. He first exhibited at the Royal Academy in 1857, and has exhibited there nearly every year since. Among well-known pictures by him are: 'The Return of the Runaway'; 'Hagar and Ishmael'; 'Three Little Kittens.'

Clark, Lewis Gaylord, American journalist and humorous writer: b. Otisco, N. Y., 5 March 1810; d. Piermont, 3 Nov. 1873. In 1834 he became editor of the 'Knickerbocker Magazine,' and with Irving, Bryant, Longfellow, Halleck, and Willis, as contributors, made it the foremost literary publication of that time, and an inspiration to a higher standard of periodical literature. The 'Editor's Table,' written by him, overflowed with amusing stories and witty sayings. The 'Knickerbocker Sketch-Book' (1850), and 'Knick-Knacks from an Editor's Table' (1853), are his only publications in book form.

Clark, Lewis George, American slave and freedman: b. about 1811; d. Lexington, Ky., 16 Dec. 1897. He was reared a slave, but escaping, lectured for emancipation in 1841–50. He claimed to be the original of "Uncle Tom" in Mrs Stowe's novel, but this the authoress denied.

Clark, Theodore Minot, American architect: b. Boston, Mass., 20 Aug. 1845. He was graduated from Harvard in 1866, and has been professor of architecture in the Massachusetts Institute of Technology in Boston for many years. He has published 'Building Superintendence'; 'Owner and Builder Before the Law'; 'Rural School Architecture.'

Clark, Thomas March, American Protestant Episcopal bishop: b. Newburyport, Mass., 4 July 1812; d. Sept. 7, 1903. He was graduated at Yale in 1831, and four years later entered the Presbyterian ministry, but in 1836 took orders in the Episcopal Church. He was successively rector of Grace Church, Boston, 1836–43; St. Andrew's, Philadelphia, 1844–7; Trinity Church, Boston, 1847–51; and Christ Church, Hartford, Conn., 1851–4. In the year last named he was consecrated bishop of Rhode Island. Since 1899 he has been the presiding bishop of the Episcopal Church. He has written: 'Formation of Character'; 'The Efficient Sunday-school Teacher'; 'The Dew of Youth'; 'Early Discipline and Culture'; 'Reminiscences' (1895).

Clark, Walter, American jurist: b. Halifax, N. C., 19 Aug. 1846. He was graduated at the University of North Carolina in 1864; became a lawyer in 1868, judge of the superior court in 1885, and of the supreme court in 1889. He is a contributor to leading magazines on current topics and a law writer of authority, his best known work being 'Overruled Cases' (1884). Other works by him are: 'Annotated Code of Civil Procedure'; 'Laws for Business Men.' In 1896 the North Carolina Democratic convention indorsed him as a candidate for the vice presidency, and in 1903 Mr. William J. Bryan expressed his preference for him as a possible candidate for the presidency.

Clark, William, American explorer; brother of George Rogers Clark (q.v.): b. Virginia 1 Aug. 1770; d. St. Louis, Mo., 1 Sept. 1838. He emigrated with his family at the age of 14 to the falls of the Ohio, in Kentucky, on the present site of Louisville. In 1808 he was appointed in conjunction with Capt. Meriwether Lewis to the command of an expedition designed to explore the northwest territory lying between the Mississippi and the Pacific Ocean. He acquitted himself with consummate ability in this hazardous employment, which required the combination of military and scientific skill. His journal and the account kept by him of the astronomical observations made by him and Capt. Lewis have been published. He was appointed in 1813 governor of the Northwest Territory and superintendent of Indian affairs, which offices he retained till 1820, when Missouri was created a State. Two years afterward he was again appointed commissioner and superintendent of Indian affairs.

Clark, William, American thread manufacturer: b. Paisley, Scotland, 1841; d. Portland, England, 7 July 1902. Entering the Scottish thread mills established by his family, he made himself conversant with all details of the business and in 1860 came to the United States. Here he joined his brother, George A. Clark, who had preceded him by four years, and established at Newark, N. J., a small branch of the Scottish business. From this was built up in time the great Clark thread mills of Newark. After the death of George Clark, in 1873, the business was solely managed by his brother William. At the latter's death he left bequests of $10,000 to each of three Newark benevolent institutions, $6,000 to a fourth, and $10,000 to Rutgers College.

Clark, William Andrews, American politician: b. near Connellsville, Pa., 8 Jan. 1839, of Protestant Irish farmer stock. His preparation for college was interrupted by the removal of his family to Iowa, where he attended an academy at Birmingham and studied law two years, but never practised. He taught school in Missouri 1859–60; was a miner in Colorado 1862–3; and in 1863 migrated to Idaho, where he set up in trade, and was soon one of the chief merchants in the Territory. In 1867 he contracted for a Star Route in Montana; and in 1868 formed a copartnership for a mercantile and banking business there. To qualify for the mining business, he took a complete course at Columbia School of Mines 1872–3. Since then he has been identified with mining interests in every mining region of the West, and has for many years been the largest individual metal producer of the world, besides having interests in manufacturing, railroading, mercantile business, etc. He was State orator to represent Montana at the Philadelphia Centennial of 1876, and a commissioner of the New Orleans Exposition of 1884; was Masonic Grand Master of Montana in 1877; in 1878 was major in the Nez Percé war against Chief Joseph; and was president of the constitutional convention when Montana was admitted to the Union. In 1898 he was elected to the Senate from Montana, but a protest was filed and an investigation ordered; before a report was made he resigned, returned to Montana, and was re-elected for the term 1901–7. He has been placed on many of

the most important senatorial committees, including that on foreign relations.

Clark, William Bullock, American scientist; b. Brattleboro, Vt., 15 Dec. 1860. He was graduated at Amherst College in 1884. After a course of European study he became instructor in geology at Johns Hopkins University in 1887, and since 1894 has been professor of geology there. In 1891 he was appointed director of the Maryland Weather Service.

Clark, William George, English scholar: b. March 1821; d. York 6 Nov. 1878. He was educated at Trinity College, Cambridge, took orders in the Established Church but gave up his orders in 1869, explaining his reasons therefor in a pamphlet 'The Present Dangers of the Church of England' (1870). He assisted in founding the 'Journal of Philology' in 1868, but is best known for his editorship with William Aldis Wright (q.v.) of the noted 'Cambridge Shakespeare' (1863–6). The 'Globe Shakespeare' (1864) was also edited by Clark and Wright. Clark published also 'Lectures on the Middle Ages and the Revival of Learning' as well as lesser works.

Clark, Willis Gaylord, American poet, twin brother of Lewis Gaylord Clark (q.v.): b. Otisco, N. Y., 5 March 1810; d. Philadelphia, Pa., 12 June 1841. He became associate editor of the Columbian Star, a religious weekly paper (1830), but resigned shortly after to take charge of the Philadelphia Gazette. His longest poem is 'The Spirit of Life' (1833). A complete edition of his poems, edited by his brother, appeared in 1847.

Clark River (named after Capt. William Clark), a river of the United States, rising in the Rocky Mountains in western Montana, about lat. 45° 30′ N. After a winding northwest course of about 650 miles between the Missouri and Bitter Root ranges, during which it expands into an extensive lake, it falls into the Columbia, in the State of Washington, lat. 48° 50′ N., lon. 117° 50′ W. It is also called Clark Fork of the Columbia River.

Clark University, a co-educational institution in Atlanta, Ga.; organized in 1870 under the auspices of the Methodist Episcopal Church; reported at the end of 1902: Professors and instructors, 20; students, 580; number of volumes in library, 1,000; value of property, $250,000; president, Charles M. Melden, D.D.

Clark University, Worcester, Mass., founded in 1887 by the gift of Jonas G. Clark (q.v.), and the work of instruction began in 1889. At first the institution was devoted wholly to post-graduate work, those only were admitted as students who had taken a first degree and who gave promise of high attainment in some department of science. No entrance examination was required. The design and organization of the university were intrusted to G. Stanley Hall (q.v.) formerly a professor of philosophy at Johns Hopkins University, Baltimore, and for years a close observer of schools and school methods in America and Europe.

But few departments have been organized, namely, mathematics, physics, anthropology, biology, philosophy, and psychology. Pedagogy (1899) was made one of the sub-departments of psychology. One of the characteristic features in the design is that professors and students should meet on the same plane, the professors to be as older students, the students to lecture occasionally on special subjects. Original work is encouraged and demanded, and a number of fellowships and scholarships have been founded so that worthy students of limited means might devote themselves to research along special lines, and not be hindered or hampered by doing outside work for the purpose of continuing their studies. No attempt has been made to secure large numbers of students; in such a school a small number is desirable. In 1892–3 there were 53 students; in 1896–7, 38; in 1898–9, 48.

There are 11 professors, 16 fellowships, and 16 scholarships. In the library are 18,000 volumes, and the following publications are issued by the university, but not officially: 'American Journal of Psychology'; 'Pedagogical Seminary'; 'Mathematical Review.'

In 1902 a collegiate department was opened with Carroll D. Wright as president. G. Stanley Hall is president of the university. See HALL, G. STANLEY.

Clarke, Adam, Methodist clergyman and scholar: b. Moybeg, County Londonderry, Ireland, 1762; d. London 26 Aug. 1832. He became an itinerant Methodist preacher in 1782, and continued to travel in various circuits till 1805, when he took up his residence in London, where he passed a considerable part of his subsequent life. He was learned in the Oriental languages, and published a commentary on the Scriptures (1810–26), and various other works, among the rest a 'Bibliographical Dictionary' (1802).

Clarke, Annie, American actress: b. Boston, Mass., 1845; d. Chicago 22 May 1902. Her first appearance was at the Boston Museum in 1853 as the Duke of York in Richard III. For several years she acted in juvenile parts in various places, but from 1861 till 1892 was a member of the stock company at the Boston Museum, soon becoming the leading actress there. She was a general favorite, but until 1892 was seldom seen outside of Boston. After that date she played in Chicago and other cities.

Clarke, Augustus Peck, American physician: b. Pawtucket, R. I., 24 Sept. 1833. He was graduated at Brown University in 1861, and at the Harvard Medical School in 1863. He was an army surgeon during part of the Civil War, and subsequently entered private practice. He has been sent to every International Medical Congress since 1887, and since 1894 has been dean of the College of Physicians and Surgeons in Boston. He has attained special eminence in the domain of obstetrics and gynecology.

Clarke, Benjamin Franklin, American educator: b. Newport, Maine, 14 July 1831. He was graduated at Brown University in 1863, and subsequently became professor of mechanical engineering there. In 1898–9 he was acting president of the university.

Clarke, Charles Cowden, English writer: b. Enfield, Middlesex, 15 Dec. 1787; d. Genoa, Italy, 13 March 1877. His father kept a small school and had John Keats as one of his pupils; but in 1810 gave it up and removed to Ramsgate. The son frequently went up to London,

where he came into contact with Leigh Hunt, Shelley, Hazlitt, the Lambs, and Vincent Novello, and in 1828 he married Mary, the eldest daughter of Novello. He engaged for some time in business as a bookseller and a music publisher, and from 1834 till 1856 lectured throughout the country, mainly on poets and poetry. His publications include his 'Hundred Wonders' (1814); 'Adam the Gardener' (1834); 'Shakespeare Characters,' chiefly those subordinate (1863); and 'Molière Characters' (1865), the two last being collections of some of his lectures. He is best known, however, by the edition of Shakespeare which he annotated in conjunction with his wife, and by the 'Shakespeare Key' (1879).

Clarke, Creston, American actor: b. Philadelphia 20 Aug. 1865. He is a son of John Sleeper Clarke (q.v.), and was educated at academies in Paris and London with a view to the stage, and made his début in London 1882. He has attained success in tragic roles, and has written 'The Last of His Race' and other plays.

Clarke, Edith Emily, American librarian: b. Syracuse, N. Y., 5 Nov. 1859. She was graduated at Syracuse University in 1881, and after teaching school some years, took up library work. Having served as cataloguer at Columbia University Library and at the Newberry Library in Chicago, she became chief cataloguer of public documents for the National Government in 1895, and librarian of the University of Vermont in 1898.

Clarke, Edward Daniel, English traveler: b. Willingdon, Sussex, 1769; d. London 9 March 1822. In 1799 he started on an extensive and laborious tour through Denmark, Sweden, Lapland, Finland, Russia, Tartary, Circassia, Asia Minor, Syria, Palestine, Egypt, Greece, and Turkey, returning in 1802 through Germany and France. On his return he obtained from Cambridge University the honorary degree of LL.D., in consideration of the services rendered to its public libraries and institutions by his liberal contributions, among which the greatest, perhaps, in value is the celebrated manuscript of Plato's works, with nearly 100 others, and a colossal statue from Eleusis, believed by him to be that of Demeter (Ceres). To him also the British nation is indebted for the acquisition of the famous sarcophagus of Alexander the Great, which he discovered in the possession of the French troops in Egypt, and which was by his means surrendered to the British army. In 1807 he commenced a course of lectures on mineralogy at Cambridge, and in 1808 a professorship of mineralogy was instituted there in his favor. He himself had made a splendid collection of mineralogical specimens, which was purchased after his death by Cambridge University. In 1805 he became vicar of Harlton, and in 1809 rector of Yeldham, Essex. In 1817 he was appointed librarian of Cambridge University. A complete edition of his travels appeared in 6 volumes (1810–23), and another in 11 volumes (1816–24), under the title of 'Travels in Various Countries of Europe, Asia, and Africa.' His 'Travels,' which are the most popular of his works, are attractive from the enthusiasm of the writer and his prolific imagination.

Clarke, Sir Edward George, English legal writer: b. London 15 Feb. 1841. He was admitted a barrister of Lincoln Inn in 1864, and was solicitor-general 1886–92. He sat in the House of Commons for Southwark in 1880, and for Plymouth 1880–1900. He has published 'Treatise on the Law of Extradition' (1866, 3d ed. 1888), and three collections of 'Public Speeches.'

Clarke, Frank Wigglesworth, American chemist: b. Boston, Mass., 19 March 1847. He was graduated from the Scientific School of Harvard University in 1867, was instructor at Cornell 1869, professor in Howard University 1873–4, and professor of chemistry and physics, University of Cincinnati 1874-83. He has been chief chemist of United States Geological Survey and honorary curator of minerals, United States National Museum, since 1883. He is a member of many American and foreign scientific societies, and was a member of the International Jury of Awards at the Paris Exposition of 1900, and received from the French government the decoration of the Legion of Honor. He has published: 'Weights, Measures and Money of All Nations'; 'Elements of Chemistry'; 'A Report on the Teaching of Chemistry and Physics in the United States,' the Smithsonian 'Constants of Nature,' and various official bulletins. He is also author of more than a hundred scientific essays and memoirs published in magazines and scientific journals. His most important contributions to science have been his 'Revaluation of Atomic Weights,' and his investigations upon the constitution of the natural silicates. He is joint author with L. M. Dennis of two recent works, 'Elementary Chemistry' and 'A Laboratory Manual.'

Clarke, Sir George Sydenham, English soldier and colonial governor: b. Lincolnshire 4 July 1848. After being educated at Haileybury College he entered the Royal Engineers' service and served in the Egyptian expedition in 1882, in the Sudan expedition 1885, at Suakin and elsewhere, and was knighted in 1893. Since 1901 he has been governor of Victoria, Australia. He has published: 'Practical Geometry and Engineering Drawing'; 'The Principles of Graphic Statics'; 'Plevna'; 'Fortification: Past, Present, and Future'; 'The Last Great Naval War'; 'The Navy and the Nation'; 'Imperial Defense'; 'Russia's Sea Power.'

Clarke, Helen Archibald, American writer: b. Philadelphia. She graduated from the musical department of the University of Pennsylvania 1884; began writing literary articles for the magazines in 1887, and in 1889, with Charlotte Porter, founded 'Poet Lore,' a journal devoted to the study of literature, and to literary criticism, which has maintained a high degree of excellence under her editorship. She has devoted herself especially to the study of Browning, and has edited several editions of his works in part or as a whole, and written a score of interpretative articles on the man and his work. She has composed considerable piano music, and contributed frequently to the various musical journals. Her work has appeared in 'Shakespeariana,' the 'Browning Society Papers,' 'Open Court,' 'Popular Science Monthly,' 'The Conservator,' 'Philadelphia American,' 'Music Review,' etc.

Clarke, Hyde, English philologist: b. London 1815; d. there 1 March 1895. In diplomacy, civil engineering, and scholarship he was equally at home, his versatility being conspicuous in 'Theory of Railway Investment', 'Colonization in our Indian Empire' (1857), 'Comparative Philology' (1858), and 'Examination of the Legend of Atlantis' (1886); 'Early History of the Mediterranean Populations,' etc. He also compiled a useful abridged English Dictionary.

Clarke, James Freeman, American Unitarian clergyman and author: b. Hanover, N. H., 4 April 1810; d. Boston, Mass., 8 June 1888. His first pastorate was at Louisville, Ky., 1833–40. He then settled in Boston in 1841; and was pastor of the Church of the Disciples which was organized especially for him, and of which he had charge till his death. He was a clear thinker and a leader in all reform and educational movements. From 1867–71 he was professor of natural religion and Christian doctrine in Harvard University. Together with Emerson and William H. Channing, he prepared the 'Memoirs of Margaret Fuller d'Ossoli.' His chief work was 'Ten Great Religions.' Among others were: 'Service Hymn-book and Hymn-book of the Church of the Disciples'; 'Christian Doctrine of Prayer'; 'The Hour Which Cometh'; 'Orthodoxy: Its Truths and Errors'; 'Steps of Belief'; 'Events and Epochs in Religious History'; 'The Ideas of the Apostle Paul'; 'Self-Culture'; 'Anti-Slavery Days'; 'Every-Day Religion'; and 'Vexed Questions.'

Clarke, John, American clergyman: b. Suffolk, England, 8 Oct. 1609; d. Newport, R. I., 26 April 1676. He was a physician in London, and came to Massachusetts soon after its first settlement; but being one of the friends of Anne Hutchinson, was obliged to flee with her and her associates from that colony. Proceeding to the south, they were welcomed by Roger Williams to his vicinity, formed themselves into an organization, and obtained from the Indians a district to which they gave the name of the Isle of Rhodes or Rhode Island. The settlement commenced in 1638, at Pocasset, and Clarke began to employ himself as a preacher. In 1644 he founded at Newport the second Baptist Church in America, and became its pastor. Venturing a few years later to preach in the vicinity of Boston, he was arrested by an officer of the government, was called first before a parish meeting and then before the court, and was condemned for what were adjudged false teachings, to pay a fine of 20 pounds or be publicly whipped. In 1651 he was sent to England in company with Roger Williams as an agent of the colony of Rhode Island, and published there a book entitled 'Ill News from New England, or a Narrative of New England's Persecution.' He succeeded in obtaining a revocation of Mr. Coddington's commission as governor, and remained in England after the return of Williams, till at the end of a 12 years' mission he had procured a second charter for the colony, which secured to every person at all times his own judgment and conscience in matters of religious concernment. Bancroft alludes to him in his history as "the modest and virtuous Clarke, the persevering and disinterested envoy." Upon his return in 1663 he resumed the pastorate of his church at Newport, which he retained till his death. In his will he left his farm for charitable purposes, the income of it only to be expended; and it has since produced annually about $200.

Clarke, John Mason, American scientist: b. Canandaigua, N. Y., 15 April 1857. He studied at Amherst and Göttingen and from 1881 to 1884 was professor of geology at Smith College. He subsequently became State palæontologist of New York, and has written numerous pamphlets and papers on geology and palæontology.

Clarke, John Sleeper, American actor: b. Baltimore, Md., 3 Sept. 1833; d. London, Eng., 14 Sept. 1899. He began his stage career in childhood and played comedy parts with success from 1851 to 1869. He then became a theatrical manager and with his brother-in-law, Edwin Booth, made paying ventures in various houses of amusement in the United States and England.

Clarke, Joseph Ignatius Constantine, American journalist and playwright: b. Kingstown, Ireland, 31 July 1846. He emigrated to the United States in 1868, and was on the editorial staff of the New York *Herald* 1870–83; edited New York *Journal* 1883–95; and the 'Criterion' 1898–1900. His plays include: 'Heartsease'; 'For Bonnie Prince Charlie'; 'The First Violin'; 'Her Majesty'; and he has also published 'Robert Emmet,' a tragedy in blank verse (1888); 'Malmorda, a Metrical Romance' (1893).

Clarke, McDonald, American poet: b. Bath, Maine, 18 June 1798; d. New York 5 March 1842. He was an eccentric character, familiarly known as "the mad poet"; and was the subject of an amusing poem by Halleck, called 'The Discarded.' The subjects of Clarke's verses were usually the belles of the city and topics of the day. His works include: 'Poetic Sketches' (1826); and 'The Belles of Broadway' (1833). One of his poems was 'Now Twilight Lets Her Curtain Down.'

Clarke, Marcus Andrew Hyslop, Australian novelist: b. London 24 April 1846; d. Melbourne, Australia, 2 Aug. 1881. He went to the island in his 24th year, took up journalism and acquired the experience of bush life and the knowledge of antipodean men and things of which such brilliant use is made in 'His Natural Life,' a striking convict story; 'Holiday Peak'; 'Old Tales of a New Country,' and other vivid fictions.

Clarke, Mary Bayard, American author: b. Raleigh, N. C., about 1830. While living in Cuba, she published verses signed "Tenella" in the periodicals. After her return in 1855 she wrote 'Reminiscences of Cuba' for the 'Southern Literary Messenger.' Among her works are war lyrics and translations from Victor Hugo; also prose articles signed "Stuart Leigh." In 1870 was published her poem, 'Clytie and Zenobia, or the Lily and the Palm,' and 'Wood Notes,' a compilation of North Carolina verse.

Clarke, Mary Victoria Novello Cowden, English story-writer, essayist, and Shakespearean scholar: b. London 22 June 1809; d. Genoa, Italy, 12 Jan. 1898. She married in 1828 Charles Cowden Clarke, with whom she wrote the 'Shakespeare Key' and compiled an edition

of Shakespeare's plays. Her best known work is her 'Concordance to Shakespeare,' published in 1845, which cost 16 years' labor. Other works from her pen are: 'The Girlhood of Shakespeare's Heroines' (1850); 'World-noted Women' (1857); and several stories and novels, including 'The Adventures of Kit Bam, Mariner' (1848); 'The Iron Cousin' (1854); 'The Trust and Remittance' (1873); 'A Rambling Story' (1874). See Mrs. Clarke's memoir of her husband (1887), and 'Her Autobiographic Sketch' (1896).

Clarke, Rebecca Sophia ("SOPHIE MAY"), American novelist and writer of children's stories: b. Norridgewock, Maine, 22 Feb. 1833. She has written 'The Dotty Dimple' series; 'Flaxie Frizzle' stories, etc., for children; and the novels, 'Her Friend's Lover'; 'The Asbury Twins'; 'Quinnebasset Girls,' etc.

Clarke, Richard Henry, American author: b. Washington, D. C., 3 July 1827. He was made president of the Society of American Authors in 1891. He has published 'The New Crusade of the Nineteenth Century,' relating to the Church and slavery; 'Socialism in America'; 'Biography of Commodore John Barry, Founder of the American Navy'; 'Father Sebastian Rale,' an answer to Gladstone on 'Maryland Toleration'; an 'Illustrated History of the Catholic Church in the United States'; 'Lives of the American Catholic Bishops'; and 'Old and New Lights on Columbus.'

Clarke, Samuel, English theological and philosophical writer: b. Norwich, 11 Oct. 1675; d. London 17 May 1729. He became chaplain to Dr. More, bishop of Norwich, and between 1699 and 1701 published 'Essays on Baptism, Confirmation and Repentance,' replied to Toland's 'Amyntor,' and issued a paraphrase of the Gospels. He was then presented with two livings, and in 1704 and 1705 twice delivered the Boyle lectures at Oxford on 'The Being and Attributes of God,' and on 'The Evidences of Natural and Revealed Religion.' In 1706 he published 'Immortality of the Soul', and a Latin version of Newton's 'Optics.' He was then appointed rector of St. Bennet's, London, and shortly afterward rector of St. James' and chaplain to Queen Anne. In 1712 he edited Cæsar's 'Commentaries,' and published his 'Scripture Doctrine of the Trinity,' which became a subject of much controversy and of complaint in the Lower House of Convocation. His chief subsequent productions were his discussions with Leibnitz and Collins on the 'Freedom of the Will,' his Latin version of part of the 'Iliad,' and a considerable number of sermons. His philosophic fame rests on his *a priori* argument for the existence of God, his theory of the nature and obligation of virtue as conformity to certain relations involved in the eternal fitness of things, and his opposition to Hobbes, Spinoza, Locke, Leibnitz, and others.

Clarke, William Horatio, American organist: b. West Newton, Mass., 1840. He filled positions as organist in Dedham, Boston, and Woburn; was for some years superintendent of schools at Dayton, Ohio; was organist of Tremont Temple, Boston, Mass., 1878–87, when he retired to Reading, Mass., where he built the fine four-manual organ in Clarigold Hall. He has published: 'New Method for Reed Organs' (1869) of which over 100,000 copies sold within 20 years, and 'Outline of the Structure of the Pipe Organ' (1877).

Clarke, William Newton, American Baptist clergyman: b. Cazenovia, N. Y., 2 Dec. 1841. He graduated at Colgate University 1861, and at Hamilton Theological Seminary 1863. He filled Baptist pastorates at Keene, N. H., Newton Centre, Mass., Montreal, and Hamilton, N. Y., 1863–90, and was a professor in Toronto Baptist College 1883–7. Since 1890 he has been professor of Christian theology at Colgate University, Hamilton, N. Y. He has written: 'Commentary on Mark' (1881); 'Outline of Theology' (1897); 'What Shall We Think of Christianity?' (1899); 'Can I Believe in God the Father' (1899); 'A Study of Christian Missions' (1900).

Clarksburg, W. Va., a city and county-seat of Harrison County, on the main line of the Baltimore & O. R.R., about 20 miles west of Grafton. It is pleasantly situated on the Monongahela River, in a country singularly favored by nature with an abundance of oil, coal, and natural gas. The manufactures are many and varied, decorated china, glass, tin-plate, and ironware being the leading products. The city is proud of having been the birthplace of the famous "Stonewall" Jackson (q.v.). The educational advantages are of the best, the common schools being supplemented by the Broadus Classical and Scientific Institute, a secondary school of the best type. Pop. (1900) 3,008.

Clarkson, Matthew, American soldier and philanthropist: b. New York 17 Oct. 1758; d. there 25 April 1825. Both his father and grandfather were prominent colonial officials. He was with the Northern army in 1777; was wounded at Fort Edward; at Saratoga acted as aide-de-camp to Gen. Benedict Arnold, and was present at Burgoyne's surrender. He also took part in the campaigns in the Carolinas 1781, and was aide to Gen. Benjamin Lincoln at Yorktown. He was brevetted a lieutenant-colonel, and for 14 years was major-general of the New York militia. In private life he was associated with many notable enterprises of a benevolent or educational nature. He was president of the Bank of New York for 21 years, a member of the State legislature, and at one time Federalist candidate for United States senator. Consult Memorial History of New York City (1893).

Clarkson, Thomas, English philanthropist and emancipationist: b. Wisbeach, Cambridgeshire, 28 March 1760; d. Playford Hall, near Ipswich 26 Sept. 1846. He was originally intended for the Church, and studied at St. John's College, Cambridge, where he gained the vice-chancellor's prize for a Latin essay on the theme, 'Anne liceat invitos in servitutem dare?' (Is it lawful to make slaves of men against their will?) In the course of collecting materials for this dissertation his feelings had been greatly roused by the accounts of the miseries inflicted on the unhappy Africans; and the project of accomplishing their relief, and the abolition of the slave-trade, took possession of him as the leading principle of his life. He formed a connection with a Quaker

association for the suppression of negro slavery, and was introduced to Mr. Wilberforce and other distinguished individuals. While the latter advocated the cause of abolition in Parliament, Mr. Clarkson was indefatigable in obtaining information and evidence on the subject, in attending meetings in different parts of the country, and generally conducting the agitation throughout England for the suppression of the slave traffic. In 1788 a committee of the privy council made an inquiry into the state of the African trade, and in that year a bill mitigating some of the worst cruelties of the traffic was passed. In 1791 a motion by Wilberforce in favor of putting an end to the traffic was lost by 163 to 88; but his labors, and those of his party, were at last successful in England, the slave-trade being abolished by a bill passed 25 March 1807. This point gained, their next effort was to procure the total abolition of slavery in the British colonies, and in this also, after a long struggle, they succeeded, by the passing of the emancipation act in 1833. He published, 'A Portraiture of Quakerism' (1806); 'History of the Abolition of the African Slave-trade' (1808); 'Memoirs of the Private and Public Life of William Penn' (1813); 'Researches, Antediluvian, Patriarchal, and Historical' (1836).

Clarksville, Tenn., a city and county-seat of Montgomery County, situated on the Louisville & N. R.R. near the junction of the Red and Cumberland rivers. It is the trade centre of a large tobacco-growing district, and has a number of tobacco factories, being one of the 10 leading cities of the United States in the manufacture of snuff. It has also lumber and flour mills. It is the seat of the Southwestern Presbyterian University, and of a Methodist school for girls. Pop. (1900) 9,431.

Clarksville, Tex., the county-seat of Red River County, on the Texas & P. R.R., about 15 miles south of the Red River, and 100 miles northwest from Dallas. It is the centre of a fertile cotton country, and its industries are such as are related to the raising and marketing of this staple, with some traffic in grain, hides, and live stock. Pop. (1900) 2,069.

Clary, klā'rĭ, the name of several species of the genus *Salvia,* of the mint family (*Labiatæ*). The plants are natives of countries bordering on the eastern Mediterranean, but are common in all civilized countries, and are cultivated for their aromatic or medicinal qualities. The wild clary, or wild sage, (*S. verbenaca*), is found wild in waste places imported from Europe. Clary, clear-eye, or sea-bright (*S. sclarea*), a native of Europe, is a common plant in Pennsylvania, where it has escaped from cultivation. It receives its common names from the employment of its mucilaginous seeds to remove specks from the eyes. In Europe the plant is used for flavoring soups and confectionery. Its flowers were formerly used with brandy, sugar, cinnamon, and a little ambergris, to make clary-water, regarded as a cardiac to help digestion.

Class, Classifying, Classification. When the domain of a science comprehends a very great number of objects which it is necessary to describe, or whose analogies and differences require to be assigned, it is always useful, and sometimes indispensable, to make a methodical distribution of these objects, to group those which present the greatest number of common characters, to form with these groups new assemblages, continuing the process till a limit is reached where this mode of generalizing may be stopped. The highest assemblage in this ascending series is a "class" (though this term may not be technically applied to it); the procedure necessary in forming it is "classifying," and the result, extending over some entire branch of natural science, is a "classification." We do not begin to classify till we feel the need of it, for the task requires analysis, multiplied comparisons, and researches as to the means of generalizing the particular and isolated notions which we had previously been contented to amass without regular arrangement. It is only, however, after the revision necessary for such arrangement has been undertaken that science can be said to have begun. The first attempts at generalization and classification often exercise a very important influence on the future progress of any science, and may even extend to the period when it seems to be approaching its perfection. A science consists principally in the relations of the facts observed, or knowledge acquired in connection with it. If the relations thus established are founded on accurate observations, they become in fact laws of nature. the most important and most prolific truths which human reason is able to discover. But if the imagination has been allowed to take part in the work, if it has either furnished the materials or directed the construction of the edifice, it must sooner or later be demolished, and rebuilt with better selected materials and on more solid foundations. In modern times geology commenced with faults of this description, and still seems to have difficulty in avoiding them. Natural history, to which a good classification is so essential, was not very fortunate in its first combinations: systems took possession of it, and too often blinded the inquirer to great truths which otherwise he could hardly have failed to discover. Influenced by this love of system, many, instead of submitting to the laborious investigation of facts, have come forward with some new fanciful combination, and made it almost their sole business to secure the credit of their particular classifications by overthrowing those of their predecessors or rivals. In a subject so comprehensive as natural history it seems vain to hope for a perfect classification until the resources of embryology are exhausted. Zoology is gradually tending toward a consistent system of classification, the basis of which is the resemblances of animals at various periods of their growth. The impulse to this line of research was given by Darwin. Being a strictly natural method, inasmuch as the affinities by common descent are sought after to the neglect of mere outward resemblances at a later period of life, the arrangements suggested by it to different naturalists show a considerable amount of harmony, and even those who oppose Darwin acknowledge the simplicity and consistency of embryological or genealogical classification. For the classification of the animal kingdom see ANATOMY.

Classic (Lat. *classicus,* the *classici* in ancient Rome forming the highest of the six classes into which the people were divided see CENSUS), the Greek and Roman authors of the first rank; models of literature. There is

of course a great diversity of value among them; but their superiority to the writers of modern Europe at the time of the revival of letters was so great that it was very natural for their admirers to give them collectively the name of «classics.» Subsequently the word "classical" came to be employed in a wider sense, being applied both to the standard works of any nation, and to ancient literature and art in contradistinction to the modern, and especially to the romantic.

On the revival of learning in Europe the manifest superiority of the ancient classics to the crude productions of a semi-barbarous period gave rise to a large amount of servile imitation. This was especially the case in those countries whose languages most nearly approximated to the classical models, the Latin-speaking nations of southern and central Europe, among whom the revival of classical learning first took place. German literature, which sprung into existence more recently, has perhaps most completely escaped the infection. In England the trammels of this sort of literary despotism were most experienced in the higher education, which was cast completely in a classical mold, and from force of habit has in great measure retained it, but the form and substance of the native literature have on the whole been wonderfully little affected by this exotic discipline. In Italy the early literature was very strongly penetrated with the classical spirit, but the powerful imagination of the people rejected a servile imitation, and a bold originality characterizes the best Italian writers. It was in France, where taste assumes an empire in literary matters somewhat hostile to originality, that the spirit of imitation took the strongest hold of the national genius, and so completely penetrated as to become almost indigenous to it. In the reign of Louis XIV., the golden age of French literature, classical subjects and classical models were run upon with a dreary monotony. Classical rules were received with an unquestioning allegiance, as if they had been the laws of Nature herself, and the chief glory even of those who boasted of excelling the ancients was to follow more rigidly the canons of ancient art than the ancients themselves. Admirable as much French literature in many respects is, it has not escaped the consequences of this false start. There is an inevitable coldness and unreality about the imitation of forms which have lost their original meaning, and even the vivacity of French genius hardly suffices to animate the rigidity of the models demanded by French taste, while a great deal of the older French criticism is nearly unintelligible elsewhere in Europe. Under the influence of Hugo and others, however, France has latterly escaped from the trammels of her classical age.

Classical Greek Poetry, The Growth and Influence of, a work by Prof. Richard C. Jebb (1893). Delivered originally as lectures at Johns Hopkins University, these chapters compose a brilliant sketch of the history and character of Greek poetry, epic, lyric, and dramatic. To the student who seeks to know what Greece and her literature means to the present age, but who has no time for superfluous dates or facts, or disquisitions, this book is indispensable.

Classification and Cataloguing. See LIBRARY ADMINISTRATION.

Classification of Animals, See ANATOMY (*Comparative*).

Claude, Jean, zhŏn klōd, French Protestant theologian: b. La Sauvetat, near Agen, 1619; d. The Hague 13 Jan. 1687. He officiated as pastor at Nimes and Montpellier, but owing to his opposition to the government scheme for the reunion of the Protestants and Roman Catholics, was interdicted from preaching. The controversial abilities of Claude rendered him formidable and obnoxious to the Catholic party. He wrote against Arnauld and Nicole on the doctrine of transubstantiation, and in 1678 held a discussion with Bossuet in presence of Mlle. de Duras, a Protestant lady connected with the court, and niece of Turenne, who wished to review the grounds of her faith by hearing the arguments of these distinguished champions. Bossuet published an account of the conference, which was answered by Claude. On the very morning on which the revocation of the edict of Nantes was registered at Paris, he was ordered to leave France within 24 hours. He retired to Holland, where he was received by the Prince of Orange, who settled a pension upon him. The most important of his works is his 'Défense de la réformation' (1673). He also published a well-known 'Essay on the Composition of a Sermon.'

Claude, St., France, a town in the department of the Jura, at the confluence of the Bienne and Tacon, 25 miles southeast of Lons-le-Saunier. It owed its origin to a celebrated Benedictine abbey, founded in the 5th century, and possessed of very large and even very oppressive privileges. The town is well built, is the see of a bishop, and has several handsome edifices, among others a cathedral and communal college, and a fine promenade along the Bienne. It is celebrated for its fancy turnery, snuff and fancy boxes, cutting of precious stones, etc. Pop. 9,200.

Claude Lorraine, klōd lōr răn, or **Lorrain,** so-called, French landscape painter: b. Chamagne, Vosges, France, 1600; d. Rome 21 Nov. 1682. His real name was CLAUDE GELLÉE: he was called *Lorraine* from the province of this name, where he was born. Not much is known of the particulars of his life, some of which are differently given by different writers. When 12 years old it is said he went to live with his brother, an engraver in wood, at Freiburg. Afterward a relation of his took him to Rome, where the sight of some paintings of Gottfried Wals enchanted him so much that in spite of his poverty, he traveled to Naples to study with the artist. Returning to Rome after a stay of two years, he was employed by the landscape-painter Agostino Tassi, as a color-grinder and otherwise. He is next said to have studied, in Lombardy, the paintings of Giorgione and Titian, whereby his coloring and chiaroscuro were greatly improved. After making a journey into his native country, and residing for some time at Nancy, he settled in 1627 in Rome. Here he attracted the notice of Cardinal Bentivoglio, and was introduced by him to Pope Urban VIII., who gave him orders for four paintings. His position being now assured, he had many other eminent patrons, and was enabled to live much at his ease. The

principal galleries of England, France, Spain, Russia, and Germany are adorned with his productions. The public and private galleries of England are richest in these works, a number being in the National Gallery, others at Dulwich, at Windsor Castle, and elsewhere. Claude possessed the greatest power of invention, by which he gave an inexhaustible variety to his paintings, united with an ardent and persevering study of nature. The truth with which he portrays the effect of the sun in every part of the day, soft breezes playing through the tops of the trees, and all the delicate beauties of nature, is surprising; and all his rivals fell far short of equaling the dewy humidity which he threw over dark, shadowy places. His figures are poor, and he used to say — "I sell my landscapes, and give my figures into the bargain." In a great number of his paintings the figures are the work of other artists. Claude most frequently chooses views in which the eye loses itself in agreeable prospects, without being able to define their limits. He often introduces grand architectural structures, and makes his landscapes the scenes of mythological and historical events. Claude himself made a collection of some 200 drawings of his pictures. This record, now in the collection of the Duke of Devonshire, is known as the 'Liber Veritatis.' Consult Lady Dilke, 'Claude Lorrain, sa Vie et ses Œuvres' (1884); Dullea, 'Claude Gellée, le Lorrain' (1887).

Claudian. See CLAUDIANUS.

Claudianus, klâ-dĭ-ā'nŭs, **Claudius** (commonly known as **Claudian**), Roman poet: b. Alexandria about 365 A.D.; d. about 408. He went to Rome in 395 A.D., where his poems gained him such renown that a statue was erected to his honor in the forum of Trajan. Besides several panegyrical poems on Honorius, Stilicho, and others, we possess his epic, the 'Rape of Proserpine,' an unfinished Gigantomachia, idyls, epigrams, epistles, and occasional poems. Claudian, whose native tongue was Greek, possessed a remarkable command of the Latin language, and displays poetic powers of a high character, brilliancy of diction, truth of description, and richness of illustration. The best editions of his works are those of Gesner (1759); Burmann (1760); Jeep (1876-9); Koch (1893). There is a metrical translation of his works by A. Hawkins (1817).

Claudius, klâ'dĭ ŭs (often also called **Clodius**), the name of a distinguished Roman family, which under its head Attus Clausus, a Sabine, settled at Rome about 504 B.C., and soon branched off into a patrician and a plebeian stock. Attus, admitted among the patricians, changed his name to Appius Claudius. The patrician Claudii were characterized throughout their whole history by their haughty and tyrannical bearing, displayed particularly toward the plebeians; while the plebeian branch were equally distinguished for the resolute assertion of the rights of their order. The patrician Claudii counted among their members 28 consuls, 5 dictators, 7 censors, etc. The most distinguished members of the plebeian branch bore the cognomen of Marcellus.

Clau'dius, or in full, **Tiberius Claudius Drusus Nero Germanicus,** 4th Roman emperor: b. Lyons, 10 B.C.; d. 54 A.D. He was the youngest son of the elder Claudius Drusus Nero and Antonia the younger, the daughter of Augustus' sister. His early education was left to women and slaves; owing to his ill health it was thought he would never become a robust man. He lived as an unimportant private man, and occupied himself with literature. Among other works he wrote a Roman history, embracing the period from the death of Cæsar to his own time, in 43 volumes, and also his own life. After the murder of Caligula, the body-guard, who were ransacking the palace, discovered him secreted in a corner, dragged him out, and proclaimed him emperor (41 A.D.). The senate, who had determined on the restoration of the republic, were forced to confirm the appointment. Claudius, suddenly transferred from retirement and oppression to uncontrolled power, distinguished the beginning of his reign by some praiseworthy acts; he recalled the exiles and restored their estates to them; embellished Rome and erected several large buildings for the public good. He made Mauritania a Roman province; his armies fought successfully against the Germans, and kept possession of several strong places in Britain. But he sunk into debauchery and voluptuousness; and his wives, particularly the infamous Messalina, together with his freedmen, administered the government, sold offices and places of honor, and committed the greatest atrocities unpunished. He died of poison administered by his fourth wife, Agrippina (mother of Nero), at the age of 63, 54 A.D. His deification was the cause of Seneca's pasquinade entitled 'Apokolokynthosis.'

Claudius II. (MARCUS AURELIUS FLAVIUS), surnamed GOTHICUS, Roman emperor: b. Illyria; d. 270 A.D. He was raised to the throne on the death of Gallienus, in 268, and by his virtues as well as his splendid victories over the Goths, he proved himself worthy of his exalted station.

Claudius, Appius, surnamed **Cæcus** ("the blind"), an ancient Roman, elected censor in 312 B.C., in which office he made himself notorious by his arbitrary proceedings, for the purpose of weakening the influence of the plebeians, by admitting into their number the sons and grandsons of freedmen, and others of the lowest of the people. He performed an important service, however, by the construction of the road and the aqueduct which bear his name, though he is said to have procured the removal of his colleagues from office that he might be able to appropriate the whole honor of these works to himself. Selfish ambition was the distinguishing feature in his character. In his old age he became blind; but when Cineas, the deputy of Pyrrhus (280 B.C.), had gained over the senate, which was on the point of accepting peace on the terms offered by him, Appius caused himself to be led into the senate-house, and in a celebrated speech, of which Cicero speaks in the highest terms, insisted and induced the senate to resolve that they would listen to no proposals of peace in which the evacuation of Italy was not made an essential condition. From his two sons spring the two best known branches of the Claudian family, the one distinguished by the surname of Pulcher, and the other by that of Nero.

Claudius, Matthias, mat-tē'äs klow'dĭ-ŭs, German poet: b. Rheinfeld 15 Aug. 1740; d. Hamburg 21 Jan. 1815. His prose and poetry bear a peculiar stamp of humor, frankness, and

cordiality. In 1775 he made a collection of his compositions, which had appeared in the 'Wandsbeck Messenger' and other periodicals, with the addition of some which had not been printed, and gave the collection the title 'Asmus omnia sua Secum Portans,' or 'Complete Works of the Wandsbeck Messenger.' All his works are written in a natural, intelligible, and often humorous style, and support the cause of good morals, benevolence, patriotism, and piety, while they attack folly and vice with the weapons of ridicule and scorn. Many of his songs have been set to music by the first composers, and have become a part of the national melodies. He occupied several public offices. In the latter part of his life he became a convert to religious mysticism.

Clausel, Bertrand, bĕr-träń klō-zĕl, France, a marshal: b. Mirepoix 1773; d. 1842. After gaining a high reputation by his services on the Pyrenees, in Haiti, Italy, and Dalmatia, he accompanied Junot and Massena to Spain in 1810. He laid siege to Ciudad Rodrigo, and was wounded at Salamanca. By his skill and conduct the army of Portugal was preserved and led into Spain. In 1813 Napoleon rewarded his valor by conferring on him the chief command of the forces in the north of Spain. On the restoration of the Bourbons he came to the United States, and lived here for a long time in retirement, but when Charles X. was overthrown in 1830 he received from Louis Philippe the command of the French troops in Algeria, which he retained till 1836, when he resigned in consequence of the defeat he had sustained at Constantine.

Clausen, klow'sĕn, **George,** English artist: b. London 1852. After studying at South Kensington 1867–73, he was for some time in Paris under Bouguereau and Fleury and subsequently visited Holland and Belgium, exhibiting at the Royal Academy in 1876, 'High Mass at a Zuyder Zee Village.' Besides many paintings of Dutch themes he has painted among other works: 'Laborers at Dinner'; 'Brown Eyes'; 'Evening Song'; 'Turning the Plow.'

Clausewitz, klow'zĕ vĭts, **Karl von,** Prussian military officer: b. Burg 1 June 1780; d. Breslau 16 Nov. 1831. He served with distinction in several campaigns in the Prussian and Russian services in 1815, became chief of a Prussian army corps, and was ultimately director of the army school, and inspector of artillery. Of his works the best known are his great book 'Of War' (3 vols.), and his life of Scharnhorst.

Clausius, klow'zĕ-ŭs, **Rudolf,** German physicist: b. Köslin, Pomerania, 2 Jan. 1822; d. Bonn 24 Aug. 1888. He studied at Berlin and afterward lectured on natural philosophy as *privat-docent* at Berlin, and as professor at the Zürich Polytechnic School. In 1869 he was appointed to the chair of Natural Philosophy at Bonn. He was elected a foreign member of the Royal Society in 1868, and in 1879 was given its highest honor, the Copley medal. His scientific labors cover parts of the field of optics and of electricity, but his especial work was his contribution to the science of thermo-dynamics, the honor of establishing which on a scientific basis he divides with Rankine and Thomson. His mathematical methods he also applied to the theory of the steam-engine, the dynamical or kinetic theory of gases, and to electricity and electro-dynamics. His great work is his 'Theory of Thermo-Dynamics.'

Clausthal, klows'täl, Prussia, a mining district and town in the province of Hanover. It is situated on the Zellerbach, 26 miles northeast of Göttingen. It stands in a bleak district, on the top and slopes of a hill, about 1,800 feet above the sea. It is regularly laid out, having been frequently burned down and rebuilt, but the houses are generally of wood. It contains a government mining school, with a good collection of models of mines and minerals, a library of 30,000 volumes, a mint at which 14,000 silver dollars are coined weekly, and over 600 gold ducats yearly, and it has also a church, court-house, and gymnasium. One of the mines reaches 500 feet below the level of the Baltic, and is drained by a tunnel cut through the mountain to a distance of six miles. The machinery of the mines is worked by water power, and every stream in the vicinity is carefully appropriated to this purpose; the various canals, which extend from mill to mill throughout the mines, have an aggregate length of 125 miles. These mines have been worked since the 11th century. The mines furnish employment to the men, and a number of knitting mills give employment to the women. Pop. 9,200.

Clava Coronæ, klā'va kō-rō'nē ("the Key of the Crown"), one of the names given to the star Alpha Coronæ Borealis, the brightest in the Northern Crown. The more common name is that of Arabic derivation, Alphecca.

Clavagel'la. See GASTROCHÆNIDÆ.

Clavaria, klā-vā'rĭ a, a genus of fungi, many of them edible. Some of the species are branched, some club-shaped. One species (*C. botrytis*), growing in Germany, is a common article of food. It has a sweetish taste, and is said by Liebig to contain mannite (q.v.). Another species is the goat's-beard fungus.

Claverack, klăv'ĕr-ăk, N. Y., a town in Columbia County, on the Boston & A. R.R., about 28 miles south of Albany. The town was settled in 1660, and has a church building dating from 1767, and a court-house erected in 1784. The town is the seat of a well-known school called the Hudson River Institute, established in 1854. Pop. (1900) 4,416.

Claverhouse, klăv'er ŭs. See GRAHAM, JOHN.

Clav'erings, The, a novel of contemporary English life, by Anthony Trollope, published 1867.

Clav'ichord, a keyed musical instrument, now out of use, somewhat in the form of a spinet, the strings of which are supported by five bridges. One distinction in the clavichord is that the strings are covered with pieces of cloth, which render the sound sweeter, and at the same time deaden it, so as to prevent its being heard at any considerable distance. On this account it was formerly much used by the nuns, who could practise on it without disturbing the dormitory. It is sometimes called the "dumb spinet."

Clav'icle, or Collar-bone, a bone situated immediately above the first rib, stretching from the upper border of the manubrium of the sternum, outward and backward to the acromium

process of the scapula or shoulder-blade. It connects the upper limb, the arm, with the trunk, and is so fastened that while its inner end rests on the sternum and cartilage of the first rib the outer end is associated with the scapula, supporting it firmly in its varied positions and preventing it from falling forward from the chest. The clavicle is a long bone, and in men is much heavier than in women. It is absent or imperfectly developed in those animals which do not use lateral movements of the fore-limbs and is very much exaggerated or modified in animals such as birds, that exercise the arms very extensively. The clavicle is very frequently broken in children from the results of a direct fall, and as it does not always occasion a marked deformity the diagnosis is at times difficult. Consult Morris, 'Human Anatomy,' 3d ed.; Gerrish, 'Text-Book of Anatomy by American Authors,' 2d ed.; Spalteholz, 'Anatomy.' See SHOULDER-GIRDLE.

Clavigero, Francisco Xavier Saverio, frän-thēs'kō hä-vē-ār' sä-vā-rē'ō klä-vē-hā'rō, Mexican historian: b. Vera Cruz, Mexico, about 1720; d. Cesena, Italy, 1787. He was educated as an ecclesiastic, and resided 36 years in the provinces of New Spain, where he acquired the languages of the Mexicans and other indigenous nations, collected many of their traditions, and studied their historical paintings and other monuments of antiquity. The first of his researches was a 'History of Mexico,' written in Italian, of which an English translation was published in 1787. This is a most comprehensive work, affording a great deal of information relative to the natural and civil history, antiquities, and religion of Mexico; but it displays more industry than judgment on the part of the author. On the suppression of the Jesuits by the Spanish government in 1767 Clavigero went to Italy, the Pope assigning him a residence in Cesena.

Clavijo y Fajardo, José, hō-sā' klä-vē'hō ē fä-här'dō, Spanish scholar: d. 1806. He lived in Madrid, where he had the reputation of an intelligent scholar, and had published a journal, 'El Pensador,' and other useful works, when his connection with the sister of Beaumarchais, whom he had loved and then forsaken, gave rise to an affair of honor between him and the brother of the lady, who was formidable for talent rather than courage. This affair, in which he narrowly escaped with his life, deprived him of his office and the good opinion of his fellow-citizens. He passed the remainder of his days under a kind of dishonor, which the representations of his adversary had brought upon him. For more than 20 years he superintended the publication of the 'Mercurio Historico y Politico de Madrid,' with which he had been intrusted as early as 1773. He likewise translated Buffon's 'Natural History' into Spanish (1785–90). He was vice-director of the Cabinet of Natural History, and director of the Theatre de los Sitios, when he died. Far from resembling the detestable portrait which Beaumarchais draws of him, Clavijo was of a mild disposition, pleasing manners, and a clear understanding. Goethe founded his tragedy 'Clavigo' on Beaumarchais' story.

Clavis, klā'vĭs (Lat. "key"), a drawing, index, etc., which serves as a guide to the understanding of another work; for instance, *clavis Ciceronia, clavis Homerica,* etc.

Claws, sharp hardenings of the skin at the end of the limbs of animals. The term is often applied to the chelæ and similar structures at the end of arthropod limbs, but is best restricted to the horny nails found at the end of the digits in most reptiles, on the toes, and often on the thumb and first finger of birds, and seen in perfection in many mammals, such as the carnivores, insectivores, rodents, edentates, and others, where the nails are sharp and serve for scratching and clinging. See HOOF; HORN; NAIL.

Claxton, Alexander, American commodore: b. Maryland about 1790; d. Talcahuana, Chile, 7 March 1841. He entered the navy as midshipman in 1806, was promoted to a lieutenancy in 1813, and served in the sloop of war Wasp in her action with the British sloop of war Frolic, on 18 Oct. 1812. He was promoted to the rank of master commandant in March 1820, and to that of captain in 1831, performing much active service in both grades. He died while in command of the squadron in the Pacific Ocean.

Claxton, Kate (STEVENSON), American actress: b. New York 1850. She was the daughter of Spencer Wallace Cone, and was married to Charles Stevenson in 1878. She made her début at Daly's Theatre before she was out of her teens, but her success dates from 1873, when she acted Mathilda in 'Led Astray.' As Louise in 'The Two Orphans' she attained great celebrity. She was playing the part at the Brooklyn Theatre when, on the night of 5 Dec. 1876, that structure was destroyed by fire with great loss of life. Since 1896 she has been touring the country in emotional plays.

Clay, Cassius Marcellus, American diplomatist: b. Madison County, Ky., 19 Oct. 1810. He was graduated at Yale College in 1832, and three years later was elected to the legislature of Kentucky. The improved jury system and the common school system of Kentucky are in large measure due to his efforts while in the legislature. He denounced the scheme of Texan annexation as designed for the extension of slavery, and in 1844 traversed the northern States, addressing immense audiences in favor of the Whig presidential candidate. On 3 June 1845 he issued in Lexington, Ky., the first number of the 'True American' a weekly newspaper, devoted to the overthrow of slavery in that State. It aroused indignant opposition, and in August following his press was seized by a mob and sent to Cincinnati. He was threatened by public resolution with assassination, but revived his paper, printing it in Cincinnati and publishing it in Lexington. Public sentiment came gradually to support the principle of the freedom of the press, and Clay was able to keep an anti-slavery journal in the field, first at Lexington, and afterward at Louisville. He served in the Mexican war, was an opponent of slavery, and supported Lincoln for the presidency. From 1862 to 1869 he was minister to Russia. In 1886 he published his speeches, edited by Horace Greeley. In 1896 he supported the "gold" Democratic ticket.

Clay, Clermont Claiborne, American senator: b. Huntsville, Ala., 1819; d. there 3 Jan. 1882. He graduated at the University of Alabama in 1835, and after studying law in the University of Virginia, was admitted to the bar in 1840. He was elected to the Alabama legis-

lature, 1842, 1844, and 1845; was judge of the Madison County court 1846–8. He was chosen United States Senator in 1853, and re-elected in 1859, receiving every vote in the legislature. In the Senate he supported the admission of Kansas under the Lecompton resolution, and was an ardent advocate of the State sovereignty doctrine. He was formally expelled in 1861, and became a senator in the Confederate Congress. In 1864 he was a secret agent of the Confederacy in Canada, but in May 1865 gave himself up to the United States authorities and was a fellow prisoner of Jefferson Davis at Fort Monroe. After his release in April 1866 he returned to the practice of law in Huntsville.

Clay, Frederic, English composer: b. Paris 3 Aug. 1840; d. London 27 Nov. 1889. He studied music at Paris, and settled in London as a composer for the stage, his most successful production being 'The Black Crook.' He composed several popular songs, the best known being 'She Wandered Down the Mountain Side.'

Clay, Green, American soldier: b. Powhatan County, Va., 1757; d. Kentucky 31 Oct. 1826. He was a cousin of Henry Clay (q.v.). He went to Kentucky early in life and there acquired a fortune as a surveyor. He filled many local offices, was a member of the convention that ratified the Federal constitution, of the Kentucky Constitutional Convention of 1799, and served for many years in the State legislature. On 16 March 1813, Gov. Shelby commissioned him a brigadier-general, and in May of that year, when Gen. Harrison was besieged by the British at Fort Meigs, on the Maumee River, Clay came to his relief with 3,000 volunteers. He was left in command of the fort and successfully defended it against a combined attack of British and Indians under Gen. Proctor and Tecumseh.

Clay, Henry, American statesman: b. Hanover County, Va., 12 April 1777; d. Washington, D. C., 29 June 1852. He was the son of a Baptist preacher who died in 1782, leaving but a small property to his widow and children. His early education was of a very limited character, and at 15 he was placed in a small retail store in Richmond. In a short time, however, he secured employment as a lawyer's clerk and after becoming a student of law was licensed to practice at the Virginia bar before he was 21 years of age. In less than a year later he removed to Lexington, Ky., and there began the practice of his profession, securing a lucrative business almost immediately. His success at this period is sometimes explained by reference to his frank, cordial, attractive manners, but no doubt his signal abilities had quite as much to do with it. In boyhood he had acquired the art of ready speech by solitary practice in the forest, barn, or cornfield, and the easy self-confidence which this had produced now stood him in good stead. In 1800 he was sent as representative to the Kentucky legislature and in 1806 was for a year United States senator to fill the unexpired term of Gen. Adair, who had resigned. He returned to the State legislature in 1807 and the next year, as the outcome of a dispute between himself and another member, Humphrey Marshall, challenged his opponent to a duel in which both were slightly wounded. In 1809 he was a second time chosen to fill a vacancy in the national Senate, remaining there two years, making his first speech at this time in favor of protection. In 1811 he was elected to the House of Representatives and on his appearance there was chosen speaker by a large majority, a post which he retained till 1814. During this period Clay took an active part in the congressional debates respecting the second war with England, vigorously sustaining the war measures of the administration by his eloquence. In January 1814 Clay resigned his speakership, having been appointed one of the commissioners to negotiate a peace with England at Ghent, in Belgium. In this matter he was instrumental in securing to the United States the free navigation of the Mississippi. After the signing of the treaty he spent some time in Paris, and also in London, where he was cordially received, returning to America in September 1815. He was again elected to Congress and again chosen speaker, and at this time was a strenuous advocate of the independence of the Spanish-American republics, as well as of the stimulation of American industries by a protective tariff. Slavery was now becoming one of the most important of political questions as regarded its limitation or extension, and the admission of Missouri into the Union brought controversy to a white heat, the contention being whether or not it should be admitted as slave or free territory. Clay, if not the author of the celebrated "Missouri Compromise," establishing the line of 36° 30′ as the northern limit of slave-holding territory, was its most earnest supporter. In 1824 he was a candidate for the presidency, in opposition to John Quincy Adams, Andrew Jackson, and William Crawford, and the Electoral College failing to make a choice, the election devolved upon the House of Representatives. On this occasion the election was secured for Adams through Clay and his friends voting in his favor. He was subsequently charged with bargaining by his enemies, in respect to his attitude at this time, but there is no evidence sustaining such a claim. John Randolph was the most persistent of Clay's defamers and after he had termed Clay's course in securing Adams' election as a "coalition of Puritan with blackleg" he was challenged to a duel by the other. During Adams' administration Clay was secretary of state, filling that office to general satisfaction, and in 1831 entered the Senate, where he led in the opposition to President Jackson's administrative policy, and attempted to prevent the removal of the deposits from the United States Bank. Largely through his influence the "Compromise Bill" was carried through Congress, which closed debate on the nullification question, through its partial reversal of the protective tariff. In 1832 Clay was for the second time a presidential candidate, but the popularity of Gen. Jackson was so great at this time that any other candidate had small chances of success, Clay receiving the votes only of Massachusetts, Rhode Island, Connecticut, Delaware, Maryland, and Kentucky. In March 1842 he resigned from the Senate and retired to private life, permanently, as he hoped. He was, however, in 1844, nominated a third time for the presidency and defeated after an intensely exciting political contest. The numerical majority was very small and his defeat was attributable in some degree to the influence of the administration. The primary cause, nevertheless, was the annex-

ation of Texas, a measure to which Clay had been opposed. After spending several years in retirement on his estate of Ashland, near Lexington, Ky., he was returned to the Senate in 1849, where he took an active part in the dispute between the slave-holding power and its opponents on the question of the admission of California, and devised the "Compromise of 1850," which terminated the long and bitter struggle. It has been sometimes urged against him as a reproach that he was always ready with a compromise in political emergencies, but in these matters he may have been wiser than his critics. For the greater part of his life he wielded a great political influence, acquired partly by his eloquence as an orator, partly by the fact that he never left his position in doubt on questions of national moment. By throwing the entire weight of his talents and influence in favor of a *via media* he more than once ended the violence of party strife which had reached so high a pitch as to endanger the national peace and the continuance of the government. In the crucial matter of slavery his counsels were moderate and his policy always pacificatory. In his latest years, however, this question had become too overwhelmingly important to be handled in any but the most resolute fashion and although the "Compromise of 1850" served its immediate turn, the day for compromises was nearly over, and this the great Kentuckian may have realized. This was his latest political effort and his death resulted, in effect, from the exhaustion induced by the controversy at this time. His political career extended over half a century and for much of that period he ranked as one of the foremost orators of the time. He was the subject of much adulation as well as of bitter slander. The latter was certainly undeserved, and if he does not bulk so largely in the minds of men at present as his admirers fondly anticipated, a juster estimate than any of which they were capable may find in him a truer greatness than they recognized. There were serious limitations in his character: He reflected the violence of his time, the tendency to unrestrained invective, once common among public men, but he also reflected much of its nobility, and his devotion to the real interests of his country can scarcely be doubted. Consult Cotton, 'Life and Times of Henry Clay'; Schurz, 'Henry Clay' (1887); Parton, 'Famous Americans.'

OSCAR FAY ADAMS.

Clay Center, Kan., the county-seat of Clay County, is situated on the Union P., and Chicago, R. I. & P. R.R.'s, and on the Republican River, which supplies ample water-power. The principal industries are the manufacture of foundry and machine-shop products and flour, and the cultivation of nursery stock. The city is somewhat noted for its greenhouses. Pop. (1900) 3,069.

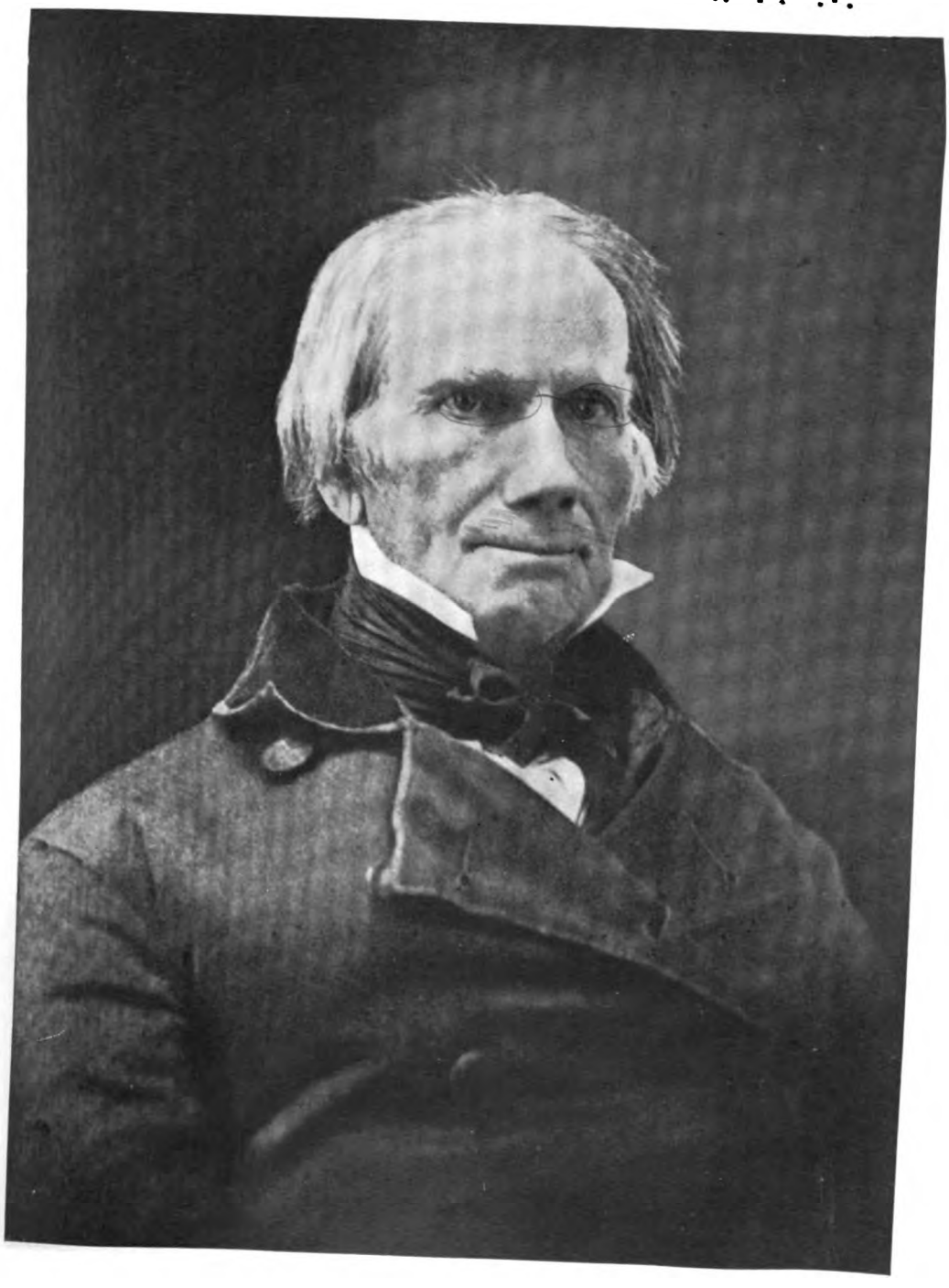
Clay, any aluminous silicate having plasticity; that is, which can be molded, when moist, into forms which become stone hard after exposure to a red heat or higher temperature. Plasticity is a physical quality, apparently having little relation to chemical composition, and the exact reason why one clay is more plastic than another is even yet largely a matter of speculation. In a broad way clays may be divided into: (1) Pure clays, mostly silica and alumina, with small amounts of iron, lime, magnesia, soda, and potash; (2) sandy clays or loams, comprising much of the arable soil of the world; and (3) limy clays or marls, clays containing a high per cent of lime. Clays are also given a great variety of names, according to special characteristics and economic use. The important divisions, based on use in the arts are: Kaolin, or China clay, pottery clay, fire clay, and brick clay.

Origin of Clay.— The base of all clays is the mineral kaolinite, having the formula $Al_2O_3.2SiO_2+2H_2O$, giving silica 46.3 per cent; alumina, 39.8 per cent; water, 13.9 per cent. It is made up of minute hexagonal plates. It results from the decay of feldspathic rocks, particularly granites and gneisses. Surface waters percolating through such rocks leach out the potash in the feldspar; some silica is also leached out and left in a hydrated state Kaolinite results from the union of the broken-down alumina of the feldspar with the hydrated silica. Thus were formed in place the kaolin deposits of Cornwall, England, and some of the kaolin of North Carolina and Pennsylvania. By the erosion of the land the kaolin and other products of rock decay are carried away and deposited as silts in lakes or in the ocean. Also, under the grinding of glaciers, rocks are reduced to a fine rock flour, forming glacial clays (boulder clay or till). The beds of clay laid down in the ocean may be buried deeply under other deposits, and by heat and pressure be changed to shale. When the sea bottom is elevated and the new land surface eroded, the shale may disintegrate into clay again, or the shale itself may be mined by man, ground, and used as clay.

Varieties of Clay.— Pure kaolin or China clay is rare. It is pure white and almost free from iron salts. The common chemical impurities in the crude material are silica, iron, lime, alkalies, magnesia, and titanium, and the common mineral impurities are quartz, feldspar, mica, calcite, magnetite, limonite, and pyrite. If the product is white, contains very little iron, and is low in alkalies it passes in the trade as kaolin. Kaolin has little plasticity, and in making pottery other clays are often added to give this quality. It may occur as residual kaolin in the position of the original feldspar body, a vein or dike, or, if transported by streams and deposited at a distance in beds, as sedimentary kaolin. Residual kaolin is apt to be of better quality than sedimentary, containing less iron and other impurities.

The United States imported about 130,000 tons of kaolin in 1902, the production for 1901 having been 97,253 short tons. Kaolin is mined in De Kalb and Jefferson counties, Ala.; at Hockessin, Del.; in Taylor County, Ga.; at Blandford, Mass.; in Macon, Jackson, and Montgomery counties, N. C.; in Chester and Delaware counties, and in the South Mountain region, Pa.; in Aiken County, S. C.; and in Lake County, Fla.; and there are deposits in Missouri, Tennessee, and several other States.

Besides being used in making pottery and white tiling and brick, kaolin is largely employed in the manufacture of paper, for weighting the paper and giving a better surface. The largest pottery manufactures in the United States are at Trenton, N. J., and East Liverpool, Ohio. Nearly all the Chester County, Pa., kaolin goes



HENRY CLAY.

to those places. The South Carolina kaolin is nearly all used in paper-making.

ANALYSIS OF VARIOUS CLAYS.

	SiO_2	Al_2O_3	H_2O	Fe_2O_3	CaO	MgO	Na_2O, K_2O	TiO_2
1	53.10	33.06	11.32	1.18	0.38	0.08	0.83	—
2	73.80	17.30	4.69	.35	—	1.18	2.49	—
3	59.83	24.58	7.83	1.66	0.28	0.87	3.11	1.17
4	68.13	20.80	6.72	1.20	0.42	0.37	2.55	—
5	67.80	11.55	0.20	6.50	8.90	5.32	2.42	—
6	56.10	27.42	8.90	2.68	—	0.18	2.71	1.0
7	40.22	8.47	20.71	2.83	15.45	7.80	3.20	—
8	57.46	21.15	—	5.52	3.65	1.50	4.72	—

1. Crude kaolin, West's Hill, N. C. 2. Refined kaolin, Mt. Holly, Pa. 3. Fire clay, Bolivar, Pa. 4. Pottery clay, Zanesville, O. 5. Paving brick clay, Bloomington, Ill. 6. Front brick clay, Sayreville, N. J. 7. Brick clay, Milwaukee, Wis. 8. Terra-cotta clay, Glens Falls, N. Y.

Fire Clays differ much in color, hardness, texture, and composition, and some clays used in making fire brick are not particularly refractory, but are used for their high plasticity. Strictly a fire clay is a nearly pure mixture of sand and clay with only traces of iron, lime, and magnesia, and hence makes white or light colored bricks which can stand very high temperatures. According to Ries a clay should not be considered refractory unless its fusing point is above 2,700° F. Fire clays are divided into plastic and flint, the former, if hard when dug, becoming plastic when ground and mixed with water; the latter, though sometimes having nearly the same composition, do not become plastic when similarly treated. Fire clays, like kaolins, are sometimes residual products of the decay of feldspar veins, but most are of sedimentary origin. Some form the underclay of coal seams, but all such underclays are not refractory. The underclays of the Michigan coal beds are not. Fire clays in the United States are found in rocks of many geological periods, but chiefly in the Carboniferous and Cretaceous. Workable deposits are known in 18 States; important deposits being in western Pennsylvania; in the coal-mining region of Ohio; in a belt across New Jersey from Perth Amboy to Trenton; in Cecil, Garrett, and Allegany counties, Md.; near St. Louis, Mo.; near Woodstock and Aniston, Ala.; and near Golden, Colo.

Potters' Clay.— Clays for potters' use, apart from the materials used in accessory work, such as fire-brick, saggers, etc., are divided into two classes, kaolins and ball clays. The former term is derived from the Chinese Kao-ling, meaning lofty hill. The Chinese porcelain clay was found in quantities in a hill thus named, and the term applied to the clay served to define it. The word kaolin is now applied by common consent to a residual clay which remains white after burning. A residual clay is one which lies as it was formed. Masses of feldspar have been decomposed, the contained potash has been gradually dissolved by carbonated waters, and the residue of silica and alumina has been left. There is usually more or less undecomposed feldspar and grains of quartz associated with the clay, and hence most kaolins are washed before being put on the market.

Kaolin is well known as forming one of the ingredients in Oriental porcelain, the other ingredient being a quartzose feldspathic rock called in China *petuntze*. For Sèvres porcelain kaolin is obtained from Limoges.

Ball clay,— probably corrupted from bowl clay,— is a sedimentary clay, having been washed up and redeposited. It is valued for a high plasticity which kaolin does not possess. The purest ball clay is found in Florida and is sold under the name of "plastic kaolin." Most of these clays burn to a cream or almost a stone color. They are mined in New Jersey, Kentucky, Missouri, and Colorado, in addition to the Florida clay already mentioned. Ball clays are not usually washed before use.

Pure clay is a hydrated silicate of alumina containing about 46 per cent silica, 39 per cent alumina, and 14 per cent water. There is no clay known, however, which contains more than 98 per cent of this silicate, even after washing.

Brick Clays are mixtures of sand and pure clay with lime, magnesia, iron, potash, and soda; in fact, bricks are often made from sandy mixtures which are not properly clay. A mixture with considerable iron burns red, from the oxidation of the iron. Carbonate of lime, or magnesia, by forming light-colored silicates, counteracts this red color. Thus the red clays of Wisconsin, which sometimes contain 20 per cent of lime, make the cream-colored Milwaukee brick. The sedimentary glacial clays are largely used for brick-making in the northern States, sedimentary surface clays and loams in the western States, and residual clays in the southern States. All that is required is that the brick shall be of good color, dense, hard, and of regular form. Brick material of good quality is found in nearly every State of the Union.

For making paving-brick a clay or shale should be relatively high in lime, iron, and the alkalies, that it may vitrify well in burning. When ground and mixed the clay or shale should be fine-grained and plastic, and should shrink but little when burned. Of the western States Illinois leads in the production of paving-brick, with Missouri second.

The very plastic clay known as gumbo in the southern States, besides other clays, are burnt in small lumps and used as ballast by a number of railroads.

Terra cotta, used in fire-proof construction and for decoration, may be made of any clay that will make good, strong brick, and contains no excess of soluble salts that will "whitewash" on weathering.

Methods of Mining.— The clay, if it lies at or near the surface, is first stripped of soil or sand and gravel; sometimes as much as 30 feet being removed. In New Jersey the clay is often dug in pits as deep as the thickness of the bed by hand labor. Usually clay beds are worked either by digging the clay entirely from the base of the bank, by working the bank on an incline of about 30° or, where the bank is over 30 feet high, by working in benches six to eight feet wide and seven to nine feet high. Steam shovels are sometimes used. Where the clay is tough it is often worked by undermining several feet and then breaking a foot or more from the face by wedges. Blasting is used in very tough clay and in shale. If the clay lies at some depth, drifts large enough for a man and a wheelbarrow are driven in to the bank side by side.

Sometimes a shaft is sunk and drifts driven from the base, this method being used in Pennsylvania and Ohio and in the fire-clay beds of Missouri.

Egyptianized Clay.— A discovery which gives good promise of affecting the clay industry and its various branches has been made by Mr. E. G. Acheson of Niagara Falls. While experimenting in crucible manufacture, Mr. Acheson had occasion to search for a clay possessing certain qualities. After a series of experiments the account of Egyptian brick-making given in the fifth chapter of Exodus attracted his attention, and conceiving the idea that some property in the straw used in brick-making in Egypt might give him the result he sought, he boiled a quantity of straw, obtaining a dark-red liquid which he used in the treatment of clay, finding it excellent for increasing its plasticity. He sought out the principle, and determined that the agent was tannin. He treated other clays with water in which tannin was in solution, and realized that he had made an important discovery.

The name given by Mr. Acheson to clay treated by his process is "Egyptianized clay." He has discovered that it is practicable so to treat clay and other earthy materials as to ensure greater strength in the products made therefrom, also to greatly reduce the shrinkage and warping in the process of drying and baking, and to increase the solubility and the plasticity of the material. By his process, non-plastic clays may be rendered plastic, and plastic clays made more plastic by treatment with tannin or an agent having the astringent principles of tannin.

It has been found by experts of the highest standing that clay so treated is changed in a remarkable manner. Even one half of 1 per cent of tannin develops a wonderful effect, requiring 13 per cent less water to make the clay soft. The maximum effect of the process and treatment, however, seems to be obtained by the use of 2 per cent of tannin in a 10-day treatment, consisting in keeping the clay wet, so that the tannin is dissolved. In the burned form the strength of the clay is increased 50 per cent, while in the sun-dried form it is increased in tensile strength 350 per cent. It is also observed that the Acheson treatment removes the crackling tendencies of many clays. In cases where clay articles are to be made of a certain size, they can be made more exact by the Acheson process, as there is less shrinkage. All parts intended to carry loads may be greatly increased in strength, while there is decreased porosity. Many of the plastic clays are off color, but non-plastic clays of desired color will be brought into service by the Acheson process. In making glass pots it now takes months to "age" or temper the clay, while with the Acheson process the maximum effect is obtained in a 10-day treatment. It is told of the Chinese that the people of one generation prepare the clay for the use of the next, all of which time is spent in making the clay plastic. Under the Acheson process the results are said to be more pronounced in 10 days than obtained by old methods in years.

The following States in 1901 manufactured clay products to the value of $3,000,000 or over. The figures are from 'The Mineral Industry.'

State	Brick and Tile	Pottery	Total
Ohio	$11,526,424	$10,048,561	$21,574,985
Pennsylvania	13,656,730	1,665,012	15,321,742
New Jersey	5,781,805	5,900,073	11,681,878
Illinois	8,960,041	682,449	9,642,490
New York	7,214,358	1,077,360	8,291,718
Missouri	4,409,906	64,647	4,447,553
Indiana	3,935,083	531,371	4,466,454

The total value of the clay products made in the United States in 1901 was $87,747,727, classified as follows:

Common brick	$45,503,076
Front brick	4,709,737
Fire brick	9,870,421
Paving and vitrified brick	5,484,134
Sewer and drain tile	6,736,969
Crude clay and various manufactures	15,443,390

See Porcelain; Soil.

Bibliography.— For statistics of production, see 'The Mineral Industry.' For general works, see Davis, 'Practical Treatise on Manufacture of Bricks, Tile, and Terra Cotta'; Fairie, 'Notes on Pottery Clays: Their Distribution, Properties, and Uses, with Analyses of Ball Clays, China Clays, and China Stone'; Sandeman, 'Notes on the Manufacture of Earthenware'; also the following bulletins and reports: 'New York State Museum Bulletin 35'; 'New Jersey Geological Survey Report 1878'; 'Ohio Geological Survey Report 1893' (Vol. VII., Part 1); 'Missouri Geological Survey' (Vol. II.); 'Wisconsin Geological Survey Bulletin 8' (Part 1); 'Twentieth Annual Report of the Geological Survey of Indiana'; 'Report of Pennsylvania State College 1897'; 'North Carolina Geological Survey Bulletin 13.'

Clay Iron-Stone, oxide of iron (hematite) mixed with clay or sand, an iron ore of importance in England. It is hard and red to brownish-black in color. The name is also given to the argillaceous carbonate of iron occurring in nodules and beds in the coal regions of Pennsylvania, Ohio, and other States. When intimately mixed with coal, as in Scotland ("blackband ironstone"), it is of importance as an iron ore (q.v.).

Clay Marl. See Marl; Soil.

Clayden, Peter William, English Unitarian clergyman and author: b. Wallingford, Eng., 20 Oct. 1827; d. London 19 Feb. 1902. After being pastor of Unitarian congregations at Boston, Lincolnshire, 1855–9; Rochdale 1860; and Nottingham 1860–8; he became one of the staff of the London *Daily News,* on which he remained till 1896, in the meantime establishing the Reading *Observer* in 1873, remaining its proprietor for six years. He published: 'The Religious Value of the Doctrine of Continuity' (1866); 'Scientific Men and Religious Teachers' (1874); 'England Under Beaconsfield' (1880); 'Samuel Sharpe, Egyptologist' (1883); 'The Early Life of Samuel Rogers' (1887); 'Rogers and His Contemporaries' (1889); 'England Under the Coalition' (1892).

Clay'more, formerly the large two-handed, double-edged sword of the Scotch Highlanders; now the name is given to a basket-hilted, double-edged broadsword.

Claypole, Edward Waller, American geologist: b. England 1 June 1835; d. Long Beach, Cal., 17 Aug. 1901. He was graduated at the University of London in 1862; was professor of geology and biology in the California Polytech-

nic Institute in Pasadena, and for a time was on the geological survey of Pennsylvania. He was the author of numerous reports on the geology of Perry County, Pa., and of papers and essays on geological and biological subjects. He was a member of a number of geological societies in London, Edinburgh, and America, and of the American Association for the Advancement of Sciences.

Claypole, Noah, the sneaking, cowardly apprentice in Dickens' 'Oliver Twist,' who robs his master's till, joins Fagin in London, and by turning state's evidence insures the conviction of Bill Sykes for the murder of Nancy.

Clayton, Augustine Smith, American lawyer: b. Fredericksburg, Va., 27 Nov. 1783; d. Athens, Ga., 21 June 1839. He graduated at the University of Georgia 1804; was admitted to the bar, and practised with eminent success. He served in the State legislature; was judge of the superior court 1819–25 and 1828–31; and a representative in Congress from 1831 to 1835. In Congress he opposed the tariff and United States bank measures. He is said to be the author of the political pamphlet 'Crockett's Life of Van Buren.' He compiled 'The Laws of Georgia, 1800–10' (1812).

Clayton, Estelle Evesson, American actress and dramatist: b. New York State; married to Charles W. Durant in 1888. She began her stage career in 1878, playing Agnes Wickfield in 'Wilkins Micawber.' She has played Nora in 'Esmeralda,' and Constance in 'Young Mrs. Winthrop' with conspicuous success. In 1885 she wrote and produced at Madison Square Theatre, New York, 'Tric-o-Trin,' and in 1888 dramatized Amelie Rives' famous novel, 'The Quick or the Dead,' and played it with great success throughout the southern States. She wrote the text for the operas 'Paulita' (1890), and 'The Viking' (1895), and a comedy, 'A Puritan Romance' (1897), which was produced in London with success.

Clayton, John, American botanist: b. Fulham, England, 1686; d. Virginia 15 Dec. 1773. In 1705 his family came to Virginia, where his father became attorney-general, and took up their residence near Williamsburg. He entered the office of Peter Beverly, clerk of Gloucester County, succeeded him, and held the office for 51 years. He was an enthusiastic botanist, and thoroughout his long life delighted in exploring and describing the plants of his region. Gronovius and Linnæus published an account of specimens of Virginia flora sent them by Clayton (Leyden 1739–43), and Gronovius' son named a genus of herbaceous plants *Claytonia* in his honor. Clayton's studies of Virginia natural history were published in the 'Philosophical Transactions' of the London Royal Society, and his descriptions of some new species of plants are to be found in the third volume of Peter Force's 'Tracts.' Two folio volumes of manuscript, almost ready for the press, were burned with the records of New Kent County during the Revolutionary War.

Clayton, John Middleton, American statesman: b. Sussex County, Del., 24 July 1796; d. Dover, Del., 9 Nov. 1856. He was elected United States senator in 1829, and held office till the close of 1836, when he resigned. He was then appointed chief justice of his native State, and continued on the bench for nearly three years. In 1845 he was again sent to the Senate, and remained there till March 1849, when he became secretary of state under Gen. Taylor. In this capacity he negotiated the Clayton-Bulwer Treaty (q.v.), adjusting the respective claims of Great Britain and this country in Central America. Clayton resigned office on Gen. Taylor's death in 1850, but remained in the Senate till his death. He was a zealous Whig, an able debater, and a statesman of high talent and upright character.

Clayton, Powell, American soldier and diplomatist: b. Bethel, Pa., 7 Aug. 1833. He received an academic education in Bristol, Pa.; later studied civil engineering, and went to Leavenworth, Kan., as engineer and surveyor in 1859. When the Civil War broke out he entered the Union army as captain of the 1st Kansas Infantry. In May 1863 he led a successful expedition against a band of guerrillas on the White River, Ark., and also to destroy Confederate stores; and in 1864 was promoted brigadier-general of volunteers. At the close of the war he settled in Arkansas; was elected governor in 1868; United States senator in 1871–7; appointed minister to Mexico in 1897, and raised to rank of ambassador in 1899.

Clayton-Bulwer Treaty, a treaty existing from 1850 to 1901 between the United States and Great Britain. It was an agreement designed to prevent either country from securing exclusive rights over any interoceanic canal across Nicaragua (See ISTHMIAN CANALS, AMERICAN). Its origin represented a supposed mutual withdrawal from positions rapidly generating war. Its lifetime has two opposite phases: (1) That in which the United States, wishing no such exclusive rights, held it and appealed to it as a bulwark against British encroachments, opposing only an injurious interpretation of it; (2) that in which the same power did wish such privileges, endeavored first to gain British assent to its abrogation, and after long and fruitless struggles and repeated threats of abrogating it without such assent, was only withheld from the abrogation by a compromise treaty which replaced the old. The three periods were as follows:

1. The English colony at Belize (now British Honduras), for a century or more had strengthened their position against the Spaniards by a vague protectorate over the Mosquito Indians, occupying the northeast coast of Nicaragua. They termed their chiefs "kings," and upheld their dominion over "Mosquitia," usually called the Mosquito Coast. In 1815 they crowned one of them at Belize and, when the Spaniards lost control of Central America in 1822, had him set up a claim to boundaries reaching down into Costa Rica, and so including the banks of the San Juan River, where the canal would run if built. In 1841 this sovereignty was enforced by raiding San Juan del Norte at the mouth of the river, and carrying off the commandant; in 1847 the "king" announced to Nicaragua that on the first of January next he should "reassume his lawful control" over the San Juan, and early in the year the English seized the town and renamed it Greytown. A new English treaty was then made with Nicaragua, recognizing this occupation. This roused great excitement in the United States, as equally a blow at the Monroe Doctrine and against American control of the

canal; and an over-zealous Nicaragua chargé of the fire-eating Polk administration drafted a treaty for United States fortification of the canal, and a guarantee of Nicaragua's sovereignty over all the territory she claimed. This, if we made its provisions active, meant war with England. The pacific Taylor administration then in power framed a milder treaty for a right of way merely, allowing Nicaragua to make similar ones with other nations. This still left Greytown as an apple of discord, and conflicted with the English treaty. Both England and America were on edge with suspicion: the former (whom events justified) that American expansion would end in a claim to entire control of the canal, which would prejudice British colonial interests; the United States, that the English recognition of a fictitious and swollen sovereignty by a tribe of savages over the Atlantic end of the canal foreshadowed the total exclusion of the United States. Each party in fact wanted only to bar the other's monopoly. John M. Clayton (q.v.), secretary of state, opened negotiations with the English minister, Sir Henry Bulwer (q.v.), in January 1850, for a joint control. Meantime Great Britain, to secure the Pacific end, sent an expedition to occupy an island in the Gulf of Fonseca (then supposed to be the natural western terminal); our then Nicaraguan representative, E. G. Squier (q.v.), obtained a temporary cession to us of Tigre Island, the nearest one to Nicaragua, to block this scheme, pending a formal treaty; shortly afterward the British expedition arrived, and seized Tigre "for debt." Clayton, in great fear lest the popular indignation should force his hand, pushed the treaty through without sufficient insistence on clear definition of the points at issue. It was signed 19 April, and passed the Senate, 42 to 11. Its provisions were that (1) neither power was to have exclusive control over the proposed canal; (2) neither was to fortify the canal or its vicinity; (3) neither was to occupy, fortify, colonize, or have dominion over any part of Central America, either directly or through any "alliance or protection, intimacy, connection, or influence" in or over it; (4) the two powers should mutually guard the safety and neutrality of the canal, and invite all other nations to do the same; (5) they should aid and protect any authorized and reasonably operated canal company; (6) the fifth article (to establish a general principle) should extend also to any other means of isthmian transit.

England did not formally withdraw her Mosquito protectorate, but with the neutralization of the canal it ceased to have any object, and was thought sure to drop. Before the ratifications were exchanged, however, Lord Palmerston wrote to Bulwer that the British government would interpret the treaty as not applying to Honduras "or its dependencies." This could include Mosquitia, and it was Clayton's duty to settle that point before proceeding; but in fear of having his statesmanlike plan wrecked, and confident of no practical evil resulting, he assumed that it referred only to the islands, did not press Bulwer for assent to this construction, concealed the three quoted words from the Senate and the attorney-general, and the ratifications were exchanged 4 July. Great Britain had won a distinct diplomatic victory; she had secured a pledge from the United States not to occupy any position in Central America, while herself retaining the entire eastern coast of Nicaragua.

2. The ambiguous interpretation of the treaty satisfying neither power, Daniel Webster (q.v.), who succeeded Clayton in 1850, undertook negotiations with Bulwer to modify it; but what each side most desired was what the other would not grant — recognition or abandonment of the bogus Mosquito claim to the mouth of the river. In 1851, to clear up the meaning of the word "dependency," Great Britain occupied Greytown; proclaimed afresh the Mosquito protectorate; and in November one of her men-of-war fired on the American vessel Prometheus for refusing to pay port dues at Greytown. England disavowed this, but the question which Clayton had shirked must be settled. About this time the English had started a project to build a ship railroad across Honduras; and to hold the approaches, their government reoccupied (August 1852) a group of islands off the northern coast, called the Bay Islands, formerly part of Belize. American suspicion once more became hot; and the new Pierce Senate in December ordered an investigation into the way the treaty had been kept, called for the papers, and for the first time found how they had been tricked — not, however, by the English diplomat, but their own. In great wrath, they denounced the occupation of the islands and the Mosquito protectorate as an infraction at once of the treaty and the Monroe Doctrine, and Marcy, now secretary of state, instructed Buchanan, minister to England, to insist on the British evacuation of all English territory in Central America except Belize. Lord Clarendon replied that Belize was not a part of Central America as understood by the treaty; that the Bay Islands were a part of Belize; that the treaty did not refer to Mosquitia, but only prohibited further colonization; and that the Monroe Doctrine was no part of international law. Just then a quarrel between the Mosquito Indians and the American settlement south of Greytown led to a United States gunboat bombarding and burning the latter. Then William Walker (q.v.), with the aid of a Nicaraguan faction, became for a time the master of the state, ostensibly in the interest of the United States, whose slaveholding government at last received a representative from his; and the British believed that this country intended to retain possession of Nicaragua. On the other hand, Costa Rican action against Nicaragua was laid to English incitement. Walker continued to make mischief till shot in 1860. Dallas, who succeeded Buchanan, drew up with Clarendon a treaty of 7 Oct 1856, which came to grief on the question of the Bay Islands. In 1857 Buchanan became President, and supported his secretary of state, Lewis Cass, in making a preferential canal treaty with Nicaragua; to which Great Britain objected as violating the Clayton-Bulwer Treaty, and it was not ratified. In the fall of that year, Buchanan announced his intention of proposing an entire abrogation of the treaty and arranging a new one on a satisfactory basis. Lord Napier, now British minister, proposed three alternatives: a mutual abandonment of the treaty and return to the *status quo ante;* submission of the question to arbitration; and the awaiting the issue of treaties pending between Great Britain and the

Central American states. The last was accepted, and the results were satisfactory enough to prevent further trouble for more than 20 years. The Bay Islands were retroceded to Honduras on condition of not parting with them to any other nation; the Mosquito protectorate was abandoned, and a reservation set up for the Indians by Nicaragua, which was to pay them $5,000 a year or else the rights reverted to Great Britain; and Greytown became a free port under Nicaraguan sovereignty. The conditional clauses of the renunciation were not pleasing to the United States, and in fact the money was never paid, partly because Nicaragua expected the United States to back its refusal; but on the whole the settlement was accepted as a happy ending to the wrangle. Up to 1880, though the growing sentiment in favor of exclusive United States control of the canal sometimes fretted against the treaty, a host of treaties and other international actions were based upon its validity, and it was more than once appealed to when British acts (as the erection of Belize into the colony of "British Honduras" in 1862) were assumed to violate it.

3. The latent feeling in favor of exclusive control was stirred into active life by the French canal at Panama, and the fear that it would give that nation the military control of Central America. In March 1880 President Hayes sent a special message to Congress enunciating the policy of "an American canal under American control," expanded later into the claim that the banks of the Nicaragua Canal would be a continuation of the United States shoreline. As a result, Congress passed several resolutions recommending the abrogation of the Clayton-Bulwer Treaty. Garfield in his inaugural of 4 March 1881, spoke (though less strongly) in the same strain; the project of a joint European neutralization of the Panama Canal was arousing much American feeling. J. G. Blaine (q.v.), then secretary of state, opened the attempt at an outright repudiation of the treaty. In a circular to the European powers, 24 June 1881, he declared that the United States would in future allow no foreign interference in the control of any isthmian canal, whose neutrality we would ourselves guarantee; and that any European action toward sharing in such guaranty would be held equivalent to an alliance against the United States. Lord Granville, for Great Britain, replied briefly that this matter was already settled by the Clayton-Bulwer Treaty, and his government relied on its observance. Meantime and afterward, 19 and 29 Nov. 1881, Secretary Blaine sent two long arguments of his position to James Russell Lowell, then minister to England. He did not, however, allege that the treaty was null, or commit the country to an open repudiation of it, but complained of it as so contradictory of interpretation, and mutually vexatious, that it ought to be no longer binding under new circumstances. He also asserted that the joint control would be virtually controlled by England, from her superior naval strength. In fact, however, the treaty provided not for a joint control, but a joint refraining from control, and prevention of any other power gaining control. Lord Granville replied by two dispatches of 7 and 14 Jan. 1882, traversing the logical and historical arguments adduced. Garfield's murder led shortly to Blaine's retirement, and F. T. Frelinghuysen's accession to his place. The outcome of further correspondence was, that England would not give up the treaty, and declared that the United States was estopped by its own acts from interfering with it, and that the Monroe Doctrine was a mere assertion of force, having no standing in international law, and had the same place in diplomatic argument as a list of the military or naval forces. Congress and the President (Arthur) were much dissatisfied with this result; and the latter proceeded to draw up a treaty with Nicaragua in flat defiance of the Clayton-Bulwer Treaty. It formed a perpetual alliance between the United States and Nicaragua, whose territorial integrity this country guaranteed; save that the United States was to build a canal and have exclusive control over it, and own in fee simple a strip on each side. The Senate shrunk from this direct repudiation, without stronger cause than yet existed, and refused, 32 to 23, to ratify the new treaty. Mr. Cleveland's accession put a stop to the agitation for many years, as he disapproved of the new movement, preferring a union of the nations in a common protection of what was for their common interest. So far from any attempt being made under his administrations to repudiate the treaty, on two important occasions it was appealed to in protest against acts of Great Britain. The first revival of the feeling of 1880–4 in practical form was in President McKinley's second annual message, December 1898, favoring a canal under American control; and few then doubted that it must be through Nicaragua. The acquisition of new territory and the increase of the navy led many who had been opposed to the movement to change their minds, and favor a canal through which the United States at all times could pass its war vessels, and from which it could exclude its enemies. Others continued to argue that if the country were not superior in naval force it could not maintain that privilege against its enemies, and if it were, could enforce it against them in any event, and that an exclusive control only made the canal the instant mark of our enemies. But the dominant feeling was strongly against the treaty; congressional resolutions declared it void; the press denounced it; and the sentiment was in favor of President Arthur's old scheme of acquiring a strip of land along the canal outright. The British feeling was by no means strong for the treaty, but it preferred a modification by decent diplomatic forms rather than a violent abrogation. To take the movement out of the hands of newspapers and demagogues, the American and British governments hastened to devise a new arrangement which should not throw all old principles to the winds, and a treaty was negotiated by Secretary John Hay on our side and Sir Julian Pauncefote on the other, known as the first Hay-Pauncefote Treaty, signed 5 Feb. 1900, and sent to the Senate. The majority were astonished and indignant, as the new treaty not only did not abolish the old, but proclaimed it in force and binding; adhered to its principles of neutralizing the canal, which were what the growing sentiment wished to reverse; and was in fact only the Clayton-Bulwer Treaty in new and tighter form, in all the points which had become most obnoxious. The "Davis Amendment," proposed in committee, practically nullified the neutrality feature, but neither it nor the main treaty had

been acted upon when the Senate adjourned in June. The period for ratification was extended to 5 March 1901; but the platforms of both parties insisted on exclusive American control. The amendments added to it in the following session of Congress made it unacceptable to Great Britain, which refused to ratify it, and it expired by its own limitation. The two statesmen, however, drew up another, less satisfactory in some respects than the old, and which specifically abrogated the Clayton-Bulwer Treaty, but succeeded in saving its general principles of neutralization (see HAY-PAUNCEFOTE TREATY); and it was ratified 16 Dec. 1901. By the irony of fate, this question of the control of a Nicaragua canal, so burning for half a century, and menacing war more than once, seems to have been dealing with a contingency never to happen, as the entire subject-matter is apparently set aside in favor of the Panama canal.

Clayto'nia, a genus of plants of the purslane family (*Portulacaceæ*), so named in honor of the American botanist John Clayton (q.v.). It is among the earliest and most beautiful of the American wild-flowers, these two qualities giving it its common name of spring beauty. There are at least 25 species, most of them natives of North America. The plants grow in damp woods and wet places, and are found at all elevations up to 5,000 feet, in the region of Nova Scotia, south to the Gulf, and westward to the Pacific coast. *C. perfoliata,* Spanish lettuce, common from British Columbia to Mexico, is used as an anti-scorbutic in household medicine. *C. tuborasa,* a native of Siberia, supplies a root that is eaten by the natives.

Cleanthes, klē-ăn'thēz, Greek Stoic philosopher of the 3d century B.C. He was a native of Assus, in Lydia, but, visiting Athens, became a zealous disciple of Zeno. In order to attend on that master in the day, he was accustomed to labor by night. His mental and his bodily strength were immense, and despite all obstacles, he studied so successfully as to become Zeno's successor, 263 B.C. Of his writings only some fragments remain, among which is his noble 'Hymn to Zeus.'

Clear, Cape. See CAPE CLEAR.

Clear Lake, a body of water lying in a picturesque region in Lake County, Cal.; 110 miles north of San Francisco. It is 25 miles long, and from two to six miles wide.

Clearance of Vessels, the examination of them by the proper custom-house officers, and the giving of a certificate that the regulations have been duly complied with. Vessels are said to clear inward or outward according as they arrive or depart.

Clearchus, klē-ăr'kŭs, Spartan general who commanded about 13,000 Greeks in the army of Cyrus the Younger when that Persian prince tried to wrest the throne of Persia from his brother, Artaxerxes II. When Cyrus was defeated at Cunaxa (401 B.C.), Clearchus and his chief officers were seized by treachery and put to death.

Clear'field, Pa., the county-seat of Clearfield County, on the Susquehanna River (west branch), and on the Pennsylvania R.R. It is situated in the west-central part of the State, and is surrounded by a rich agricultural region, underlying which are deposits of coal, fire-clay, and limestone. Its manufactories include flour-mills, tanneries, foundries, and lumber mills. Pop. (1900) 5,081.

Clearing-house, an institution for balancing daily the mutual obligations of a number of banks in a single city, with the least possible transfer of actual cash from "debtor" to "creditor" banks. At a central office the various accounts are canceled against each other on the blanks of the clearing-house, which is thus made the one debtor and creditor of all; and each settles the day's transactions by giving or receiving in a single payment the balance due. Some clearing-houses do not even require cash in the settlement: in London it is made by transfers on the banks' accounts with the Bank of England (which is not a member of the clearing-house); in Philadelphia by United States or clearing-house gold certificates. In one shape or another, however, the final payments must represent gold; this has been so from the foundation of the system, and in every country and every State of the United States. The institution as developed has come to serve other purposes more valuable even than its primary ones; but those relieved a situation vexatious then, and quite incompatible with the volume and character of banking at present. Indeed, in America for many years the need of it was indefinitely greater than where and when it originated — Great Britain, in the latter part of the 18th century. Each bank sent a messenger daily to each of the others, to collect its checks on them and bills payable at them; and the amounts were paid by each to each in cash — Bank of England notes — which the messengers carried back through the streets. This was not only costly and wasteful of time, but involved danger of accident or robbery in transit. In Edinburgh, which claims priority in the clearing-house device, a still more curious reason is alleged: that rival banks accumulated a mass of each others' obligations and presented them in a lump, to break each other. (Something like this actually was done about 1850 by Overend, Gurney & Company to the Bank of England — accumulating a great deposit and withdrawing it all at once — not to bankrupt it, but to frighten it into rescinding a rule not to lend to brokers except at certain seasons.) Hence it was agreed to adjust their claims to date twice a week only. But the first historical appearance of the system is in London. About 1770 the clerks evolved the idea (perhaps from the custom among French merchants of making their bills payable at the annual fair of Lyons, where they mostly canceled each other) of economizing their time and labor by meeting daily in a room and exchanging obligations, settling only for the balance. This obviously enabled on an average one half of the clerks to dispense with their errands, and reduced the needful stock of real money. Many years later a great English bank reduced its reserve of daily cash from £150,000 to nearly nothing by admission to the clearing-house; and the ratio of balances in money to the total obligations in American clearing-houses has varied all the way from 20 per cent down to 3.9 per cent (in New York, where it has never risen to 7). In 1775 a special building in Lombard Street, London, was assigned to this department; at first it was merely a meeting-place of the clerks for ex-

change; but shortly the further step was taken of appointing paid clerks to receive and balance checks and bills. In 1858, on the suggestion of Sir John Lubbock, the system was extended to include the country banks of Great Britain, by means of their London correspondents.

The New York clearing-house was not established till 11 Oct. 1853. The conditions were so bad previous to this, that it is scarcely intelligible how they could have been endured so long. There were 52 banks, each sending messengers back and forth; there was no national currency, and balances had to be paid in gold coin; the labor of counting and carrying this was so onerous that actual transfers of cash were made but once a week, though the accounts were balanced on the pass-books and the bills exchanged daily; and the bags of coin were so heavy and precious that they were often transported in wagons guarded by militia. The average daily clearings for the first year of the New York establishment were $19,104,594.94, which would have weighed over 70,000 pounds avoirdupois, or 35 tons; in other words, a week's settlements would have demanded 422,486 pounds of coin, or 211 tons. The actual payments in gold were $988,078.06, a little over 5 per cent. If all the average daily clearings of the United States in 1902 ($381,650,000) can be imagined paid in coin according to the practice prior to 1853, it would need 1,406,653 pounds, over 700 tons; or if settled weekly, 4,220 tons. Further, the formation of the clearing-house enabled the banks to close 2,500 regular ledger accounts, to be posted up daily. Since then the system has spread to every part of the Union, all the large cities and several minor ones having clearing-houses, and all the leading States having at least one; while the more sparsely settled ones, or those with slightly developed industrial systems, utilize those in the nearest centre. But nearly two thirds of all the clearings in the United States are done in New York, that being the most convenient settling-place of cities with cities. In 1902 the total clearings of the United States were $116,021,618,003, of which $74,753,189,436 was in New York, a daily average of $245,898,649. The balances settled in money were $3,377,504,072, or 4.51 per cent. The next highest clearings, in order of volume, were in Chicago, Boston, Philadelphia, St. Louis, San Francisco, Baltimore, and Kansas City, Mo., each over $1,000,000,000 except the last, which was just below it. In 1902 the New York clearing-house had 60 members, besides the assistant treasurer of the United States; and 79 banks and trust companies in the city or vicinity not members used its members as agents.

The methods in different countries and centres are not exactly alike; but the differences in detail are matters of interest to bankers rather than to the public. It is interesting, however, to know that an English expert pronounced the American (New York) system the best. In brief, it is as follows: each bank, before the day's work begins, must have prepared and ready to hand in — first, its checks for collection, made up in as many packages in envelopes as there are bank members of the clearing-house; second, a schedule of its amount due from each; third, a debit ticket to be given to each; fourth, a schedule of its aggregate claim on all the members together for the day, which goes to the manager or the proof clerk. Each sends two clerks to the clearing-house, a delivery and a settling clerk. The latter sit at desks in rows, the former in front of them, and they assemble at about 9.50. At 9.58 a bell is struck, and any clerk not in place is fined $2. At 10 it strikes again, and each delivery clerk begins handing his envelopes of checks to the settling clerks in succession as he passes along, at the same time dropping the corresponding debit ticket into a slit in the desk. This takes about 10 minutes; and the proof clerk at his desk enters the claims of each bank against the clearing-house on a "proof sheet," which must show a total the same as that of all the debit tickets put into the desk slits. Next, the settling clerks set down the sums on these tickets, foot them, and pass the total to the proof clerk, who arranges them on his proof sheet with each bank's debit opposite its credit; the difference being the sum due to or from the clearing-house in each case. This takes about half an hour. If accurately computed, the debit and credit columns must foot alike in both cases, as to bank claims and as to clearing-house claims. The manager reads off the balances due, and the settling clerks write them down. At 10.45 the work must be completed, and if errors in the footings prevent the proof being correct, the culprit is fined, with the fines doubled after 11.15 and quadrupled after noon. The balances are paid with gold coin, gold certificates (either of the United States treasury or of the clearing-house against gold in its vaults), or legal-tender notes. In Boston balances are borrowed and lent by members at call, being transferred by a written order on the manager; more than half of them are thus employed, the clearing-house rate of interest being a regular stock quotation. If a bank denies liability on any check presented to it by another member, the clearing-house takes no cognizance of the denial, that being a matter between the banks, to be settled outside. But the clearing-house determines the class of claims to be accepted, and different clearing-houses have different rules.

The strength and the comity of these associations, however, have given them both the power and the disposition to accomplish ends much more momentous than saving money and time in doing business. The power of disciplining their members and deciding on their qualifications is inherent: a majority of the members can expel a member, the Standing Committee can suspend without notice, and the moral power exercised is very great. A fraudulent return to the United States internal revenue commissioner caused the expulsion of one bank; and a watchful lookout is kept on the financial condition of all. The New York clearing-house requires a weekly, the Philadelphia a daily, report on their standing. There is usually an arbitration committee to settle disputes between members. But far more important is the financial strength given by the union of the banks, when they are willing to act together, in checking or preventing "runs" and tiding over panics. That a run on one bank may precipitate runs on others, and in the mad fright thus started pull down a series of perfectly sound banks, is not more obvious now than ever; but for many years there was not sufficient unity of purpose, or confidence in the strength of the others, to enable the stronger or the unimperiled to help the others; and still

more, it was not seen how this could be done and the others be secured for their advances. Of late years, however, the clearing-houses have acted in this matter with signal success, by means of clearing-house loan certificates. The method is to allow a member bank to turn in its bills receivable or other securities approved by the Loan Committee, with its own note for sums loaned, and be granted in exchange certificates for a large portion of the face value, which shall be accepted as cash in paying clearing-house balances. These bear the highest legal rate of interest, 6 per cent, to operate as a restraint on borrowing more money or retaining it longer than is absolutely needed; and they can be used for no other purpose. The reserves of the member banks are thus made a common treasury; and not only is all the cash at the service of whoever needs it most, but the fact that this is known breaks nine runs out of ten, because people do not wish to take out their money, but only to know that it is safe. The last panic in the United States in which there was a general suspension of the banks was in 1857; and the five panics since then have been prevented from resulting in this largely by the use of these loan certificates; of which in the last panic, that of 1893, over $40,000,000 were issued. A further use of this combined credit is to aid government action in critical places. The Union would have been repeatedly in most intense embarrassments to maintain its credit but for the banks of the New York clearing-house, which floated its loans and advanced money, and probably prevented a collapse for a time of apparent financial resource.

The clearing-house system is also applied to other business than banking. In England there is a general railway clearing-house, which pools traffic facilities, and the shares of each of the railway companies in through business; has weekly reports of the passenger tickets taken up, and the weight, destination, and payment of through freight; and arbitrates between companies on claims for damages or disputes over liability. In London also there is a stock exchange clearing-house.

Consult: Cannon, 'Clearing-Houses' (1900); White, 'Money and Banking' (1902).

WILLIAM SHERER,
Manager New York Clearing-House.

Clearing-nut, a small tree (*Strychnos potatorum*) of the same genus as the *nux vomica,* the seeds of which are used in India for settling or clearing muddy water. The seeds are rubbed upon the inside of the water-vessel, and within a few minutes after the water has been introduced it becomes clear, the sediment and non-soluble ingredients having sunk to the bottom. The wood is very hard and heavy, and is used for cabinet-making and house-building.

Clearstory. See CLERESTORY.

Clearwing, a small moth with transparent wings, the caterpillars of which are the borers that destroy peach-trees and fruit-bushes. Although common in America they are mostly importations from Europe or Asia.

Cleary, James Vincent, Canadian clergyman: b. Waterford, Ireland, 18 Sept. 1828. He was educated at Royal College, Maynooth, and ordained to the Roman Catholic priesthood in 1851. He became president of St. John's College, Waterford, in 1873, and in 1880 was appointed bishop of Kingston, Canada, the see being made an archbishopric in 1889. In 1896 he reopened the Theological Seminary of Regiopolis College in Kingston.

Cleavage, in mineralogy and geology, the mode in which any body may most readily be, or naturally tends to be, split up into fragments. The regular structure of most crystallized bodies becomes manifest as soon as they are broken. Each fragment presents the form of a small polyhedron, and the very dust appears under the microscope an assemblage of minute solids, regularly terminated. In this process common salt and galena break up into small cubes, fluor-spar and the diamond into octahedrons, sulphate of barytes and the topaz into rhomboidal prisms, calcite and other related mineral carbonates into rhombohedrons, etc. The directions in which all those bodies thus break up are called their planes of cleavage. It must not be supposed, however, that all inorganic crystallized substances possess this property. Several of them break up only into irregular fragments, as the rock-crystal, the garnet, the emerald, etc. In others the cleavage is only in two directions, and sometimes only in one, and consequently produces no regular solid. Cleavage often indicates the different bodies which belong to the same system of crystallization, or distinguishes between those which belong to different systems, even when their external forms happen from any cause to be disguised or destroyed. The term is employed by geologists in a somewhat different sense, and applied to non-crystallized bodies, as clay-slate. In this sense it means the tendency of rocks to split along planes which either coincide with the original plane of stratification or may cross it at any angle up to a right angle. This tendency is the consequence of the readjustment (by pressure and heat) of the components of rocks. See PHYSICAL CRYSTALLOGRAPHY: MINERALOGY.

Cleaveland, klēv'land, **Moses,** American pioneer: b. Canterbury, Conn., 29 Jan 1754; d. there 16 Nov. 1806. He was graduated at Yale in 1777, and began the practice of law in his home town, being several times elected to the legislature, and in 1796 commissioned a brigadier-general of militia. He was a leading shareholder in the Connecticut Land Company which had bought for $1,200,000 the land in northeastern Ohio reserved to Connecticut by Congress, and subsequently known as the Western Reserve. In 1796 Cleaveland went out with a party of 50 to survey the tract and arrange for its settlement by white emigrants. After successfully negotiating with the Indians who claimed certain rights to the region, the party arrived at the present site of Cleveland, 22 July 1796. Cleaveland immediately chose it as a place for his settlement, surveyed it into town lots, and the members of the party named it Cleaveland in his honor. In 1830, when the Cleveland *Advertiser* was founded, the headline was found too long for the form, the editor therefore dropped the letter "a" in the first syllable of the city's name, and the new spelling of Cleveland was soon generally adopted.

Cleaveland, Parker, American mineralogist: b. Rowley, Mass., 15 Jan. 1780; d. Brunswick, Me., 15 Oct. 1858. He graduated at Harvard 1799, and was appointed tutor there 1803.

In 1805 he was chosen first professor of mathematics and natural philosophy at Bowdoin College. Applying himself with energy to the new sciences of chemistry and mineralogy, his studies resulted in a treatise on 'Mineralogy and Geology' (1816; 2d ed. 1822; 3d ed. 1856), which brought him the offer of the chair of mineralogy in Harvard, which he declined, as he likewise did the presidency of Bowdoin in 1839. He stood first in his subject in this country, was a popular and lucid lecturer, an enthusiastic and inspiring teacher. When the medical school was founded at Bowdoin in 1820 he was made its dean and librarian.

Cleavers, one of the 70 common names applied to certain species of goose-grass (q.v.), of the madder family, occurring throughout the whole United States; troublesome weeds, probably naturalized from Europe. Other names by which they are known are catchweed, beggar-lice, burhead, clover-grass, cling-rascal, scratch-grass, wild hedge-burs, stick-a-back or stickle-back, gosling-grass, gosling-weed, turkey-grass, pigtail, grip or grip-grass, loveman, and sweethearts. They are as common in Europe as in America, and seem to be useless except in Sweden, where for many years their prickly stems have been used as strainers for milk. Cleavers was formerly of repute in household medicine as a diuretic, but is now so used only in the most remote settlements.

Cle'burne, Patrick Ronayne, American soldier: b. Cork County, Ireland, 17 March 1828; d. Franklin, Tenn., 30 Nov. 1864. While a student at Trinity College, Dublin, he ran away and enlisted in the English army, in which he served for three years. He came to America, settled in Helena, Ark., studied law, and practised successfully until the Civil War. Joining the Confederate army as a private, he rose rapidly to a brigadier-generalship, commanded a brigade at Shiloh, was wounded at Perryville, and commissioned major-general, December 1862. He distinguished himself greatly in many fierce engagements, notably at Murfreesboro, Chickamauga, Ringgold Gap, and Missionary Ridge, receiving the thanks of the Confederate Congress. He was killed at the battle of Franklin, after carrying two lines of Union works, and shortly after saying to Gen. Hood: "I have more hope in the final success of our cause than at any time since the first gun was fired." He was a soldier of quick perception and strong character, and early and boldly advocated freeing the slaves, and the enlistment of the young and able-bodied negroes in the Confederate service. He was called the "Stonewall of the West," and instituted the Order of the Southern Cross.

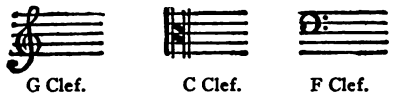
Cle'burne, Texas, the county-seat of Johnson County, on the Gulf, C. & S. F. R.R., whose division offices and shops are located in the town. It is a distributing centre for a large agricultural region, and has flour-mills, machine-shops, and cotton-gins. Pop. (1900) 7,493, being more than double that of 1890, when it had a population of 3,278.

Cleckheaton, klĕk'hē'-tŭn, England, a town in the county of York, West Riding, situated on a declivity in the Spen Valley, 10 miles west of Leeds. It is well built, lighted with gas, and has a technical institution, handsome premises belonging to the co-operative association, a fine town-hall, and three large and beautiful churches. The industries include the worsted and machine-card trades, machine-making, engineering works, etc., and coal is mined in the neighborhood. Pop. (1901) 12,523.

Cleef, klāf. 1. Joost (yoost-) Van, called Zotte (crazy) Cleef: b. Antwerp 1480; d. 1529. He was one of the most celebrated painters of his time, and in regard to beauty of coloring may challenge comparison with the most distinguished Italian masters. His excessive vanity and eccentricity caused him to be described as "mad." 2. Jan (yän) Van, a painter: b. Venloo, Guelderland, 1646; d. Ghent 1716. He was a pupil of De Cræyer, and belongs to the Flemish school, of which he is one of the most eminent masters. His works, which resemble those of Poussin, are particularly remarkable for beauty of design and coloring. The churches of Ghent are adorned with many of his paintings, in which the heads of children and the countenances of women are very beautiful.

Cleeve, Lucas, English author; daughter of Sir Henry Wolff, and wife of Col. Howard Kingscote. She has traveled widely and has published: 'Tales of the Sun'; 'English Baby in India'; 'Life of Eugenie Berni'; 'In the Ricefields'; 'Woman Who Wouldn't' (1895); 'Lazarus'; 'Epicures' (1896); 'Water Finder'; 'The Monks of the Holy Tear' (1898); 'Plato's Hand-Maiden'; 'The Real Christian' (1901); 'Blue Lilies' (1902); 'Anglo-Americans' (1903).

Clef (Fr. for key), a character placed at the beginning of a staff to show the elevation of that particular staff in the general claviary or system, and to determine the names of the notes according to their positions on the staff. There are three Clefs; the G Clef, generally known as the treble Clef, which is placed on the second line of the treble staff; the C Clef, which is used either as the alto, tenor, or (rarely), soprano Clef, according to its posi-



G Clef. C Clef. F Clef.

tion on the third, fourth, or first line of the staff; and the F Clef, which is either base or baritone (rare) Clef, according to its position on the fourth or third line of the staff.

Cleft Palate, a fissure of greater or less extent existing in the roof of the mouth, extending in some instances through the jaw, the hard and the soft palate, even to the end of the uvula. Both congenital and acquired forms of cleft palate are known, but the congenital variety preponderates. It seems to be a family trait, and is much more common in Hebrews than in other peoples. Cleft palate is due to a lack of union of the intermaxillary and the supramaxillary bones. These normally join to make the bony roof of the mouth, but they sometimes fail to unite on either side of the middle line. If such failure to unite occurs on one side only, unilateral cleft palate and hare-lip results; if the developmental failure occurs on both sides bilateral cleft palate and hare-lip are produced. Very often there is only a slight depression on the edge of

the lip, showing that the soft parts have not united as they should. This constitutes the simplest form of hare-lip and is not associated with cleft palate. In cases of severe cleft palate food regurgitates through the nose, and swallowing is impossible. In these cases, children are apt to die of inanition unless surgical procedures are used to repair the defect. Modern surgery has evolved a number of plastic operations with a view to obviate these congenital mal-developments, and treatment is very satisfactory. Consult 'American Text Book of Surgery' (Phila., 1903).

Cleishbotham, klēsh'bŏth-ăm, **Jedediah,** a character in Scott's 'Tales of My Landlord,' who is represented to have collected the stories, of which Peter Pattieson is the imaginary writer.

Cleisthenes, klīs'thĕ-nēz, or **Clisthenes,** an Athenian politician who flourished about 500 B.C. He was the grandson of Cleisthenes of Sicyon, and the son of Megacles, and at the end of the rule of the Pisistratidæ (510 B.C.) was a leader of their enemies. When, with the assistance of the Delphian oracle and the Spartans, Hippias was banished from Athens, Cleisthenes, in order to secure his ascendency over his rival Isagoras, chose to defend the cause of the people and succeeded in introducing some important changes in the ancient constitution of Athens; among others, the division of Attica into 10 instead of 4 tribes, each consisting of several *demi,* under demarchs; the increase of the number of the senators from 400 to 500, 50 of each tribe; and, as some say, the law of ostracism (q.v.), so remarkable in the history of that state. Cleisthenes, being suspected of the desire of tyrannical power, was himself banished, but afterward returned and triumphed over his enemies.

Clélie, klā-lē, a romance in 10 volumes by Mademoiselle de Scudéry, published in 1656. The subject is the siege of Rome after the expulsion of Tarquin the Proud, and the heroine is the young Roman girl who was a hostage of Porsena, and swam across the Tiber to escape from him. The manners and language assigned the Roman characters in the romance are utterly ridiculous and grotesque, but if we consider the Romans as disguises for the fashionable people of the 17th century, the pictures of life are true to nature.

Clemanges, Mathieu Nicolas, mä-tė-ė nīk-ō-lä klä-mänzh, French theologian: b. Clemanges 1360; d. about 1430. He studied at Paris under Pierre d'Aille and Gerson. In 1391 he was professor of theology at the University of Paris, and in 1393 became rector there. In the hope of helping to heal the Papal Schism of the time, he accepted the position of private secretary to Benedict XIII., the anti-pope at Avignon; but when Benedict excommunicated the French king in 1407 Clemanges resigned his office and lived in voluntary exile with the Carthusian monks. Here he devoted himself to his studies and writing, endeavoring to correct abuses in the Church, and seeking to place the study of theology upon a wider basis: his writings had much influence on the deliberations of the Council of Constance. In 1425 he went back to the University of Paris, where he continued to lecture until his death. His works were collected and published by Lydius (1613).

Clematis, a genus of climbing vines or ascending herbs, of the crowfoot family (*Ranunculaceæ*). It numbers upward of 100 species, and is widely distributed throughout the temperate regions of the world. In the United States between 20 and 25 species are recognized. The best known is the virgin's-bower (*C. virginiana*), a vine that climbs over shrubs and along fences, from Nova Scotia to Georgia, and west to Kansas and Manitoba, its sprays of white flowers making a showy appearance from July through September. Other species are found west of the Mississippi River, extending to the Pacific coast, and south to the Gulf of Mexico. The only English species is called traveler's joy (*C. vitalba*). Rare foreign species are to be found in gardens, and culture and hybridizing have produced varieties that, escaping from gardens, add new species to the wild representatives of the genus.

Clémenceau, Eugène, ė-zhăn klā-mŏñ-sō, French politician: b. Mouilleron-en-Pareds 28 Sept. 1841. He studied medicine at Paris, and began the practice of his profession there. He became active in politics, joining the radical party, and in September 1870 was elected mayor of the 18th Arrondissemont (Montmartre). Not being an extreme radical, he tried to bring about a reconciliation between the Commune and National Assembly, but failing in this, resigned his office as mayor. In 1871 he was a member of the Municipal Council; in 1876 he was elected to the Chamber of Deputies, and became the leader of the Radical Republicans; though a violent opponent of several ministries, he refused to form a cabinet of his own. He was implicated in the Panama Canal scandals in 1892, and failed of re-election in 1893. He is editor of the radical journal 'La Justice.'

Clemens, Jeremiah, American politician: b. Huntsville, Ala., 28 Dec., 1814; d. there 21 May 1865. He graduated at the University of Alabama 1833, studied law at Transylvania University, Ky., and was admitted to the bar, 1834. He was United States attorney for the northern district of Alabama 1838; a member of the State legislature 1839–41, 1843–4; in 1842 raised a company of volunteer troops and went to Texas, having been appointed lieutenant-colonel, and subsequently held the same rank in the regular service. In 1848 he was governor of the civil and military department of purchase in Mexico, holding the position until the end of the war. He was a United States senator 1849–53, and held high rank as an able and eloquent debater. He took part in the Alabama secession convention, and though protesting against its action, subsequently yielded and held office under the Confederacy. In 1864 he advocated Lincoln's re-election. He wrote several novels which were popular in their day: 'Bernard Lyle' (1853); 'Mustang Gray' (1857); 'The Rivals: a Tale of the Times of Aaron Burr and Alexander Hamilton' (1859); 'Tobias Wilson' (1865), a story of the Confederacy. He left in manuscript an unfinished history of the war in northern Alabama.

Clemens, Samuel Langhorne, American humorist; more generally known by his pseudonym MARK TWAIN: b. Florida, Mo., 30 Nov. 1835. He received only a scanty school educa-

tion, and in 1848 became apprentice to a printer, subsequently working at this trade in Philadelphia, New York, and elsewhere. He afterward learned the business of pilot on the Mississippi, but left this occupation to become secretary to his brother, who had been appointed secretary of Nevada Territory. He then tried his fortune at the Nevada mines. In 1862 he became local editor of a newspaper in Virginia City, but soon went to San Francisco, where he was for some time a reporter. After meeting with slight success in the Calaveras gold-diggings he returned to journalism in San Francisco. In 1866 he went to the Sandwich Islands, and on his return commenced his lecturing career. A trip to the Mediterranean, Egypt, and Palestine followed. He edited for a time a newspaper in Buffalo, and soon after married and settled in Hartford, Conn. He has traveled widely, and many of the scenes and incidents in his works are drawn from his journeys. He lost heavily through the failure of a publishing house which he founded in 1884.

Among his chief books are 'The Jumping Frog' (1867); 'The Innocents Abroad' (1869); 'Roughing It' (1873); 'The Gilded Age' (with Warner) (1873); 'Adventures of Tom Sawyer' (1876); 'A Tramp Abroad' (1880); 'Life on the Mississippi' (1883); 'Huckleberry Finn' (1885); 'A Yankee at the Court of King Arthur' (1889); 'The American Claimant' (1892); 'Tom Sawyer Abroad' (1894); 'Puddinhead Wilson' (1894); 'Joan of Arc' (1896); 'More Tramps Abroad' (1897); 'The Man That Corrupted Hadleyburg' (1900); 'Following the Equator' (1901).

Clemens, Will M., American author: b. Paris, O., 16 Jan. 1860. Educated at Buchtel college; entered journalism at 16 and for 20 years was engaged on the leading newspapers of New York and San Francisco. Among his published works are 'Depew Story Book' (1898); 'Life of Theo. Roosevelt' (1899); 'A Ken of Kipling' (1899); 'Life of Admiral Dewey' (1900); 'Hasty Pudding Poems' (1901); 'The Gilded Lady', a novel (1903).

Clem'ent I. (CLEMENS ROMONUS), Pope and martyr and one of the apostolic fathers. By Irenæus he is reckoned the third in the line of the bishops of Rome, and Origen holds him to be the same Clement who is named by the Apostle Paul in his letter to the Philippians, iv. 3. Tradition declares that he suffered martyrdom in the reign of Trajan and that his term of episcopate extended from 93 to 101; his day in the Roman calendar is 23 November. There is extant a letter from the Church of Rome to the Church of Corinth now generally accepted as having been written by this Clement: A bishop of Corinth, Dionysius, writing about 166 to a later Pope mentions Clemens Romanus as its writer.

Clement II., Pope. He was a native of Saxony and succeeded to the papal chair in 1046 on the abdication of Gregory VI. He was the earliest of the six German pontiffs.

Clement III., Pope: b. Rome; d. March 1191. He was elected pope in 1187, and preached the third crusade against the Saracens. There was an anti-pope with this title, who died in 1100.

Clement IV. (GUY FOULQUES, gē fook), Pope: b. St. Gilles, France; d. Viterbo 29 Nov. 1268. He became pope in 1265, succeeding Urban IV., and was the friend and protector of Roger Bacon.

Clement V. (BERTRAND D AGOUST, bĕr-trän dä-goost), Pope: b. Bordeaux 1264; d. Roquemaure, Languedoc, 20 April 1314. He became pope in 1305 and at the time of his election was archbishop of Bordeaux. He transferred his see from Rome to Avignon, and thus commenced "the Babylonish captivity" of the Church, which lasted about three quarters of a century. Another memorable event of his reign was his bull suppressing the order of the Knights Templar, 1311.

Clement VI. (PIERRE ROGER, pēär rō-zhā,) Pope: b. near Limoges, France, 1292; d. Villeneuve d'Avignon December 1352. He succeeded Benedict XII. in 1342 and made an attempt to bring about a reunion of the Latin and Greek churches.

Clement VII. (GIULIO DE MEDICI, joo'-lē-ō dā mā'dē-chē), Pope: b. Florence about 1475; d. Rome September 1534. He succeeded Adrian VI. in 1523. Having by his joining in league with the French king incurred the hostility of the Emperor Charles V., the constable Bourbon, with the connivance of the emperor, invaded the papal territory with an army and sacked the holy city and held the Pope a prisoner for six months.

Clement VIII. (IPPOLITO ALDOBRANDINI, ĭp-pŏl'ē-tō äl-dō-brän'dēn), Pope: b. Fano, Italy, 1536; d. 5 March 1605. He succeeded Innocent IX. in 1592, reconciled Henry IV. to the Church and ordered the execution of Giordano Bruno. An anti-pope with this title, resigning in 1420, closed the western schism.

Clement IX. (GIULIO ROSPIGLIOSI, joo-lē'ō rōs-pē-lē-ō'sē), Pope: b. Pistoia 1600; d. 9 Dec. 1669. He followed Alexander VII. to the papal chair in 1667. In his pontificate was arranged the "Pax Clementina," which for a time closed the Jansenist controversy.

Clement X. (EMILIO ALTIERI, ā-mēl'ē-o äl-tē-ā'rē), Pope: b. Rome 13 July 1590; d. 22 July 1676. At nearly 80 he succeeded Clement IX. and during his pontificate a notable controversy arose with Louis XIV. relating to the enjoyment, during vacancy, of episcopal revenues and the right of filling such vacancies.

Clement XI. (GIOVANNI FRANCESCO ALBANI, jō-vän'nē frän-chĕs'kō äl-bä'nē), Pope: b. Pesaro, Italy, 22 July 1649; d. 19 March 1721. He was elected successor of Innocent III. in 1700, and in 1713 sent forth the celebrated bull 'Unigenitus' in condemnation of Quesnel's treatise on Grace and Predestination. The bull was opposed by the Jansenists, but approved by the Jesuits. The pretender in his efforts to obtain the English crown in 1715 was supported to some extent by Clement. See Lafitau, 'Vie de Clément XI.' (1752).

Clement XII. (LORENZO CORSINI, lō-rĕnd'-zō kôr-sē'nē), Pope: b. Florence 1652; d. 6 Feb. 1740. He was the successor of Benedict XIII. in 1730, and was the first pontiff to oppose Freemasonry.

Clement XIII. (CARLO DELLA TORRE REZZONICO, kär'lō dĕl-lā tôr'rā rĕt-sō-nē'kō), Pope: b. Venice March 1693; d. February 1769. He succeeded Benedict XIV. in 1758. He published a bull in behalf of the Jesuits after their expulsion from France and Spain in 1767.

Clement XIV. (GIOVANNI VINCENZO ANTONIO GANGANELLI, jō-vän'nē vēn-chĕnd'zō än-tō'nē-o gän-gä-nĕl'lē), Pope: b. Saint Arcangelo, near Rimini, Italy, 31 Oct. 1705; d. 22 Sept. 1774. He was a Franciscan friar, a man of great piety and worth; the friend and confidant of Benedict XIV. He was elected Pope in 1769 after a struggle in the conclave in which cardinals influenced by various of the Catholic powers made interest in favor of the suppression of the Society of Jesus. When the new Pope showed an unwillingness to do the will of the powers the charge was made that he had received the support of many members of the conclave upon his promise to suppress the order; but this charge has been conclusively proved to be without foundation in fact; yet such was the urgency of the powers, he felt himself constrained in the interest of peace and of the Church to disband the Jesuit order which he did in the apostolic brief *Dominus ac Redemptor* which declares the Society of Jesus dissolved forever. The fact that the brief had been drawn up and completed in November 1772, but was not published till July 1773 is proof that he was loth to publish so severe a decree against the order. After its issue he fell into a rapid decline, presumably from remorse, and though all his life he had been exceedingly vigorous, died little more than 12 months after the brief was published. It was this pontiff who founded the Clementine Museum in Rome. See Caraccioli,' Vie de Clément XIV.' (1775); Theiner, 'Geschichte des Pontificats Clements XIV.' (1853).

Clément, Jacques, zhäk klā-môn̈, French assassin: b. Sorbon, France, about 1565; d. Saint Cloud, 1 Aug. 1589. He was a Dominican monk, and the fanatical tool of the Dukes of Mayenne and Aumale and the Duchess Montpensier. Having fatally stabbed the king, Henry III., he was at once killed by the courtiers.

Clem'ent, William Henry Pope, Canadian lawyer: b. Vienna, Ont., 13 May 1858. He was graduated at Toronto University in 1878, and became a lawyer in 1880, practising with success in Toronto. He has written: 'The Law of the Canadian Constitution' (1892), a work that was made a text-book in the principal colleges and universities of the Dominion.

Clement of Alexandria, Saint (CLEMENS ALEXANDRINUS), Greek theologian, one of the most eminent and learned of the fathers of the Church. Very little, almost nothing, is known regarding his life. The first mention of him by a writer living in or near his time is made by Eusebius of Cæsarea and by Photius; they give his name as Flavius Titus Clemens, and later writers add to the name the designation Alexandrinus, "of Alexandria." From his names and surname one might infer that he was of Latin race; but he wrote in Greek, and his writings do not indicate any special acquaintance with Roman life or thought. Whether he was a native of Alexandria or of some Grecian city cannot be decided. He was a convert from paganism and had an intimate acquaintance with the literature of Grecian philosophy, but of the circumstances of his conversion to Christianity, we know nothing. He was supposably a disciple of Pantænus, director of the Catechetic school of Alexandria and became his successor, and had among his pupils Origen, who in turn succeeded him. Further, Clement was a priest of the church of Alexandria. A list of his writings is given by Eusebius, St. Jerome, and Photius. It contains the titles of ten separate works, namely: 'Hortatory to the Greeks'; 'The Tutor'; 'The Stromates' (usually called *Stromata*): this as its title indicates is a patch-work or collection of miscellaneous observations; 'Who is the Rich Man that is Saved?' These four works have come down to us complete or nearly so. The remaining six titles are of works that have been lost: 'Outlines'; 'On the Passover'; 'On Fasting'; 'On Slander'; 'Exhortation to Patience'; 'The Church Rule.' The 'Hortatory to the Greeks' exposes the absurdities and immoralities of the pagan religions; but the Grecian philosophers and poets had a notion of the true author of the universe. 'The Tutor' sets forth the rule of Christian living. 'The Stromates' is a miscellany but it consists of the author's own studies of questions and problems in philosophy, literature, history, etc., not of passages taken from other authors. The treatise on the Rich Man is a very judicious exposition of the passage in the Gospel of Mark x. 17–31.

Clementi, Muzio, moot'sē-ō klā-mĕn'tē, Italian pianist and composer: b. Rome 1752; d. Evesham, England, 10 March 1832. As early as his 12th year he wrote a successful mass for four voices, and had made such progress in the pianoforte that an Englishman, Mr. Beckford, took him to England to complete his studies. He was then engaged as director of the orchestra of the opera in London, and his fame having rapidly increased, he went in 1780 to Paris, and in 1781 to Vienna, where he played with Mozart before the emperor. In 1784 he repeated his visit to Paris, but after that remained in England till 1802, when he went back to the Continent. He returned in 1810 to England, where he settled down as superintendent of one of the principal musical establishments in London. His most important compositions were his 60 sonatas for the pianoforte and the great collection of studies known as the "*Gradus ad Parnassum*," a work of high educative value. He represented perhaps the highest point of technique of his day, and his influence on modern execution has led to his being characterized as "the father of pianoforte playing." He was interred in Westminster Abbey.

Clem'entines, so named after Pope Clement V., who during his pontificate (1305–14) had compiled the canons of the Church, chiefly out of the canons of the 15th Council of the Church, Vienne (1311). The Clementines are one of five great collections of Church laws, examined and decided upon according to the methods employed by ecclesiastical authority. The five collections are known as: The Decretals (1234); the Sext (1298); the Clementines (1313); the Extravagantes of John XXII.; and the Extravagantes Communes (containing Decretals of 25 popes) (1484). Out of these five the 'Corpus Juris Ecclesiastici' is made up.

Clemson Agricultural College, an educational (non-sectarian) institution in Clemson College Station, S. C.; organized in 1890; reported at the end of 1899: Professors and instructors, 44; students, 503; volumes in the library, 7,350; productive funds, $80,000; income, $85,000; number of graduates, 78; president, Patrick Hughes Mell, Ph.D.

Cleobis (klē'ō-bĭs) **and Biton,** bī'tŏn, two Grecian youths, the sons of Cydippe, chief-priestess of Hera (Juno) at Argos. At the *Heraia,* a feast in honor of the goddess, it was customary for the chief-priestess to be drawn by two white oxen. Herodotus relates that on one occasion the procession had already begun to move, and the oxen had not arrived, upon which Cleobis and Biton drew the chariot of their mother for a distance of 45 stadia, up the mountain where the Temple of Hera stood. The people applauded, and the mother was so affected by this instance of filial affection that she begged the goddess to grant her sons the best gift which could be conferred on mortals. While the youths were yet in the temple a soft sleep fell upon them, and they never awoke. The Argives placed the statues of Cleobis and Biton in the temple at Delphi, and in a temple at Argolis they were represented drawing a chariot of their mother.

Cleobulus, klē-ō-bū'lŭs, one of the Seven Wise Men of Greece. He was a native of Lindus, or according to some, of Caria, and flourished 560 B.C. He traveled to Egypt to learn wisdom, like many of the sages of Greece. He was king of Rhodes, and was succeeded on the throne by his daughter Cleobulina. Several of his sayings are extant.

Cleombrotus, klē-ŏm'brō-tŭs, an ancient Greek military leader, son of Pausanias, king of Sparta. During his reign began the Theban war, in which he commanded the Spartans against Epaminondas and Pelopidas. He was killed in the battle of Leuctra, which happened 8 July 371 B.C., according to the Julian calendar. See EPAMINONDAS.

Cleome, klē-ō'mē, a genus of plants, herbs, and shrubs of the caper family, (*Capparidaceæ*), comprising about 75 species, natives of tropical America and Africa. Less than ten species are found in the United States, most of them adventitious additions from South America, escaped from gardens. The native varieties belong to the Rocky Mountain region, and when found to westward are naturalized specimens. Pink cleome (*C. serrulata*) has a stem from two to three feet in height, the pinkish-white flowers very showy and attractive. Its native location is the Rocky Mountain region from Canada to Arizona and Mexico, but it extends eastward to Lake Michigan. The spider flower (*C. spinosa*) of the eastern seaboard, from New Jersey to Florida, is a South American species escaped from culture.

Cleomedes, klē-ō-mē'dēz, ancient Greek author. He wrote a treatise, in two books, 'On the Circular Theory of the Heavenly Bodies,' which sets forth the Stoic theory of the universe, and which is remarkable as containing, amid much error and ignorance, several truths of modern science — such as the spherical shape of the earth. Nothing is known definitely regarding his life, but it seems most probable that he flourished in the 2d century A.D.

Cleomenes, klē-ŏm'ē-nēz, the name of three kings of Sparta, the most distinguished of whom is Cleomenes III., king from 236 to 220 B.C. He distinguished himself in a war against the Achæans. Returning to Sparta he put to death the ephori, made a new division of lands, introduced again the old Spartan system of education, and bestowed the full franchise upon many who had not before had it. He lived very simply, was just and friendly, and treated his enemies with generosity. He showed himself an able general in a war against the Macedonians and Achæans united, but at last lost the important battle of Sellasia (222 B.C.). He fled to Egypt, where he attempted to raise an insurrection, but finding no supporters committed suicide. With Cleomenes expired the race of the Heraclidæ which had sat on the throne of Sparta.

Cleomenes, or The Spartan Hero, a play by Dryden, acted in 1692.

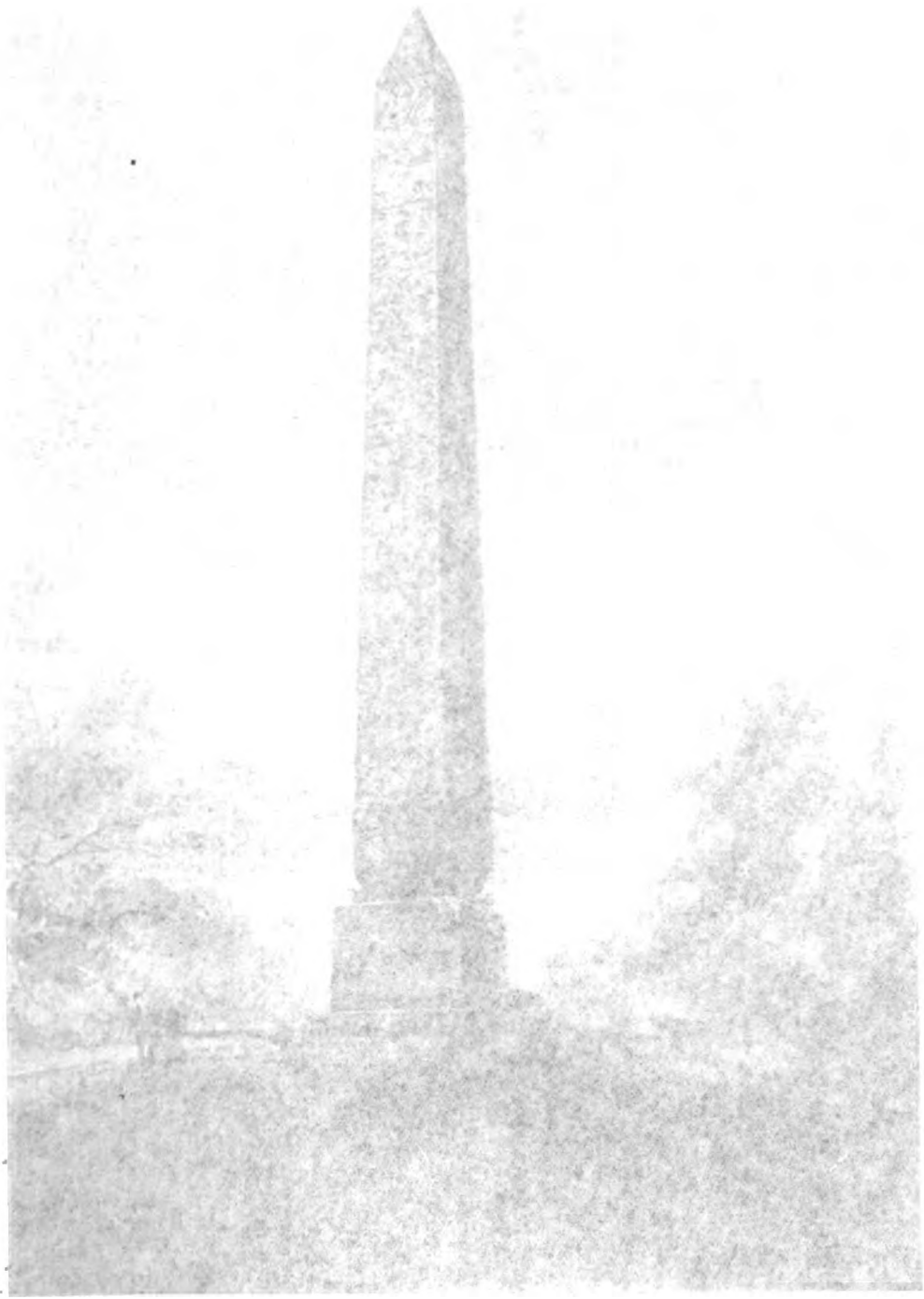
Cleon, klē'ŏn, Athenian demagogue, killed at Amphipolis, Macedon, 422 B.C. He was a tanner by trade, but became well known in public affairs before the death of Pericles. By the year 427 he was high in favor with the people, and distinguished himself by the atrocious proposal that all the adult males of the revolted Mytileneans should be put to death, and the women and children sold for slaves. In 425 he took prisoners those Spartans who had been blockaded by an Athenian force in the island of Sphacteria. The next year Aristophanes attacked him in his comedy of the 'Knights' — as he did also in the 'Wasps' in 422 — satirizing his venality, rapacity, ignorance, violence, and cowardice. The portrait was probably correct in the main. In 422 he was sent to Chalcidice against Brasidas, who was capturing the Athenian tributary cities there. He was taken unawares by a sally of Brasidas, and was slain.

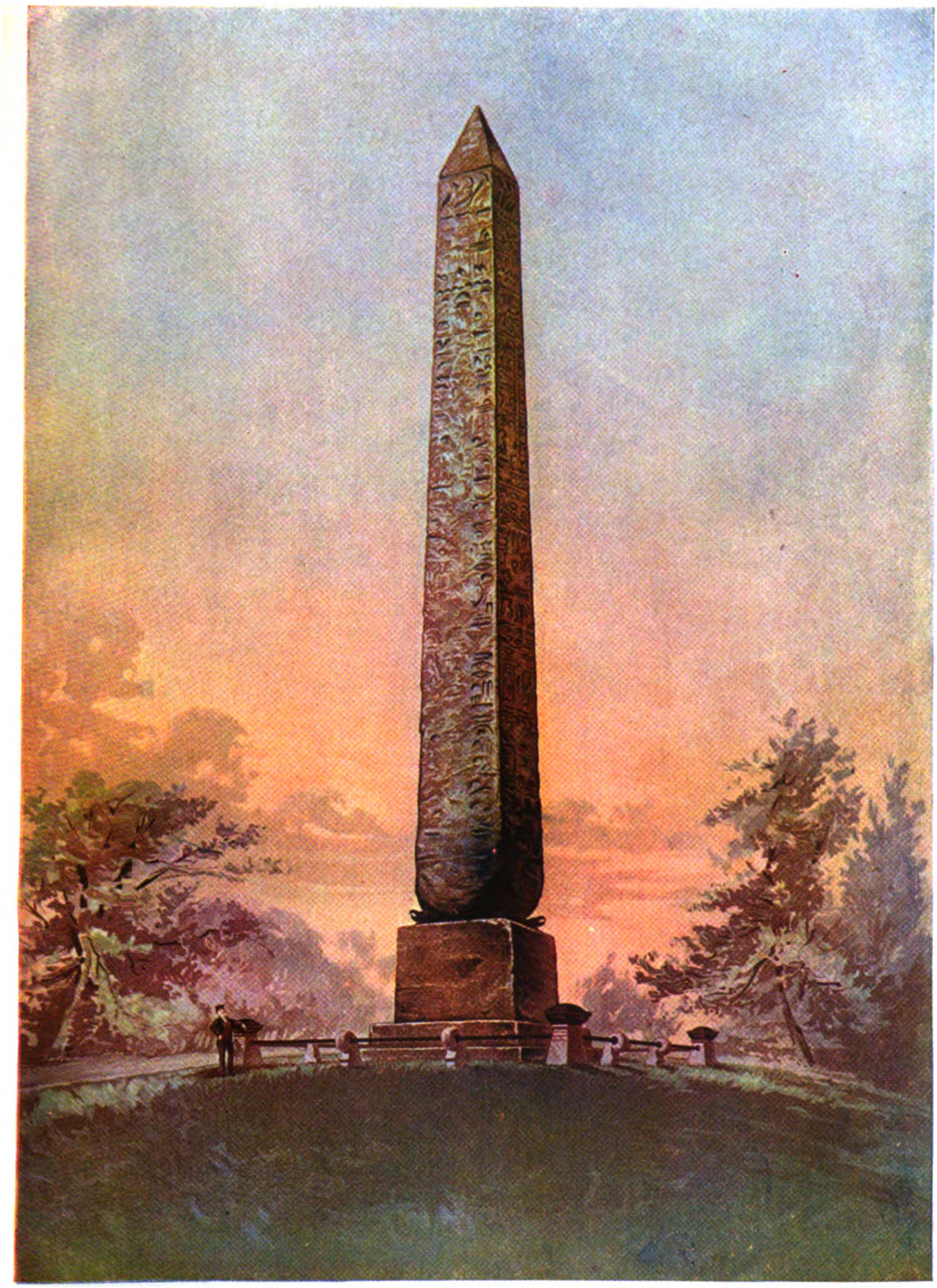
Cleopatra, klē-ō-pā'tra, the name of several Egyptian princesses, of whom the most renowned was the eldest daughter of Ptolemy Auletes: b. 69 B.C; d. 30 B.C. With her eldest brother Ptolemy she shared the throne of Egypt. Both were minors at the death of their father, and were placed under the guardianship of Pothinus and Achillas, who deprived Cleopatra of her share in the government 49 B.C. She went to Syria, and was forming plans for obtaining her rights by force, when Cæsar came to Alexandria, and captivated with her charms, successfully seconded her claims. Pothinus stirred up a second revolt, upon which the Alexandrian war commenced, in which the elder Ptolemy lost his life. Cæsar proclaimed Cleopatra queen of Egypt; but she was compelled to take her brother, the younger Ptolemy, who was only 11 years old, as her nominal husband and colleague on the throne. Cæsar continued some time at Cleopatra's court. The queen subsequently made a journey to Rome, where Cæsar received her magnificently, and erected a statue to her next to the statue of Venus, in the temple consecrated to that deity. Cleopatra remained in Rome from 46 B.C. to 44 B.C., returning to Egypt after Cæsar's death. She had by Cæsar a son, Cæsarion, afterward put to death by Augustus. When her brother, at the age of 14, demanded his share in the government Cleopatra poisoned him, and re-

mained sole possessor of the regal power. During the civil war in Rome she took the part of the triumvirs, and after the battle of Philippi she sailed to join Antony at Tarsus. She was then 25 years old, and combined with extraordinary beauty, great wit and the highest elegance of manners. She appeared in a magnificently decorated ship, under a golden canopy, arrayed as Venus, surrounded by beautiful boys and girls, who represented Cupids and Graces. Her meeting with Antony was attended by the most splendid festivals. After having accompanied him to Tyre she returned to Egypt. Antony followed her, and gave himself up to the most extravagant pleasures. She accompanied him on his march against the Parthians, and when he parted from her on the Euphrates he bestowed Cyrene, Cyprus, Cœlosyria, Phœnicia, Cilicia, and Crete on her, to which he added part of Judea and Arabia at her request. On her account he divorced his wife Octavia. After this Antony conquered Armenia, returned triumphantly to Egypt, and made his three sons by Cleopatra, and also Cæsarion, kings.

Now commenced the war between Augustus and Antony, but instead of acting promptly against his adversary, Antony lost a whole year in festivals and amusements with Cleopatra at Ephesus, Samos, and Athens, and at last determined to decide the contest by a naval battle. At Actium the fleets met. Cleopatra, who had brought Antony a reinforcement of 60 vessels, suddenly took to flight, and thus caused the defeat of her party; for Antony, as if under the influence of frenzy, immediately followed her. They fled to Egypt, and declared to Augustus that if Egypt were left to Cleopatra's children they would thenceforth live in retirement, but Augustus demanded Antony's death, and advanced toward Alexandria, which Antony hastened to defend. Cleopatra determined to burn herself with all her treasures, but Augustus pacified her by private messages. These communications, however, did not remain concealed from Antony, who, supposing Cleopatra treacherous, hastened to her, to avenge himself by her death. She, however, escaped and took refuge in the mausoleum which she had erected near the Temple of Isis, and caused the report of her suicide to be circulated. Antony now threw himself upon his sword; but before he expired was informed that Cleopatra was still living, upon which he caused himself to be carried into her presence, and breathed his last in her arms. Augustus succeeded in getting Cleopatra into his power. She still hoped to subdue him by her charms, but her arts were unavailing, and becoming aware that her life was spared only that she might grace the conqueror's triumph, she determined to escape this ignominy by a voluntary death. According to the generally received account of her death she ordered a splendid feast to be prepared, desired her attendants to leave her, and put an asp, which a faithful servant had brought her, concealed amongst flowers, on her arm, the bite of which caused her death almost immediately. There is, however, some doubt as to the exact method by which she took her life. Her body was interred near that of Antony. At the time of her death she had reigned 22 years.

Cleopatra's Needles, two obelisks, formerly at Alexandria, one of which is now in New York, the other in London. They are made of the rose-red granite of Syene, and were originally erected by the Egyptian king Thothmes III., the most celebrated king of the 18th dynasty, in front of the portico of the great temple of Heliopolis, the On of the Scriptures, and the place where Moses was born and brought up. From Heliopolis the two obelisks were removed to Alexandria not long before the commencement of the Christian era, but not, so far as we can now tell, during the lifetime of Cleopatra. We are at least informed by an inscription on the bronze supports of one of them, that they were not erected at Alexandria till the eighth year of the reign of Augustus Cæsar, and accordingly seven years after the death of Cleopatra. How, then, they came to be called Cleopatra's Needles is not apparent; but it may be conjectured that they had been removed by her order some time before they were set up on their second site, or that their removal was the carrying out of an intention formed by Cleopatra. Mr. (afterward Sir) Erasmus Wilson, to whom the credit may be awarded of having been chiefly instrumental in getting the British obelisk conveyed to London, assumes that the association of Cleopatra's name with the two obelisks represents the popularity of the queen and the affectionate regard of her subjects, rather than any participation of herself in their transport or erection. The obelisk now at London lay for a long time prostrate in the sand. In 1820 it was presented by Mehemet Ali to the British nation, but the British government, in spite of many appeals made to them on the subject, never did anything for its removal, which was at last effected solely through the public spirit of several private individuals, the obelisk being erected on the Thames Embankment in 1878. The other obelisk was presented to the United States by the Khedive of Egypt, and was transported to Central Park, New York, where it was erected in 1881. It stands upon four bronze crabs, reproductions of the original crabs upon which the obelisk formerly stood. The originals are now in the Metropolitan Museum, New York. The one in London is somewhat the taller of the two, being 68 feet 5½ inches in height, as against 67 feet 2 inches, the height of the other. The lateral measurements at the base are, in the British obelisk, 7 feet 5 inches in one pair of opposite sides, and 7 feet 10½ inches in the other pair; in the one in New York, 7 feet 9¾ inches, and 8 feet 2¼ inches. The weight of the British obelisk is rather more than 186 tons, and its mass 2,529 cubic feet. Both obelisks are inscribed with hieroglyphs, engraved to a depth of several inches and carefully polished. The hieroglyphs are inscribed in vertical colums, which are read from the top downward; and in each case the middle column is in honor of Thothmes, by whom the obelisks were first erected, and the side columns in honor of Rameses II., the most celebrated king of the succeeding dynasty, who reigned at least 200 years after Thothmes. On each side of the pyramidion, or small pyramidal top of the obelisk, is a bas-relief representing the sun-god, protector of the city of Heliopolis, receiving gifts from Thothmes.





CLEOPATRA'S NEEDLE, CENTRAL PARK, NEW YORK

Clepsydra, klĕp-sī'drạ, or **Water-clock,** an instrument for the measurement of time by the escape of water from a vessel through an orifice. Its origin is extremely ancient, and has generally been attributed to the Egyptians. Two descriptions of clepsydræ have been employed — one in which the water merely escapes through the orifice, the other in which the same level is constantly maintained by the introduction of a fresh supply of water, and a uniformity of efflux secured by retaining throughout an equal amount of pressure on the fluid as it issues from the bottom of the vessel. In one kind of water-clock the measure of time is registered on a dial-plate by means of a hydraulic apparatus acted on by the efflux of water from a cistern. These instruments are now scarcely ever constructed.

Clerc, Laurent, lō-rŏñ klār, French deaf mute: b. La Balme, Isère, France, 26 Dec. 1785; d. Hartford, Conn., 18 July 1869. At the age of 12 years his uncle took him to Paris, and placed him in the institution for the deaf and dumb. The abbé Sicard, though nominally its director, was then in prison for his alleged hostility to the republic; but Jean Massieu, himself a deaf mute, became his teacher till the release of Sicard, when he became a favorite pupil of the abbé. His intellectual condition, like that of most of the uninstructed deaf mutes, was at this time deplorable. "I had," he says, "a mind, but it did not think; I had a heart, but it did not feel. My mother had endeavored to show me the heavens, and make me know God, but her attempts were vain; I could comprehend nothing. I believed that God was a tall, big, and strong man, and that Jesus Christ, having come to kill us, had been killed by us, and placed on a cross as one of our triumphs." Under the skilful instruction of the abbé Sicard, he made rapid proficiency, and in 1805, after passing eight years in the institution, he was appointed tutor, and in 1806 a salaried teacher. His aptitude for teaching was such that in a few years the abbé confided to his charge the highest class in the institution. In 1815 while on a visit to England, Clerc formed the acquaintance of Gallaudet, who had gone thither in the hope of obtaining such instruction as would enable him to teach the deaf and dumb in this country. Failing in this, he subsequently visited France, and received instruction in the language of signs from the abbé Sicard and Clerc, and after spending some months under their tuition, persuaded the latter to accompany him to this country, here to lay the foundation of deaf mute instruction. Several months were spent by them in visiting the principal cities of the northern States, and soliciting aid for the establishment of the institution, since known as the American asylum for the deaf and dumb, at Hartford. On 15 April 1817 the asylum was opened with seven pupils, and Messrs. Gallaudet and Clerc installed as teachers. Much of the early success of the asylum is due to his patient and assiduous labors, and the greater part of the teachers sent to other institutions for the deaf and dumb, from this mother asylum received their training at his hands.

Clerc, Sébastien le, French designer and engraver: b. Metz, Lorraine, 1637; d. 1714. He acquired the elements of design from his father, a goldsmith, and by the advice of Le Brun devoted himself to engraving, in which he became so distinguished that at the suggestion of Colbert he was appointed engraver in ordinary to Louis XIV. Pope Clement XI. also conferred upon him the honor of knighthood. He formed his style on that of Le Brun, improving it, however, by a careful study of Raphael; and in his published works, which number between 3,000 and 4,000, and embrace every variety of subject he has exhibited a singularly correct and elegant execution. He also published treatises on geometry, architecture, and perspective.

Clerestory, klēr'stō-rĭ, or **Clearstory,** the upper part of the nave in churches, above the triforium where a triforium is present, and formed by walls supported on the arches of the nave, and rising above the roof of the side aisles. In these walls windows are inserted for the purpose of increasing the light in the nave. In Norman architecture the three stories of pier arcade, triforium, and clerestory are of nearly equal height, but in Gothic the clerestory becomes relatively of greater significance and in late Gothic work is often very lofty.

Clergy, in the Christian Church, that portion of the faithful which is set apart for the ministry of religion. In the Roman Catholic Church there are eight grades or distinctions of clergy, namely, that of the simple cleric, those of the four minor orders and those of the three sacred orders of subdeacon, deacon and priest. The last three are regarded as being of divine institution. The simple cleric is one who has received the ecclesiastical tonsure; by that rite he is made a clerk or cleric, and as such is entitled to certain rights, privileges and immunities, and assumes certain obligations not incumbent on the laity. See Holy Orders.

Clerk, John, Scottish naval tactician: b. Elden, near Edinburgh, 1728; d. 10 May 1812. For him is claimed the invention of the manœuvre "of breaking the enemy's line," put forth in an essay on 'Naval Tactics,' published in 1790, afterward employed with signal effect by Howe, St. Vincent, Duncan, and Nelson.

Clerk-Maxwell, James, Scottish physicist: b. Edinburgh 13 Nov. 1831; d. 5 Nov. 1879. He was a professor of natural philosophy in Marischal College, Aberdeen, in 1856–60; of physics and astronomy in King's College, London, in 1860–5; and of experimental physics in the University of Cambridge in 1871. Among his most important works are 'Essay on the Stability of Motion of Saturn's Rings'; 'Theory of Heat'; 'Electricity and Magnetism'; and 'Matter and Motion.'

Clerk, one who has charge of an office or department, subject to a higher authority as a board, corporation, etc.; a secretary, as, the clerk of the House of Representatives or Senate, clerks of the various courts, etc. In England a parish officer, a layman, whose business used to be to lead the responses in the church services and to perform other duties connected with the parish; a parish clerk

Clerke, Agnes Mary, English astronomer: b. Ireland 10 Feb. 1842. She began contributing to the Edinburgh 'Review' in 1877, and in 1888 made astronomical observations at the

Royal Observatory, Cape of Good Hope. She has published 'A Popular History of Astronomy During the 19th Century' (1885); 'The System of the Stars' (1890); 'Familiar Studies in Homer' (1892); 'The Herschels and Modern Astronomy' (1895); 'Astronomy' (1898); 'Problems in Astrophysics' (1902). In 1893 she received the Actonian prize of 100 guineas for her writings on astronomy.

Clerke, Ellen Mary, English writer: b. Ireland. She is a sister of Agnes Mary Clerke (q.v.) and has contributed extensively to English and Italian periodicals. She has published 'The Flying Dutchman,' a book of verse; 'Jupiter and His System'; 'The Planet Venus'; 'Flowers of Fire' (1902).

Clerkenwell, England, a parish of London inhabited by the better class of workingmen in the metal trades, being noted for its output of watches, optical instruments, and articles of gold and silver. The name comes from the well around which the parish clerks of London used to meet. The attempt of the Irish agitators to destroy the Clerkenwell prison was made on 13 Dec. 1867.

Clermont, The, the name given by Robert Fulton to the steamboat in which he made his first trip from New York to Albany, 11 Aug. 1807. The speed attained was only five miles per hour.

Clermont-Ferrand, klār-môn-fĕr-rān, France, a town in the department of Puy-de-Dôme, of which it is the capital. It is situated on a hill at the foot of the volcanic range in which the summit of the Puy is conspicuous. It was originally the capital of the Arverni, possessed considerable importance under the Romans, and became a bishop's see in 250. It was afterward sacked by the northern hordes, but soon recovered, and was selected in 1095 for the meeting of the great council in which the crusades originated. In 1556 it became the capital of the duchy of Auvergne. Among its natives are Gregory of Tours, Pascal, and General Dessaix. The most remarkable edifices are the Gothic cathedral, a huge, irregular, gloomy pile, begun in 1248, and recently completed by the construction of the west front and two towers; the Church of Notre Dame, founded in 580, and incrusted externally with rude mosaics; the townhouse, courthouse, theatre, general hospital, etc. There are also a medical and a theological college, technical schools, observatory, public library, botanic garden, and museums of natural history and antiques. The manufactures consist chiefly of chemicals, animal oils, table-linen, nails, hats, machinery, etc. It is an important centre of trade. Near it there are two mineral springs. Pop. 40,000.

Clermont-Tonnerre, tō-nār, the name of a distinguished ancient family of counts in Dauphiny. One of the most celebrated is Count Stanislas: b. 1757; d. 1792. At the breaking out of the Revolution in 1789 he took his place in the States-General as deputy of the nobility. He maintained the doctrine of a constitutional monarchy, and incurred the displeasure of both the aristocratic and republican parties. As a counterpoise to the influence of the Jacobins, he, in concert with Malouet and other friends of monarchy, founded the Monarchical Club; and along with Fontanes started the *Journal des Impartiaux.* The club having been denounced by Barnave as a band of conspirators, was dissolved, and the journal was suppressed after an existence of only two months. In 1791 he was arrested on the charge of having aided the king in his attempt to escape, but regained his liberty on taking an oath of fidelity to the National Assembly. The next year he was dragged by a mob before the section. As no sufficient ground of detention appeared, he was dismissed, but was pursued and murdered.

Cléry, Jean Baptiste, zhŏń bāp-tēst klā-rē, a French royal attendant: b. near Versailles 11 May 1759; d. near Vienna 27 May 1809. When in 1792 the royal family of France were imprisoned in the Temple, Cléry was one of the few servants permitted to accompany them. Louis XVI., a few days before his death, divided a loaf of bread with this faithful companion of his misfortune, the only proof of his regard which he was able to show him. After the king's death, Cléry was devoted to the dauphin. He wrote a journal of what passed in the Temple from the captivity of Louis XVI. until the death of the dauphin; it has been several times republished.

Clésinger, Jean Baptiste Auguste, zhŏń bāp-tēst ō-güst klā-zăń-zhā, French sculptor: b. Besançon 22 Oct. 1814; d. Paris 7 Jan. 1883. He obtained considerable reputation for busts of distinguished persons, and also executed statues and historical groups. His colossal bust of 'Liberty,' and his statues of 'Fraternity,' 'Woman Bitten by a Serpent,' 'The Gipsy Girl,' and of Rachael and Cruvelli in some of their principal parts, are among his best known works. He was commissioned by the French government to execute an equestrian statue of Francis I. He married a daughter of Madame Dudevant (George Sand).

Clesse, Antoine, ăń-twăń klĕs'ē, Belgian popular poet: b. The Hague 1816; d. 1889. To the day of his death he followed his trade of armorer. His first ballad, 'Godfrey de Bouillon,' won for him a gold medal. His popular songs 'Beer' and 'The Family Name' (meaning Belgian, including Fleming, Walloon, etc.), came into great favor with the people. He wrote also a comedy, 'A Poet.' Two volumes of 'Songs' (1866–88) contain all his popular ballads, with the music.

Clethra, klĕth'ra, the typical genus of the natural order *Clethraceæ,* or white-alder family. The family has but this single genus, which numbers about 30 species, indigenous to Japan, Mexico, South America, and the eastern seaboard of North America. The United States species are the sweet-pepperbush or white-alder *C. alnifolia,* found near the coast from Florida to Maine, and the mountain sweet-pepperbush (*C. acuminata*), a shrub or small tree growing in the mountain woods of Virginia, the Carolinas, and Georgia.

Clevedon, England, a watering-place on the Bristol Channel, about 15 miles southwest of Bristol. It is the burial-place of Hallam, the historian, and of his son Arthur, whom Tennyson's 'In Memoriam' made famous. Here Coleridge lived in 1795. Clevedon Court is the Castlewood of Thackeray's 'Henry Esmond.' Pop. (1901) 5,898.

Clev'eite, a variety of the mineral uraninite (q.v.), remarkable because containing yttria and the rare elements helium, polonium, and radium. It is found in the vicinity of Arendal, Norway, and occurs in cubical crystals, with octahedral and dodecahedral modifications. It has a specific gravity of about 7.5, and was named for P. T. Cleve, a Swedish chemist.

Cleveland, Charles Dexter, American writer: b. Salem 2 Dec. 1802; d. Philadelphia 18 Aug. 1869. He was professor at Dickinson College and at the University of the City of New York. His best known works are 'Compendium of English Literature' (1850); and 'Compendium of American Literature' (1858).

Cleveland, Grover, American statesman: 22d President of the United States: b. Caldwell, N. J., 18 March 1837. He was baptized Stephen Grover, but in after years dropped the Stephen. His father was a Presbyterian minister, descended from fine English stock. Mr. Cleveland's education was thorough, although he was not able to complete a college course. He began to earn his first money as a teacher, but soon developed a talent for law, and in 1859, when but 22, was admitted to the bar in Buffalo, N. Y. The sturdy, uncompromising spirit inculcated in him by his father's training stood him in good stead in his chosen profession, and he soon became known as a young man who feared nothing when principle was at stake. Four years after he began the practice of law in Buffalo he was chosen assistant district-attorney of Erie County (1863–6), thus beginning his remarkable political career, which was to carry him with rapid strides to the highest office in the gift of the American people.

In Erie County, where centres the trade of the Great Lakes, the office of sheriff is one of the most important, and in 1870 the young man who had served the county so faithfully as assistant to the district-attorney was chosen as the candidate for sheriff, and was elected by a handsome majority. Unbribable and stern in the performance of his often repugnant duties in this office, he so satisfied the people of the city and county that in 1881 he was the unanimous choice of his party for mayor of Buffalo, and was elected to that office. Here he had still greater opportunities for displaying the qualities which had won him his previous successes. When in 1882 the Democratic leaders of New York were seeking a man to lead the party, the mayor of Buffalo was suggested as a candidate for governor. He was nominated with little opposition, and elected by the immense majority of nearly 200,000 votes. This result was due partly to the divided efforts of the opposing party, but largely to Cleveland's personal popularity and to the faith which all classes seemed to feel in his character and his determination to do right. His course as governor met with the endorsement of the majority of men of all parties, and he was the logical candidate for President on the Democratic ticket in 1884. Not since the Civil War had the Democrats been as enthusiastic and united for any candidate, and Cleveland was elected, although his opponent was James G. Blaine, the idol of the Republican party, and a man of great personal magnetism. The contest was most bitter and close. New York, however, which had so believed in him and honored him in the past, stood by Mr. Cleveland, and the enormous vote polled for him in New York city and Brooklyn carried the day. He received 219 votes in the electoral college, to 182 for Blaine, as well as a majority of the popular vote, and took his seat as President of the United States in 1885, when but 48 years old. As the first Democratic President since the War, his position was one of most unusual difficulty, but the same characteristics which had previously won him the confidence of the people, proved an adequate equipment for his greater responsibilities.

Mr. Cleveland is not a man ever to hesitate when he believes a certain thing or policy to be right and proper. Immediately on his accession to office he began to redeem the promises he had made to himself and to the people. He believed that a reduction of the then high tariff on many articles was for the best interest of the nation. Accordingly he so formulated his first message to Congress as to embody in it the changes he thought wise. This was not in accordance with the opinion of many of his political advisers, but he believed it was the thing to do, and therefore he did it, regardless of personal consequences. He carried his point, making by this famous message a dividing line between the two leading political parties which was to continue to the present time. The Republicans, adhering to the policy of protection and high tariff, in 1888 nominated Benjamin Harrison to oppose Cleveland, who was renominated by the Democrats. Harrison was elected by a small plurality; but in 1892, when these two men were again opposed for this high office, Cleveland won by a large majority. His course during his two terms as President was at all times vigorous, determined, and able. His measure to secure a tax on the large incomes of individuals, so as to reduce the direct taxation of the poorer people, was bitterly opposed by the men it was proposed to tax. Finally the United States supreme court, by a majority of one vote, declared the act unconstitutional, the court standing evenly divided during several long sessions. When there was danger of complications with England over the Venezuela boundary dispute, Mr. Cleveland wrote a vigorous definition of the Monroe Doctrine, which led to the immediate appointment of an arbitration commission and averted possible war. During one of the great labor strikes, when disorder reigned, he did not hesitate, but sent Federal troops to the scene at once and quelled the uprising. He was popular in a social way, being aided in this respect by his wife, whom he had married during his first term as President.

There was talk of again nominating Mr. Cleveland for President in 1896, but the feeling against a third term was too general. He retired to private life in 1897, and to-day he is our only surviving ex-President, enjoying the respect and honor of his fellows at his home at Princeton, N. J. He has received the degree of LL.D. from Princeton University, where he occasionally lectures to the students. This was the college he had hoped to attend when a boy, and his love for it has never ceased. He is scarcely less noted as a fisherman than as statesman, being never more happy than when he can steal away for a

few weeks' enjoyment of the gentle sport. He was prominently mentioned as the Democratic candidate for the presidency (1904), as his attitude had been against the policies laid down in the recent Democratic platforms, which so failed to please the people. He is recognized as the ablest leader the Democrats have ever had, and they would, most of them, be glad to see him again the candidate, but it is not thought that he would accept another nomination. His speech at the opening of the new Tilden Club, New York, in 1902, showed his attitude, and did more to harmonize and settle the disturbed conditions existing in the Democratic party than any other utterance of recent years. His last significant public act was a speech at the opening of the St. Louis Exposition, in May, 1903.

Cleveland, John, English poet: b. Loughborough June 1613; d. 29 April 1658. He was an adherent of the Royalist party during the civil war, and severely satirized the opposite party. He was arrested and imprisoned in 1655, but was released by Cromwell.

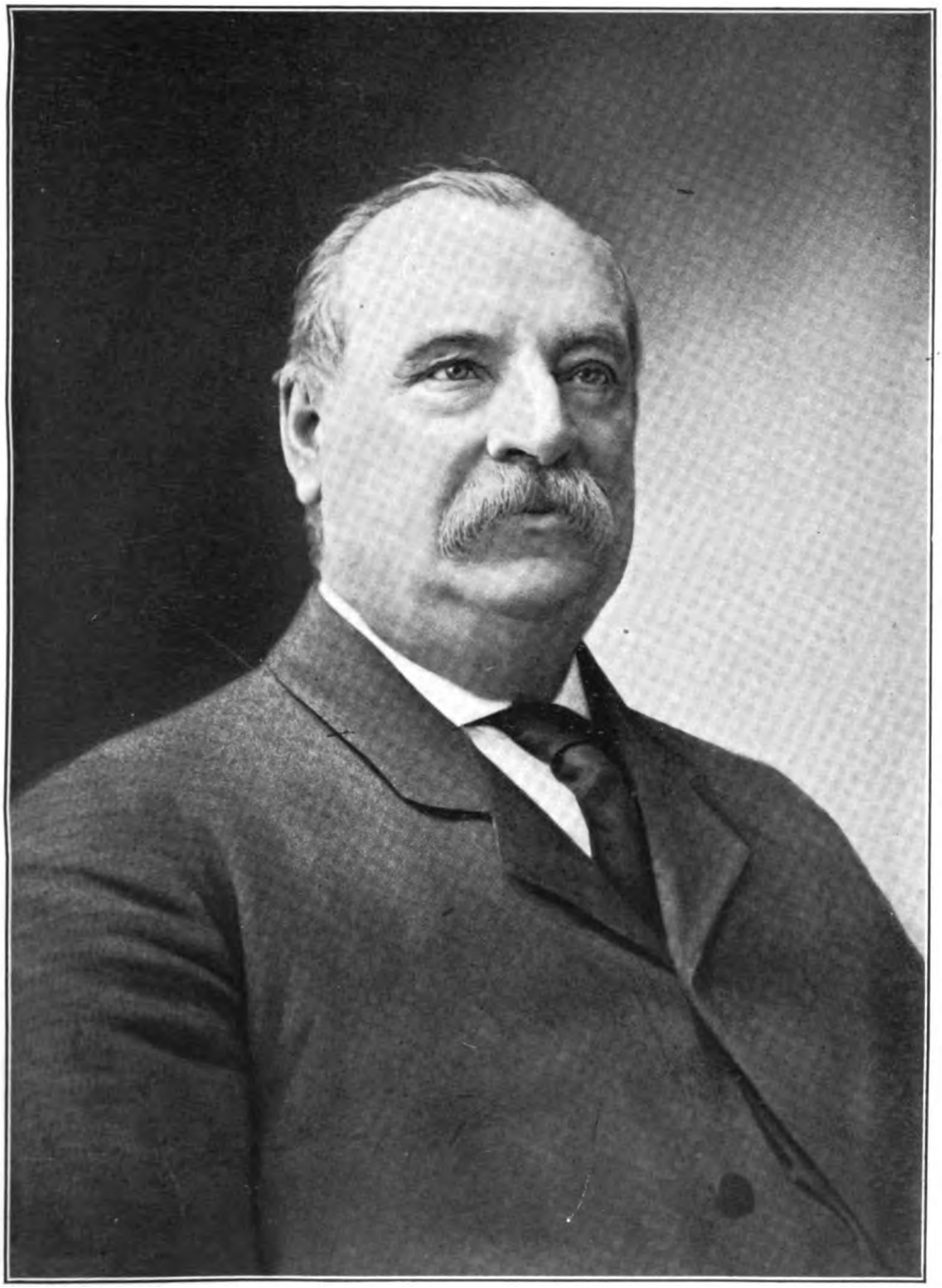
Cleveland, Rose Elizabeth, American prose writer: b. Fayetteville, N. Y., 1846. She is the sister of Grover Cleveland (q.v.), and after the inauguration of her brother (1885) she became the "mistress of the White House," remaining there until 1886. She published a book of essays and lectures entitled, 'George Eliot's Poetry, and Other Studies' (1885); and 'The Long Run,' a novel (1886).

Cleveland, England, a hilly district in the North Riding of Yorkshire, about 28 miles long and 15 broad, between the Tees and the coast at Whitby, forming one of the parliamentary divisions of the county. It has developed enormously since the discovery of its extensive deposits of iron ore, which is smelted chiefly at Middlesbrough.

Cleveland, Ohio, "the Forest City," city and county seat of Cuyahoga County; largest city in the State, second on the Great Lakes, and seventh in the United States; on Lake Erie at the mouth of the Cuyahoga River, 357 miles by rail east of Chicago and 183 west of Buffalo; 138 northeast of Columbus, 263 northeast of Cincinnati, 140 northwest of Pittsburg, 623 from New York against less than 500 overland, the Alleghanies forcing a long detour. For its great number of railroad and steamer connections, see *Commerce and Transportation,* below. Pop. 1900, 381,768.

Cleveland is on the edge of the great plateau of northern Ohio, sloping gradually from the lake to a ridge 115 feet above it and 689 above sea-level, rising much higher to the east. It extends about 10 miles along the lake, and a maximum of 6 miles back, with an area of some 33 square miles,—its annexations of Brooklyn southwest and Newburg southeast of the Cuyahoga carrying its wings south beyond the centre. About three fourths of it, and the main business part, lies east of that river, a small crooked stream with the last few miles 200 or 300 feet wide and of some depth, lined with docks for five or six miles out of an available wharfage of 16. Its valley half a mile wide, the sunken bed of a much greater stream, is filled with car tracks and car shops, lumber, coal, and ore sheds, ship-yards, etc., largely hidden from the city; and is spanned by two immense viaducts, uniting the east side with the west or south as the river runs. The lower viaduct connects Superior Street, the main business avenue, with Detroit Street west, making a sharp turn southwest west of the river; is of stone and iron, 3,211 feet long, 64 wide, and 68 above average water, with a 322-foot draw; and was completed 1878, at a cost of $1,715,000 besides $535,000 right of way. The Central Viaduct is from Ohio Street east to Jennings Avenue south, where it connects at an angle with one westward across Walworth Run, a brook running into the Cuyahoga 1½ miles above its mouth; the two have a total length of 3,931 feet (with approaches, 5,229), width 56, height 101; completed 1888, cost $675,000. Entirely on the east side is one 834 feet long, 48 wide, and 87 high, across Kingsbury Run, a brook emptying into the Cuyahoga a mile above Walworth on the other side. There are several other municipal and railroad bridges across the latter river.

Streets.— The focus of the city, the heart of the business quarter and the centre of the street-railway lines, is Monumental Square, about half a mile from lake and from river; and from this or near it radiate a fan of streets at every angle from northeast (parallel to the lake front) to southeast (toward Newburg). Two miles east, the long Willson Avenue runs north and south from near the lake to Broadway, the old Newburg highway; so that the older city is a rough triangle with the vertex at the square, the base Willson Avenue, one side the lake, and the other the river and Kingsbury Run. The rest of the city plan is largely haphazard: East Cleveland and old Brooklyn generally east and west by north and south, along Broadway a mass of short streets at right angles to it, the West Side based on the lake line and the river curves; but accidental or surface variations are endless. Monumental Square, originally a 10-acre park, is now divided into four sections by two broad avenues intersecting at right angles, Superior 132 feet (eight rods) wide, Ontario 99 feet (six rods). Superior runs from the river parallel with the lake front for two miles or so, then sheers off east; it is the great business street, the large stores extending along it from the square to the river and as far east. Ontario runs to the lake, as does Seneca along the west side of the square; St. Clair is parallel to Superior nearer the lake; Water Street runs from Superior near the river to the Union depot, as does Seneca to the other end. From the southeast corner of the square starts the world-famed Euclid Avenue, once said by travelers to be the most beautiful street in the world; named from the town of Euclid on the east to which it is the highway, and as a lake road extending to Erie, Pa., 95 miles. It widens from 80 to 99 feet, and beyond the business portion is lined with splendid and costly stone mansions set from 200 to 400 feet back from the street, amid superb grounds, "estates" rather than merely dwellings. It turns east along a low ridge, but beyond Wade Park again turns northeast. Both Superior and Euclid run to the city limits; parallel to the latter on the south is the only less fine Prospect Street, extending to Willson Avenue, itself a notable residence street, as are Case Avenue west of Willson from the lake to Kingsbury Run, East



GROVER CLEVELAND,

TWENTY-SECOND AND TWENTY-FOURTH PRESIDENT OF THE UNITED STATES.

Madison a mile east of Willson and parallel to it, and a number of shorter streets. On the South Side (Brooklyn), Jennings Avenue, reached by the Central Viaduct, is the chief residence street. The streets in general are wide, and so heavily shaded with great trees as to have given Cleveland the name of the "Forest City." The houses are nearly all detached, either tenements for the poor or flats for the richer being still comparatively few.

Municipal Conditions.— The light porous soil makes excellent drainage, and there is a good sewerage system. The death rate in 1902 was 17.1. The waterworks are owned by the city, and have cost to date above $10,000,000, which extensions under way will largely increase; there are two pumping stations and two standpipes, the water coming from a crib 8,642 feet out in the lake, through two tunnels 90 feet below the surface, to two reservoirs on the East Side, with a daily delivery capacity of 117,000,000 gallons. A new crib and tunnel 26,000 feet into the lake, or about five miles, are under construction. Of the 600 miles of streets, toward 200 are paved, largely with Medina dressed stone, also with asphalt, vitrified brick, and macadam. The street- and suburban-railway system is very extensive: not only are there over 200 miles of track in the city, but some of the longest suburban and through lines in the country start from the square,— to Akron, 39 miles, to Painesville, 29 miles, to Elyria, 25 miles, etc. They carry package freight also. The city has four public markets. The police force in 1902 consisted of 295 patrolmen, 29 lieutenants, 16 sergeants, 12 detectives. The fire department has 28 steam-engine companies, 9 hook and ladder companies, and 3 hose companies.

Buildings, etc.— Monumental Square contains a bronze statue of the city's founder, Gen. Moses Cleaveland, and the elaborate Soldiers and Sailors' Monument to the dead of the Civil War; the marble statue of Perry, formerly here, has been removed to Wade Park. The frontage on the square is occupied by the government building, one of the two court-houses, the "Old Stone Church" (First Presbyterian), the Society for Savings, the Chamber of Commerce, a hotel, etc. The public buildings are to be replaced by a new and splendid set, grouped in a quadrangle a fourth of a mile square near the centre of the city, enclosing a park. The government has authorized its new post-office building to cost $2,500,000, and a court-house costing at least $3,000,000 is assured. The entire "Group Plan" improvement is estimated at $16,000,000. The Arcade office building just east of the square, erected 1889 for $850,000, is a prominent feature: it consists of a great interior court open to the top, surrounded by tiers of offices with balconies in front, entirely around it. The Colonial Arcade, built as a companion in 1898, is near by. The Sheriff Street market is one of the largest in the country, and the stone Union Station was such when built, and is still notable,— it is on the lake a little east of the river. Of others may be noted the Central Armory, the Caxton Building housing the Case Library, the Garfield, Hickox, New England, Perry-Payne, Cuyahoga, Lennox, Rose, and Williamson buildings; besides institutional buildings,— the beautiful one of the Cleveland Medical College, the Y. M. C. A., the House of Correction, the Northern Ohio Insane Asylum, Adelbert College, and the Case School of Applied Science southeast of Wade Park, etc.; besides churches mentioned later.

Amusements and Clubs.— The chief places of public amusement are the Central Armory, the Grays' Armory, the Opera House, the Lyceum Theatre, the Colonial Theatre, the Empire Theatre, and the Star Theatre. The chief clubs, several owning their own club-houses, are the Colonial, Country (on the lake front east of Gordon Park), Excelsior, Roadside, University, Rowfant, Tavern, and Union.

Parks.— Cleveland has one of the finest park systems in the country, with 22 parks containing 1,326 acres, on which over $3,000,000 has already been spent in improvements, and authority has been granted to spend another million. The most desired improvement — to make the lake front, now occupied by the Lake Shore tracks, a boulevard — is difficult of attainment; but it would complete the chief of the park plans. Four or five miles east of the Cuyahoga, Doan Brook flows into the lake, through a valley of considerable breadth. At its mouth is the beautiful Gordon Park of 122 acres, formerly a private estate bequeathed to the city. Two miles back is Wade Park of 62 acres, on an elevation overlooking the lake,— an exquisite place, with groves of magnificent trees, a boating lake, a zoological garden, etc.; and containing also the marble monument to Commodore Perry, hero of the battle of Lake Erie, removed from Monumental Square. The whole Doan Valley between and beyond them has now been purchased and presented to the city by John D. Rockefeller and others, and turned into a broad ribbon of park three or four miles long. If the lake boulevard is ultimately built, it will connect with Lakeview Park, already extending 2,500 feet along the lake front, from Erie Street to the Union Station, and the little Clinton Park, east of it, making some eight miles of continuous park drive, with Euclid avenue as the third side. Of the large number of other parks, the chief are — on the East Side, Newburg in the south, of 160 acres; Woodland Hills, southeast of Wade Park; Forest City, between Willson Avenue and the river, at the city line; Garfield Park; on the west, Edgewater of 89 acres at the lake, with a bathing and boating beach and full summer equipment; Brooklyn of 139 acres in the south; Brookside in the southwest; and small but pretty ones like "The Circle" on Franklin Avenue, with a fountain; South Side, of nine acres, on Jennings Avenue, etc.

Cemeteries.— Of the numerous cemeteries, the finest is Lakeview, at the extreme northeast of the city six miles out, off Euclid Avenue,— one of the most beautiful in the country for site and development. It is on the crest of the ridge, rising to 250 feet above the lake: on this height stands the Garfield Memorial of Ohio sandstone, 165 feet high, with a balcony around the top commanding an immense prospect of lake and land; the lower portion is a chapel containing panels and reliefs of scenes in his life, and beneath is his tomb in the crypt. Woodland of about 60 acres lies between Willson and East Madison, a mile south of Euclid; Riverside of 120 acres is in Brooklyn, southwest of the river.

Churches.— Cleveland is the seat of a Roman Catholic bishop; and in 1902 had 319 church

societies of all denominations,— including a few mission branches, and Christian Science and Spiritualist denominations. The chief were— Roman Catholic, 43, including one Italian and one Polish, besides a monastery and five convents; Methodist Episcopal, 37, including five German, one Swedish, and one Welsh; 24 Congregationalist, including two Bohemian, one Polish, one Welsh, and one colored; 22 Baptist, including three German, one Swedish, and one Welsh; 22 Protestant Episcopal, besides three parish houses; 21 German Evangelical Lutheran; 20 Presbyterian, including one Welsh; 14 German United Evangelical; 14 Hebrew synagogues; 12 Reformed Church in the United States (Bohemian Moravian); 12 Disciples; 6 Friends; 5 United Brethren; 1 Swedenborgian, etc., showing the enormous complexity of this polyglot city. The most important church edifices are the cathedral; St. Paul's and Trinity, Episcopal; First Presbyterian ("Old Stone"), Woodland Avenue Presbyterian, with the largest Sunday-school in the city; Calvary, Second and Third Presbyterian; First and Plymouth Congregational; First Methodist; and Euclid Avenue Baptist.

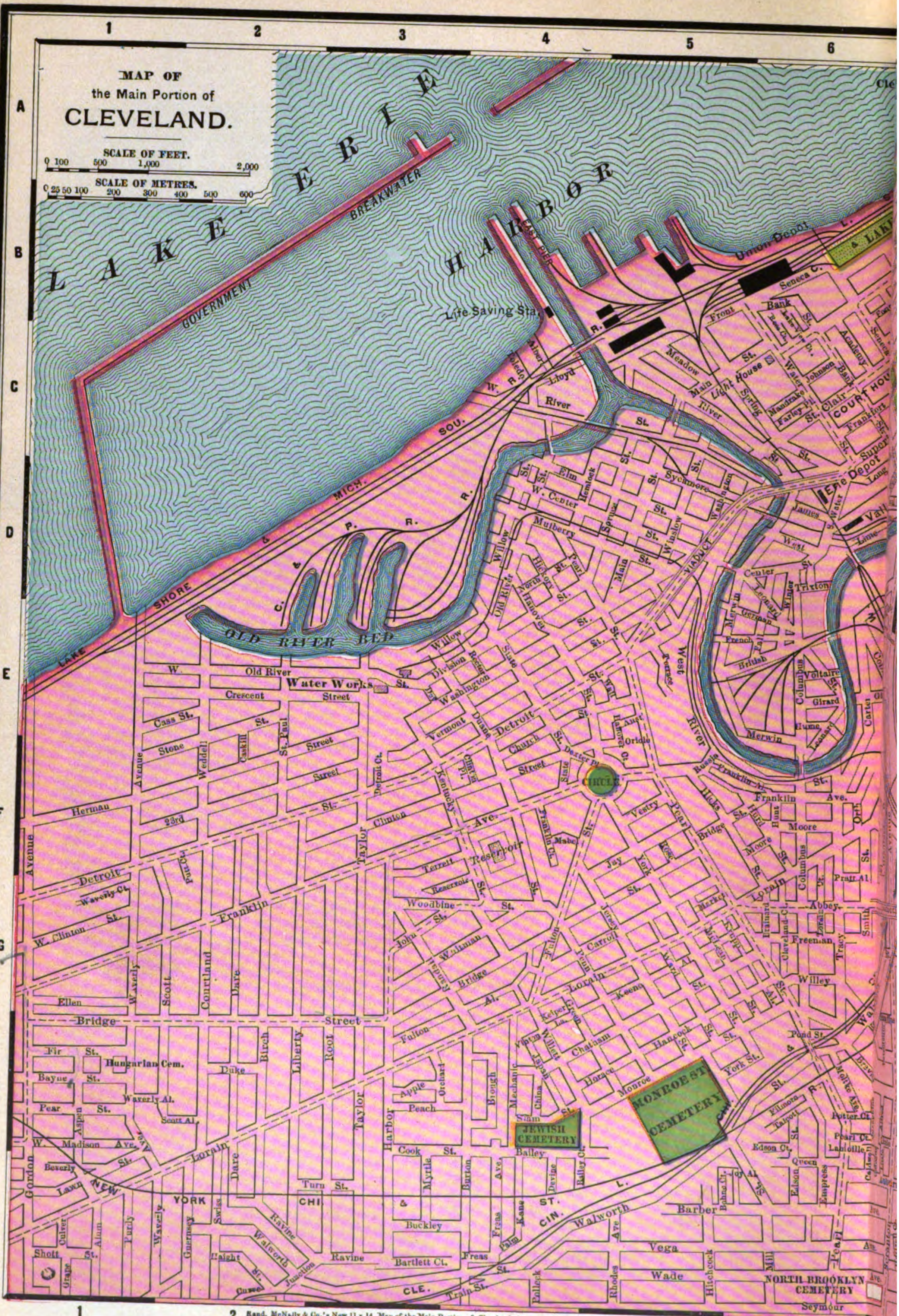
Charities.— Cleveland takes one of the highest places in charitable work. The most important of recent foundations is the social settlement called Goodrich House, founded in 1897, with a splendid $80,000 building; one of the best equipped and managed in the country, with library, reading-room, parlors, and clubs, gymnasium, baths, public laundry, sewing-rooms, kindergartens, etc. Of the others, the Northern Ohio Insane Asylum, founded in 1855, has accommodations for 900 patients, with a fine building and 112 acres of ground on a sightly spot. There are 16 hospitals, with dispensaries and maternity wards, several of them having training schools for nurses; the largest is the City Infirmary and Hospital, with an average of 1,000 patients a year, and an outdoor relief department; others are the Cleveland General, Cleveland Homœpathic, Lakeside, Charity (St. Vincent's, founded 1866), St. Alexis, St. Clair, St. John, etc. There are Protestant, Roman Catholic, and Jewish orphanages, children's aid societies, homes for working women and the aged poor, an inebriate asylum, a "reformatory home for unfortunate women and girls," a Bethel home for sailors, and scores of societies for relieving every relievable distress, besides a workhouse for incorrigibles.

Educational Institutions.— The Cleveland public-school system, with 70 grammar schools, six manual-training, and one deaf-mute, one normal, and five public high schools, and about 1,300 teachers, costs about $2,000,000 a year. It was reorganized in 1892; a director of schools and a school board of seven are elected by the people and elect a superintendent of schools who appoints the teachers. It is managed on the now well-known "Cleveland plan," in some respects an advanced step in accordance with irresistible modern drift, in others a reversion to an older type. The root idea is to abolish routine and automatic methods: there are no regular examinations and no punishments, and the teacher promotes scholars on a general judgment of capacity; while manual and domestic training are made a part of all grades. Besides these are a mass of private and parochial schools. Of secondary schools, besides the high schools, are the University School; two for girls, the Mittleberger School and the Hathaway-Brown School; and the Ursuline Academy.

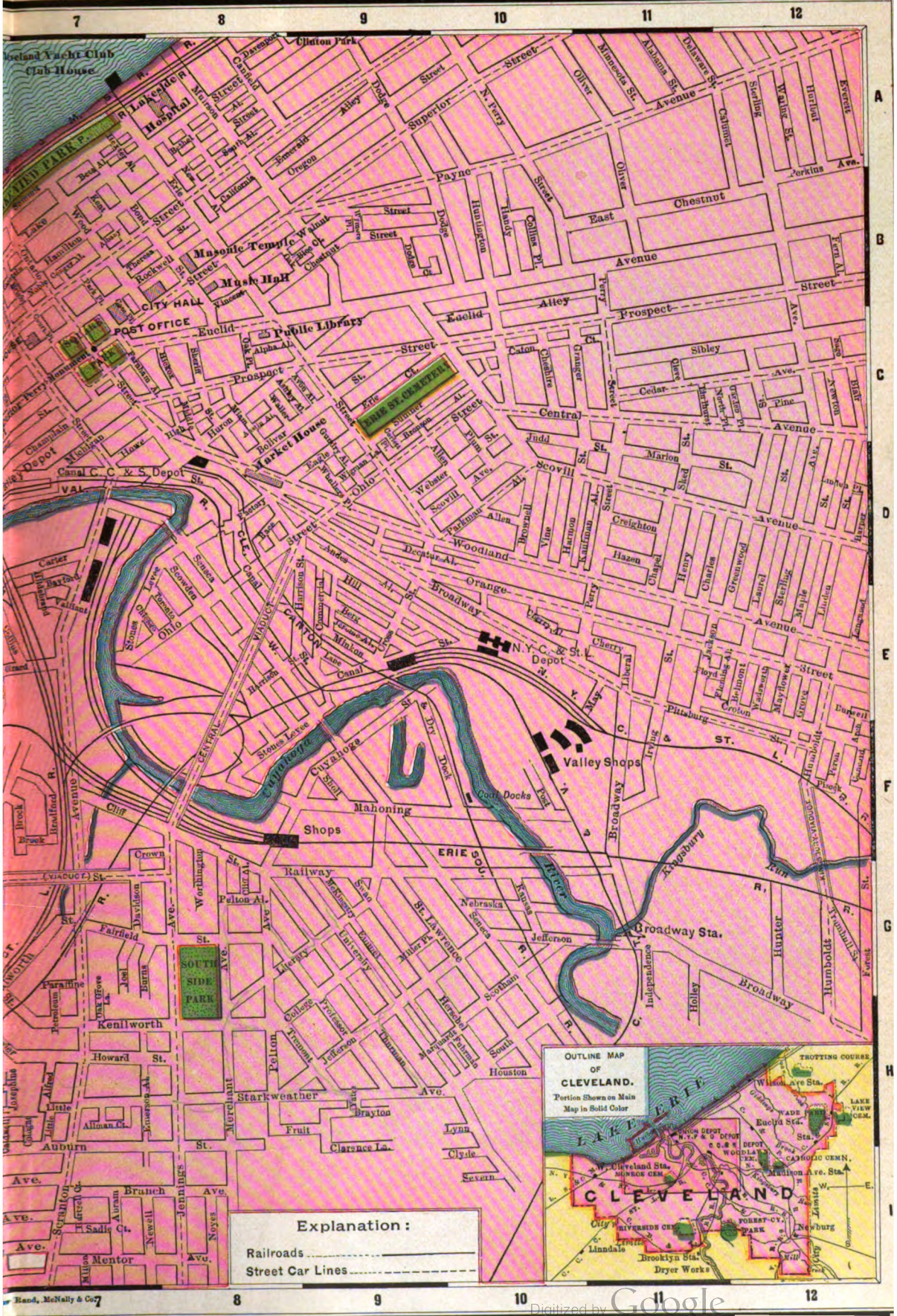
The chief seat of higher education is Western Reserve University, an institution formed by affiliating older schools and colleges and adding new; Adelbert College, till 1882 Western Reserve College at Hudson, Ohio, founded 1826; the Cleveland Medical College, with a fine museum and library, founded 1843; the College for Women, founded 1888 by the trustees of the university, as a part of it,— not an "annex," as the university confers the degrees; the School of Law, founded 1892; and the Dental College, 1893. It had in 1902, 800 students. The Case School of Applied Science, founded in 1881, and in 1887 endowed with $2,000,000 by Leonard Case, is a highly flourishing and valuable school of technology. There are also two other law schools, that of Baldwin University (Berea, Ohio), and the Cleveland College of Law; three medical schools, the Cleveland College of Physicians and Surgeons (of Ohio Wesleyan, at Delaware, Ohio), Cleveland Homœopathic Medical College (1849), and the Cleveland School of Pharmacy; and two Roman Catholic colleges, St. Ignatius (1886), and St. Mary's Theological Seminary.

Libraries.— The chief library of Cleveland is the Public, of nearly 200,000 volumes, opened 1869; next is the Case Library (subscription), with over 50,000. The library of the Western Reserve Historical Society contains toward 25,000 volumes and pamphlets, very rich in historical value; it has also an interesting collection of historical curios. Western Reserve University has a library of 45,000 volumes. There is also a law library of some 15,000 volumes, founded 1870; and medical libraries.

Commerce and Transportation.— The violent storms of the Great Lakes made every safe harborage in the mouth of a small river a potential port of importance; and every great lake city is so located, except Detroit, on a strait off the open water. Cleveland's river gave it the first hold; but it was of little consequence till the Ohio Canal tapped the State's agriculture and made it a terminal of inter-State traffic. After railroads came, the canal gradually went out of use, and in 1879 its terminal facilities were given to the Valley R.R. (now the Baltimore & Ohio); but meanwhile the city had become of supreme importance as the nearest large lake port to the iron, coal, and petroleum of western Pennsylvania and northern Ohio (as will appear by a glance at the map), and of course as convenient for sending to them the iron and copper ore of Lake Superior. Hence it has become the greatest ore market in the world, receiving about 4,000,000 tons a year; a leading coal port, its receipts being about 6,000,000 tons a year and its shipments nearly half that; one of the chief markets for grain, lumber, and petroleum; and the greatest in the United States for fresh-water fish. Its lake traffic is enormous: 48 steamship, steamboat, and barge lines operate from here, to every port on the Great Lakes, from Duluth to Buffalo, and through the Welland Canal to Toronto and the St. Lawrence. Its clearances of vessels have been over 7,200 in one year, with a gross tonnage of nearly 9,000,000. All these lines of business have doubled since 1890. Its railroad



Rand, McNally & Co.'s New 11 x 14 Map of the Main Portion of Cleveland.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I
Cleveland Yacht Club Club House
Lakeside Hospital
Clinton Park
Superior Street
N. Perry Street
Payne Avenue
Chestnut Avenue
East Prospect Street
Central Avenue
Scovill Avenue
Woodland Avenue
Broadway
Orange Alley
Euclid Street
Prospect Street
Sibley Ave.
Cedar Ave.
Pine
Masonic Temple
Music Hall
CITY HALL
POST OFFICE
Public Library
Soldiers' Monument
Erie St. Cemetery
Market House
Canal C. C. & S. Depot
N. Y. C. & St. L. Depot
Valley Shops
Cuyahoga River
Mahoning
Shops
ERIE SOU.
Railway
Broadway Sta.
Kingsbury Run
Hunter
Broadway
Holley
Independence
Dry Dock
Coal Docks
Pelton Al.
Worthington Ave.
SOUTH SIDE PARK
Kenilworth
Howard St.
Starkweather Ave.
Auburn St.
Branch Ave.
Mentor
Sadle Ct.
Fruit
Clarence La.
Lynn
Clyde
Severn
Houston
Nebraska
Seneca
Jefferson
Scotham
Hersebel
Marquardt
Fahrnam
Pelton
Thurman
Professor
College
Literary
University
Emmett
Miller Pl.
St. Lawrence
Fairfield
Davidson
Joel
Burns
Paraffine
Petroleum
Joseph
Linn
Little
Allman Ct.
Coburn
Jennings
Noyes
Newell
Aubrain
Scranton
Milton
Explanation :
Railroads
Street Car Lines
OUTLINE MAP OF CLEVELAND.
Portion Shown on Main Map in Solid Color
LAKE ERIE
CLEVELAND
TROTTING COURSE
Wilson Ave Sta.
LAKE VIEW CEM.
WADE PARK
Euclid Sta.
CATHOLIC CEMN.
W. Cleveland Sta.
MONROE CEM.
Madison Ave. Sta.
RIVERSIDE CEM.
FOREST CY. PARK
Newburg
Linndale
Brooklyn Sta.
Dryer Works
Rand, McNally & Co.
Digitized by Google

1. Lakeview Cemetery, showing Garfield monument.

2. Superior street.

communications are through all the great Eastern trunk lines, and others west and south: the New York Central and its feeder the Lake Shore by Buffalo, the Pennsylvania by Pittsburg, the Baltimore & Ohio by the Valley, the Erie through Akron, the Cleveland, Cincinnati, Chicago & St. Louis, the New York, Chicago & St. Louis (Nickel Plate), the Wheeling & Lake Erie, the Cleveland, Akron & Columbus.

The natural advantages of Cleveland have been improved by the municipality and the federal government till it forms one of the finest of harbors. The lower course of the river has been widened and deepened, and near the mouth given a uniform width of 325 feet, in place of a minimum of 150; and at each side of the mouth a stone pier 1,500 feet long has been built out into the lake, affording a channel 16 feet deep. The public dock frontage on river and lake amounts to over a mile, about half of which has been improved. A western arm of the river, about a mile long, parallel to the lake shore a little way in, has been dredged to a large ship canal, with railway docks. But still more important is the great government breakwater, begun in 1879, and $8,000,000 already spent on it. Starting opposite the mouth of the western arm, it runs about 3,000 feet into the lake, then 4,000 feet northeast parallel to the shore till opposite the main mouth, then with a break of 500 feet runs for another 2,000 feet to opposite the Union Station, forming a sheltered basin of some 300 acres west of the mouth. An extension of the eastern arm 4,000 feet farther is now under way, making nearly two miles of outer wall.

Manufactures.— Cleveland is the second largest manufacturing place on the lakes, and second in the State; and in the manufacture of iron and steel and the goods made from them, is among the foremost in the country, owing to its proximity to Pennsylvania iron, Ohio coal, and limestone from the Lake Erie islands, and its being the place of receipt of Lake Superior iron. It is the centre of the malleable-iron trade of the country; first in the United States for wire and wire nails, and second in hardware: the first of lake ports in iron and steel shipbuilding, as formerly in wooden shipbuilding,— the actual number of vessels turned out being greater than in any other United States city, and some of them reaching 380 feet long and a cost of half a million dollars,— and forges a large part of the steel shafts and stern-posts of the vessels built on the Atlantic coast. The variety of its industries in this kind is almost endless,— as bridge castings and forgings, rails, car wheels, engines and boilers, cranes for unloading vessels, railway machinery of all sorts, printing presses and sewing machines, oil and gas stoves, etc. The five groups alone of "iron and steel," "bolts, nuts, washers, and rivets," "forgings," "iron work, architectural and ornamental," and "foundry and machine-shop products," aggregate over $45,000,000 a year; and electrical apparatus, over $3,500,000 more. Besides these, there is a remarkable and most valuable variety of small specialties demanding highly skilled labor, often performed by independent workmen not compacted in shops, as optical instruments, and other scientific work of delicate accuracy. The next greatest industry is that of slaughtering and meat packing, which amounted in 1900 to $7,514,470, second only to Cincinnati in the State. Men's and women's clothing, malt liquors, petroleum refining, paints, and chemicals are also of great importance and volume. The total product of its industries in 1900 was $139,849,806, employing 64,220 workmen and officials, with wages and salaries amounting to $33,624,834 yearly.

Finances and Government.— The assessed value in 1900 was $142,768,280, against $99,614,055 in 1890; the net debt (there being a sinking fund of $2,607,000), $14,121,530; tax rate, $30 per $1,000, of which slightly over one third was for schools. The expenditures are about $6,000,000 a year, with large special outlays for improvements, of which the great public-building scheme is chief. The government is by the new city code of 1903, which went into effect in May of that year, and differs materially from the former federal plan of separating executive from legislative powers, which for more than a decade was in force. The new plan comprehends a two-years' mayor; an elected Board of Public Service; a Board of Public Safety, appointed by the mayor, and a council of 32 members in a single chamber, which makes all appropriations; and the chief school and court officials and the city treasurer are elected by the people.

Banks.— In 1902 there were 71 banks of all denominations operating in the city, including 14 national banks, with combined capital of about $11,000,000, and deposits of over $50,000,000, against $15,000,000 in 1890. The savings banks have upward of $100,000,000 on deposit, against $37,000,000 in 1890.

Population.— 1820, 606; 1830, 1,076; 1840, 6,071; 1850, 17,034; 1860, 43,417; 1870, 92,829; 1880, 160,146; 1890, 261,353; 1900, 381,768, of whom 124,631 were foreign-born, and 163,570 native-born of foreign parentage,— 288,201 in all; and 87,740, or 23 per cent, were native Americans. An analysis of this influx, however, makes not quite so extreme a showing. Of these foreigners, 47,566 were Germans, 18,460 English of Great Britain or Canada, 13,579 Bohemians, 13,120 Irish, 9,558 Hungarians, 7,696 Poles, 3,607 Russian Jews, 3,065 Italians, 2,179 South Americans, 1,490 Welsh, 1,000 Swedes, etc. The immigration 1880–90 being roughly on the same lines, and assuming one third the Irish immigration to be from the North and therefore practically English, the people of English stock would be raised to 140,000, or toward 37 per cent in place of 23.

History.— For the claim of Connecticut to the territory from lat. 41° to 42° 1′ N., and 120 miles west of the Pennsylvania line, see WESTERN RESERVE. That State conveyed its title to the Connecticut Land Company, which in 1796 sent out Moses Cleaveland to survey the land and establish "New Connecticut"; and his party, having surveyed 60 miles, ran the line north to the Cuyahoga and followed it to the lake, reaching the latter 22 July. Cleaveland at once fixed on the plateau as the capital of the new State, and had it laid out, with the square and its two main streets (not intersecting) as now, with the same names, but Euclid (then called Middle Highway) only starting from Huron Street; it was not cut through to the square till 1815. The settlement was given Cleaveland's name, but not his chosen spelling, the first survey map bearing "Cleveland"; usage fluctuated, but was fixed in 1831

by the adoption of the shorter form by a newspaper, it is said because the «a» would not go into a headline. The soil being poor, most immigrants went on into the interior; early commerce was on the Ohio, and for a decade Cleveland remained a hamlet with a few dozens at most, those mainly Connecticut people. It became a part of Jefferson County in 1797, of Trumbull County in 1800,—the United States having assumed administration over the Western Reserve,—and of Geauga County, its county-seat in 1805, just after it had become a port of entry; in 1810 Cuyahoga County was formed, with Cleveland for its seat, probably having about 100 inhabitants. They must have been of good quality, however, as a library was started in 1811. In 1814 Newburg was set off, and for many years was the more important of the two, from its water power. On 1 June 1815 Cleveland was incorporated as a village; and in 1816 the first bank was started. In 1818 the first newspaper was issued, the Cleveland *Gazette and Commercial Register*. In 1820 it had grown to over 600. In 1824 the first steam vessel was launched. But two great events happened to it near the end of the decade. In 1827 the Ohio Canal was opened to Akron, and in 1832 to the mouth of the Scioto at Portsmouth; and in 1828 the cutting of a channel across the bar at the river mouth, giving it 10 feet of water, was completed. These were its making, and with about 1,000 in 1830, the town had grown to over 6,000 in 1840. In 1836 with about 4,000 people it received a city charter, two days after its neighbor Brooklyn across the river had received one as «the City of Ohio,» which lasted till 1853, and was then annexed to Cleveland. In 1834 a horse railroad with wooden rails was built to Newburg.

The same year five steam railroads were chartered from Cleveland to everywhere, and the Ohio R.R. to the Maumee sold a good deal of stock; but the panic of 1837 ended such speculations, and it was not till 1846 that more were even chartered, and about five years later before the first one was built. The advantage was immense, and it leaped from 17,000 to 43,000 within a few years. About the time of the war the iron industry began to take root, and the manufacture of iron products for the government during the war crowded its manufactories, as did that of clothing. Since then its history is mainly that of an enormously expanding industrial city, but one that has never forgotten to keep its intellectual growth and the spirit of culture abreast of its material development. In 1872 it annexed East Cleveland; in 1873 Newburg; in 1893 West Cleveland and Brooklyn. In 1896 it celebrated its centennial.

Cleveland began the new century with no abatement of its remarkable increase in population and with many evidences of expansion in a material way. The additions to the waterworks and sewerage systems, the improvement of the lake front and the river channel, the establishment of the colossal group plan of public buildings, the increase of street paving, and the continued extensions of the park and boulevard systems, indicate that Cleveland is in the midst of an era of progressive activity with which no previous period in its history can bear any comparison.

W. R. Rose,
Associate Editor Cleveland Plain Dealer.

Cleveland, Tenn., a city and county-seat of Bradley County, about 30 miles from Chattanooga, on the Southern R.R. In addition to the usual industries of a town in an agricultural region, it has stove-works and woolen and flour mills. It is the site of Centenary Female College. Pop. (1900) 3,858.

Clevenger, klĕv'ĕn jĕr, **Shobal Vail,** American physician: b. Florence, Italy, 24 March 1843. He was the son of an American sculptor of the same name. During the Civil War he was a first lieutenant in the engineer corps, and later United States deputy surveyor in Montana and Dakota, writing a 'Treatise on Government Surveying' (1874). He graduated at Chicago Medical College, 1879, established himself in practice in that city, and is a specialist in nervous and mental diseases, and a professor and lecturer in several colleges. He has written: 'Comparative Physiology and Psychology' (1884); 'Artistic Anatomy' (1885); 'Spinal Concussions' (1889); 'Medical Jurisprudence of Insanity, or Forensic Psychiatry' (2 vols. 1898), and many professional articles in scientific and medical journals.

Clèves, klāv (German *Kleve*), Prussia, chief town of the Rhine province, 70 miles northwest of Cologne, and 4½ miles from the Rhine, with which it is connected by a canal. It has manufactures of machinery, tobacco, leather, and cotton. In the centre of the town rises the old and renowned Schwanenburg (Swan's Castle), the ancient residence of the dukes of Clèves, founded, according to tradition, by Julius Cæsar. The collegiate church, dating from the 14th century, contains monuments of the counts and dukes of Clèves. Prussia (Brandenburg) acquired Clèves in 1609. Pop. 15,000.

Clew Bay, a bay on the west coast of Ireland, in County Mayo, containing a vast number of islets, many of them fertile and cultivated.

Clews, Henry, American banker: b. Staffordshire, England. At the age of 15 he left school to enter mercantile life in New York, where his father had taken him for a visit. At the outbreak of the Civil War, his firm, Livermore, Clews & Co., was invited by the secretary of the treasury to become agent to sell government bonds. In 1877 the firm of Henry Clews & Co. was formed, and its members pledged themselves never to take any speculative risk. He was a founder of the New York Union League Club, and has been connected with many financial and city institutions, and literary and charitable organizations. He has written 'Twenty-eight Years in Wall Street' (1888), 'The Wall Street Point of View' and many financial articles for the newspapers and magazines.

Cliche, klēsh, an electrotype or stereotype cast from an engraving.

Clichy-la-Garenne, klē-shē-lä-gä-rĕn, France, (Latin, *Cligiacum*), a town in the department of the Seine, near the right bank of the Seine, and on the railway between Paris and St. Germain, about four miles northwest of Paris. In the 7th century it was frequently the residence of the court. It contains a parish church, the erection of which is due to the celebrated Vincent de Paul, who was curate of Clichy in 1612; and has manufactures of white-lead, chemical products, glue, varnish, rolled lead, etc. Pop. (1901) 39,521.

Click Beetle. See WIRE WORM.

Clients, citizens of the lower ranks in ancient Rome who chose a patron from the higher classes, whose duty it was to assist them in legal cases, and to take a paternal care of them. The clients, on the other hand, were obliged to portion the daughters of the patron if he had not sufficient fortune, to follow him to the wars, to ransom him if taken prisoner, and to vote for him if he was candidate for an office. If a client died without issue, and had made no will, his property fell to the patron. Clients and patrons were under mutual obligation not to accuse each other, not to bear witness against each other, and in general not to do one another injury. This relation continued till the time of the emperors. It may be considered as the transition from a patriarchal state, in which family relations are predominant, to a well-developed political system, securing the rights and independence of the individual. In modern times the word client is used for a party to a lawsuit who has put his cause into the hands of a lawyer.

Cliff. Nearly vertical rock walls are formed in a variety of ways by natural means. In the development of a drainage system in any high-lying tract of country, ravines, gorges, and cañons are formed by the down-cutting streams, as Watkins Glen, N. Y.; the gorge of the Niagara River, and the Grand Cañon of the Colorado. After long erosion the softer rocks may be removed, leaving the harder with steep faces standing above the surrounding country, as at the Delaware Water Gap, in the Catskills, and many places in the Appalachian Mountains. In high mountains glaciers dig out deep channels. Cliffs formed in these ways may be called cliffs of erosion. Where a high coast borders any large body of water, the waves eating into the land form cliffs, as on the northern shores of Scotland, southern England, the coast of Maine, and elsewhere. Such cliffs may be called sea cliffs. Cliffs may also be formed by the rock fractures known as "faults," where the rocks on one side of a fracture rise faster than they are worn down by weathering. Such cliffs are not uncommon; they are found in many parts of the West, being especially prominent in arid regions like the Colorado plateau, where weathering is slow. Such cliffs may be called "fault cliffs."

Cliff Dwellers, a race of Indians formerly living in the cliffs bordering on the valleys of the Rio Grande and Rio Colorado. Their homes were built in the recesses of these cliffs at a height often of several hundred feet from the ground, and at the present time seemingly inaccessible, as the former paths that led to them have nearly all been destroyed by the crumbling away of the rocks. These dwellings sometimes consisted of many rooms, and in some cases were two or more stories high, hewn in the rock, with wooden lintels in the doors and windows, which were probably closed with skins or blankets. The walls were finished with a plaster of clay. How the inhabitants subsisted is not known, but probably mainly by hunting and fishing, as the soil about these localities is barren. The Pueblo Indians, who are still to be found in that section, are probably descendants of the Cliff Dwellers, and possess considerable skill in making articles of pottery, etc.

Cliff-Dwellers, The, a novel by Henry B. Fuller (1893). It is a story of contemporary Chicago; a sober arraignment of the sin and greed of a purely material civilization. The protagonists of the drama take their title of "cliff-dwellers" from their occupation of various strata of an enormous office building. The story is too sincere to be called a satire, and too artistic to be called a photograph; but it is executed with a merciless faithfulness that has often elicited both characterizations.

Cliff Haven. See SUMMER SCHOOLS.

Cliff Swallow, a species of swallow (q.v.), the *Petrochelidon lunifrons* of ornithologists. The sexes are alike, of a lustrous steel-blue color above, with a brownish white crescent on the forehead, the under parts generally grayish with a blue patch on the breast, and the throat, chin, and sides of head rust color. From most other species of the *Hirundinidæ* (q.v.) the cliff swallow is distinguished by the very short square tail, beyond which the tips of the folded primary wing feathers extend, and the thick bill. The cliff swallows inhabit North America, except Florida, to the northern limit of the tree zone, and breed in colonies nearly throughout their range; in winter they enter South America. Probably on account of their social habits, cliff swallows are distributed very irregularly, in some places being very common, in others rare. Formerly this species attached its remarkable retort-shaped nests of mud to cliffs, which have now been generally forsaken for the more convenient and accessible eaves of barns, etc.; on this account it is known in some localities as eave swallow, in others, from the material used in constructing the nests, as mud swallow.

Cliff'ord, the name of a very old English family, several members of which have played an important part in history. The founder of the family, Walter, son of Richard Fitz-Ponce, a Norman baron, acquired the castle of Clifford, in Herefordshire, under Henry II., and hence took the name of Clifford. In 1523 the Cliffords became earls of Cumberland, but in 1643 this title became extinct. The male line of the Cliffords is at present represented by the baronial family Clifford of Chudleigh. The first Baron Clifford of Chudleigh was Thomas Clifford, one of the members of the Cabal, who was raised to this dignity in 1672.

Clif'ford, George, Earl of Cumberland: b. 1558; d. 1605. A celebrated English navigator.

Clifford, Hugh, English civil servant: b. London 5 March 1866. He entered the Malay states civil service in 1883 and was British resident at Pahang 1896-9. He has published: 'In Court and Kampong' (1897); 'Studies in Brown Humanity' (1898); 'Since the Beginning' (1898); 'In a Corner of Asia' (1899); 'Bushwhacking' (1901); and is joint author with F. Swettenham of a 'Dictionary of the Malay Language.'

Clifford, John, English Baptist clergyman: b. Sawley, Yorkshire, 16 Oct. 1836. He was educated at the Baptist College, Nottingham, University College, London, and the Royal School of Mines and has been minister of the Praed Street and Westbourne Park Church, London, from 1858. He was president of the London Baptist Association, 1879; of the Baptist Union, 1888 and 1889; of the British Chau-

tauqua, 1899–1900, as well as of other assemblies. He has received degrees from several English colleges as well as of D.D. from Bates College, Lewiston, Maine, and has been for years the acknowledged leader of the Baptist faith in England. He was editor of the 'Baptist Magazine,' 1870–83 and has published 'Familiar Talks with the Young' (1872); 'George Mostyn' (1874); 'Is Life Worth Living' (1880); 'Daily Strength for Daily Living' (1885); 'The Dawn of Manhood' (1886); 'The Inspiration and Authority of the Bible' (1892); 'The Christian Certainties' (1893); 'Typical Christian Leaders' (1898); 'Social Worship an Everlasting Necessity'; 'God's Greater Britain' (1899).

Clifford, Lucy Lane, English novelist, married to William Kingdon Clifford (q.v.) 1875; after whose death in 1879 she turned to literature for support. Her writings, some of which are notably original and striking, include: 'Very Short Stories' (1882); 'Mrs. Keith's Crime' (1885); 'Love Letters of a Worldly Woman,' which attracted much attention (1891); 'The Last Touches' (1893); 'Aunt Anne' (1893); 'A Flash of Summer' (1895); 'Mere Stories' (1896); 'A Woman Alone' (1901); 'Woodside Farm' (1902); and the plays, 'The Likeness of the Night' (1900); 'A Long Duel' (1901); 'A Supreme Moment' (1902); 'Margaret Vincent.'

Clifford, Mrs. W. K. See CLIFFORD, LUCY LANE.

Clifford, Nathan, American jurist: b. Rumney, N. H., 18 Aug. 1803; d. Cornish, Me., 25 July 1881. Through his own efforts he obtained a common school and academic education, studied law, and began practice in York County, Me., 1827. He was a member of the State legislature, 1830–4; speaker of the House, 1833, and attorney-general of the State, 1834–8. He served two terms as representative in Congress 1839–43, advocated Van Buren's re-election, took part in public discussions with the leading Whig orators, and established a reputation as one of the most eloquent of democratic champions. He was United States attorney-general under President Polk, and a special commissioner to Mexico to arrange terms of peace between that country and the United States, and he negotiated the treaty which secured California as a part of the United States. He resumed law practice in Portland, Me., 1849, and won an enviable reputation for forensic ability. In January, 1858, President Buchanan appointed him associate justice of the United States supreme court. As the oldest associate judge in 1877, he presided over the electoral commission conducting its proceedings with noteworthy impartiality, though a firm believer in Tilden's election.

Clifford, William Kingdon, English mathematician: b. Exeter 4 May 1845; d. Madeira 3 March 1879. Educated in his native town and at King's College, London, he proceeded to Trinity College, Cambridge, where he graduated in 1867 as second wrangler. In 1871 he was appointed professor of applied mathematics at University College, London, a post which he held till his death. In 1876 his health gave way, but was restored by a summer spent in Spain and Algiers, though not permanently, for two years later he again broke down, and died soon afterward. In mathematics his teachings and writings are regarded as marking an epoch in the history of the science in England. His 'Canonical Dissection of a Riemann's Surface,' his theory of 'Biquaternions,' and his memoir 'On the Classification of Loci,' may be mentioned as his most important contributions to this subject. He also wrote on philosophical subjects. Among his works the most important are: 'Elements of Dynamic' (vol. i. on 'Kinematic,' 1878); 'Seeing and Thinking' (1879); and 'Common Sense of the Exact Sciences' (1885, completed by Karl Pearson). In 1882 appeared a collection of his 'Mathematical Papers,' and in 1879 his 'Lectures and Essays.'

Clif'ton, England, a popular watering-place of Gloucester County. It is a suburb of Bristol situated within the city boundary, on the summit of lofty cliffs, whence its name. A suspension bridge 703 feet long here crosses the river Avon 245 feet above its bed. Clifton contains many handsome residences but neither trade nor manufactures. It is known for its hot mineral springs. Clifton College is an important educational institution. Pop. 44,400.

Clifton Springs, N. Y., a summer and health resort in Ontario County on the New York Central and Lehigh V. R.R.'s, famous for its sulphur springs. Pop. (1900) 1,617.

Climacteric (*annus climactericus*), a critical year or period in human life wherein, according to astrologers, there is some notable alteration to happen in the body, and a person is exposed to great danger of death. The word comes from *κλιμακτήρ*, the step of a ladder or stair. The first climacteric is, according to some, the seventh year; the others are multiples of the first, as 14, 21, etc.; 63 and 84 are called the grand climacterics, and the dangers attending these periods are supposed to be great. Some held, according to this doctrine, every seventh year a climacteric; others allowed this title only to the product of the multiplication of the climacterical space by an odd number, as 3, 5, 7, 9; others considered every ninth year as a climateric. The idea of climacterics is very ancient.

A climateric disease is a disease affecting both men and women, but more obvious in the former. It may be looked for about the 63d year of age, but varies in the time of its coming, according to the constitution of the individual, the limits being in the one direction 50, and in the other 75. Its most common predisposing cause is mental anxiety or suffering. The expression of the countenance alters for the worse, the pulse becomes accelerated, the flesh wastes away without obvious cause; there are sleepless nights, and wandering pains flit through the head and chest, and sleep is either deficient or brings little refreshment. After a time recovery as a rule takes place, but the countenance never recovers its former aspect, or the constitution its vigor.

Climate (Gr. *κλίμα*, "a slope or inclination"). The term was used to denote the effect of the oblique rays of the sun on the temperature of the earth and its atmosphere. To-day it is applied to the sum of the atmospheric conditions as recorded for a long period of time; or, in other words, it is the totality of weather, while "weather" is the physical con-

dition of the atmosphere at a given time or during a limited period.

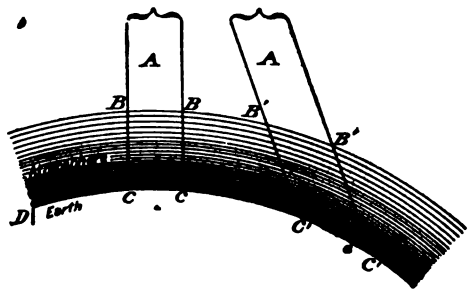
One may well speak of the weather to-day, or of last month, or of some past year; but not of the climate of a day, a month, or a year. The climate of a place is what may be expected to occur as the result of a study of its continuous weather records for a long period of years,—the atmospheric pressure, the temperature, the rainfall and snowfall, the time and frequency of frost, the extremes of heat and cold, the direction and velocity of the wind, the amount of air that flows from the different points of the compass, the amount and intensity of sunshine, the humidity and transparency of the atmosphere, and its electrification.

The study of the causes of the weather and of the laws of storms constitutes that branch of science known as meteorology; climatology is to be considered as a subdivision of meteorology.

Climates may be broadly divided into marine, continental, mountain, and plain, with the many variations produced as these conditions gradually or precipitately shade off the one into the other.

Basis of Climate.—If the axis of the earth's rotation were perpendicular to the ecliptic (the plane of its orbit) there would be no seasonal changes, for the rays of the sun would fall upon every point on a parallel of latitude with the same angle of incidence on each day of the year. There would be but one season at any place and it would never end; and there would be little variation in the intensity of storms. But as the axis of the earth is inclined at an angle of 23.5° to the plane of its orbit, and as the direction toward which it points remains nearly constant, there are but two days in each year when both hemispheres (north and south) are exactly one half in sunshine and one half in darkness, that is, at the vernal and autumnal equinoxes, when the sun crosses the equator. At all other times in each hemisphere the angle at which the sun's rays strike the earth, the depth of the air through which they pass, the length of the day, and the proportions of each hemisphere immersed in sunlight, are increasing or decreasing. As these four conditions increase in the northern hemisphere after the vernal equinox the summer grows upon us, reaching its greatest degree of heat about four weeks after the summer solstice. The lag of temperature is due to the fact that the atmosphere, being heated mainly by radiation from the earth and comparatively little by the direct action of the solar rays, does not attain its greatest heat until after the land and water have reached their maximum temperature and in turn have communicated this heat to the air above. Up to June 21, or the summer solstice, the northern hemisphere receives each day more heat than it loses, otherwise it could not gain in temperature; after the solstice the sun each day at meridian is found to have receded a little to the south. At places north of the tropic of Cancer its rays fall with increasing obliquity and pass through a greater depth of air, and impinge for a less time each day, so that within a few weeks the earth begins to radiate more heat each day than it receives. The maximum heat of summer occurs, on the average, when the loss of heat from the earth is just equal to that gained during the day from the sun. This, as previously stated, occurs several weeks after the sun is well on its way southward. About September 21 the autumnal equinox occurs, when the sun crosses the equator, and, as at March 21, the days are of equal length at all latitudes of both hemispheres. On or about December 21—the winter solstice—the sun is farthest south, and the same conditions prevail in the southern hemisphere that prevailed in the northern hemisphere on June 21. North of the equator the sun is now least effective; its rays reach the earth at the lowest angle through the greatest depth of air, and they are operative for the fewest hours during each day, of any portion of the year, but the greatest cold does not occur. This comes about four weeks later, when the increasing heat received each day by the earth from the sun is just equal to that lost by radiation.

The effect of latitude will be understood by reference to the following figure:



As the latitude increases, the rays of the sun will fall with increasing obliquity, and they lose in power by being spread over a larger surface, and by traversing a greater depth of air, which absorbs more of their heat.

The same beam A, "when the sun is vertical, is spread over a surface such as CC. When the sun is inclined at an angle as shown in the figure, the beam is spread over a surface, C' C', which is somewhat greater than the first, and it passes through a column of air, B' B' C' C', greater than that of BBCC. The intensity of insolation at midday decreases approximately as the cosine of the latitude."

Near the equator the sun's rays at midday fall perpendicular to the surface of the earth, and there is virtually no change in the length of the day, and consequently there is little variation in the daily or seasonal temperature. As the variation in the length of the day increases with the latitude, there are regions, in the temperate zone, where the length of time that the sun's rays fall upon the earth each day more than compensates for their obliquity. On this account the interior of continents may have at midday a higher temperature than prevails at the equator.

Solar energy is about seven per cent greater at perihelion (the point in the earth's orbit nearest the sun) than at aphelion (the point farthest away). As perihelion occurs in December, or the summer time of the southern hemisphere, and aphelion in its winter, that region has a greater annual range in the intensity of solar insolation than the northern hemisphere. If the land surfaces of the two hemispheres were equal in area, the southern would have colder winters and warmer sum-

mers than the northern, and this is the case in portions of the southern hemisphere where the land area is large. But the great capacity of water for heat, and the slowness with which it radiates the same, modifies seasonal extremes that otherwise would be much greater.

Variations in Climates.— If the earth were all water or all land, and if the land were everywhere of the same elevation, most of the factors that cause variations in climates — often considerable for regions closely contiguous — would be eliminated from the equation. Every point on the same parallel of latitude would have the same mean annual temperature, and the same average heat in summer and the same average cold in winter. New York and London, separated by eleven degrees of latitude, would not, as now, have about the same mean annual temperature. If it were all water, there would be no such extremes of heat and cold as we now know. It is probable that a thermometer exposed in shade four feet from the surface of the earth would not anywhere — even at the equator — ever register above 90° F.; there would be no frost within 35° or 40° of the equator, and zero temperatures would be recorded only in regions within 30° of the poles. If it were all land the heat would be much more intense than now in the tropics, and in the temperate and frigid zones the heat of summer and the cold of winter would reach extremes unknown at this time.

All the anomalies of climates are caused by the different specific heat capacities of land and water; their different powers of conduction and radiation; the irregular distribution of these two surfaces; the widely-varying elevations of the land; the trend of mountain ranges; the prevailing direction of the winds, and the carrying of large quantities of heat by ocean currents from the equator toward the poles, and the relative quantities of cloud and rain or snow. It is germane to a proper understanding of climate to know something in detail of the manner in which the air is heated. At 100 or 200 miles above the earth's surface there is only the hypothetical ether, which, while too tenuous to be detected or measured by any methods or appliances so far known, is supposed to be the medium that transmits solar energy to the earth and diffuses it through space. This energy, coming in many different wave-lengths and with widely varying intensities of vibration, produces several different phenomena as it is absorbed by or passes through the air, or as it impinges on the surface of the earth. The waves differ in their effects on different objects, depending on the length and the absorptive response of the substances upon which they fall. The waves have heating, lighting, and chemical effects simultaneously in themselves, and it is only the nature of the objects upon which they fall that tends to differentiate them. The atmosphere, even at the surface of the earth, absorbs but a small part of the heat-waves. They therefore reach the earth and warm its surface; and the earth in turn, by radiation, convection, and conduction, sends back into the air long heat-waves, which, unlike the shorter solar waves, are readily absorbed by the atmosphere. The atmosphere is thus warmed from the bottom upward. This accounts for the perpetual freezing temperatures of very high mountain peaks, although they are nearer the sun than are the bases from which they rise. At the height of one mile in free air the temperature is about the same at midday as at midnight. Only during recent years have we begun to realize how extremely thin is the stratum of air next the earth that has sufficient heat for the inception, growth, and maturity of both animal and vegetable life. The raising of the thermometer shelter at the New York City observatory from an elevation of 150 feet above the street to an elevation of 300 feet, has caused an apparent lowering of the mean annual temperature of 2.5° F. On the hottest day in summer, if one could be lifted up to a height of only 1,000 feet in free air, he would find a marked change in temperature. The United States Weather Bureau at 16 stations made a total of over 1,200 kite observations in the United States in 1897. They showed an average decrease of 7.4° F. for the first 1,000 feet of ascent during the warm months, and when the observations were taken near the hour of daily maximum heat the decrease was frequently as much as 15°. At the height of six miles the cirrus clouds common to this level are, on account of the low temperature, always composed of minute ice spiculæ, never of watery droplets like the lower cumulus clouds. In the middle latitudes of both hemispheres the air at this height is ceaselessly rushing toward the east, passing uninterruptedly over the cyclonic and anti-cyclonic systems that cause our storms and cold waves at the surface of the earth. Glaisher and an assistant ascended to a height of about 30,000 feet. They suffered greatly from the cold, which measured many degrees below zero, although the time of year was 5 September. At the height of six miles the average temperature, determined by many balloon ascensions is about —60° F.

The difference between continental and marine climates is marked. The same amount of heat will raise the temperature of a land surface four times as high as it will raise that of a water surface. Land is a good absorber and a good radiator, but it is a poor conductor and a poor reflector. The absorbed heat does not penetrate into the ground to any great depth. The land, therefore, retains its absorbed heat near the surface and quickly and freely radiates that which it has absorbed. These conditions give to large land surfaces much higher temperature during the day, and much lower temperature during the night, than obtain over a water surface of the same latitude and much colder winters and much warmer summers. As an illustration, it may be stated that the Bermuda Islands, in the North Atlantic Ocean, have a mean daily range of temperature of only 10° F., and an annual range of only about 50°; while Memphis, Tenn., near the same latitude, in the interior of a large continent, has a daily range of 17° and an annual range of 112°. At Memphis a temperature of 104° has been recorded in summer and —8° in winter. At Bermuda the temperature generally reaches 90° during the summer, but very rarely exceeds that figure, while temperatures below 45° are also very infrequent. The two places are typical of continental and of marine climates. All regions bordering closely on the sea partake of both climates, the predominating one being determined by the direction in which the coasts

trend, their elevation, and the direction and force of the prevailing winds.

In the middle latitudes of both hemispheres the prevailing winds are from the west, and therefore continents lying in these regions have a marine climate in their western coastal regions, where the air moves from the water to the land, and nearly continental climate in their eastern coastal regions, where the general movement of the air is from the land to the sea.

The distance to which moist and equable air conditions extend inland is determined by the elevation of the land and its trend relative to the incident winds, and the proximity of mountain ranges. The humid air from the Pacific meets the lofty range that skirts the western shoreline of both North and South America; it is forced up the mountain side until the cold of high elevation and the cooling of the air by expansion as it ascends cause it to precipitate its moisture mostly upon the western side of the mountain, and it passes to the interior of the continent bereft of that life-giving moisture which, were it not for the intervention of the mounains, would spread a mantle of luxuriant vegetation 1,000 miles inland. If the disintegrating effects of temperature and rainfall had worn down the Sierras, the Plateau, and the rugged crags of the Rocky Mountains to the height of the Appalachians, the vaporous atmosphere of the Pacific would flow eastward far more freely than now, and meet that which, by the convectional action of cyclones, is frequently carried from the Atlantic Ocean and the Gulf of Mexico inland to the Mississippi valley; then rain would be more abundant and the whole of the United States would have arable land.

To give a further idea of the effect of mountain systems on the climates of continents one needs only to reverse the conditions just mentioned; if the Appalachian Mountains were as high as the Rocky Mountains, and if they extended farther southward and bordered the Gulf of Mexico, then the Ohio River, the Mississippi, and the Missouri and their many tributaries would not exist, and the world's greatest granary would be a gray and nearly barren plain.

The specific heat of water is greater than that of almost any other substance. It requires ten times the quantity of heat to raise a pound of water one degree than it does to raise a pound of iron one degree. Solar rays penetrate the sea to a considerable depth; they are quite uniformly absorbed by the stratum penetrated. In consequence of these laws and conditions a vast quantity of heat is stored by the ocean in the tropics and slowly given to the air as the ocean currents carry the warm water toward the poles. In this connection the writer would correct what he believes to be an exaggerated popular idea relative to the effect of the Gulf Stream on the climate of Europe. The North Atlantic circulation, flowing northward on the western side of the ocean (except a southward current from Davis Strait that chills Labrador and somewhat affects the temperature of the New England coast), and southward along the coast of Europe, is many times more effective in modifying climate than is the Gulf Stream. That the western part of Europe is warmer, more humid, and subject to less radical changes in temperature than equal latitudes in North America, except on the Pacific coast, is due primarily to the great ocean that lies on the west of Europe. Without ocean currents of any description, this body of water would give to the air that moves from it to Europe a more equable temperature than is possessed by the eastern part of the North American continent. Continents, therefore, partake largely of marine climates on their western borders, and principally of continental climates on their eastern borders.

Climate affects the health, happiness, and well-being of people more than any other condition that goes to make up their environment. Within the broad confines of the United States there are many, but not all, shades and varieties of climate. One of the questions most frequently asked is, "Where shall I find a climate possessing both dryness and equability of temperature?" To this interrogatory reply must be made that the ideal climate as regards equability of temperature and absence of moisture does not exist in the United States, but that the nearest approach to it will be found in the great Southwest.

The temperature of the Southwest is not equable in the sense of having an extremely small daily range, but it possesses the quality of annual uniformity in a greater degree than will generally be found elsewhere except on the seacoast, and there the humidity is great.

The most equable temperature on the globe will be found on the high table-lands and plateaus of the tropics. Santa Fé de Bogota, in the United States of Colombia, has an average temperature of about 59° F. for all months of the year, and the range for the entire year is less than is often experienced in a single day in some parts of the middle latitudes. But while the ideal temperature may be found on the higher elevations of the tropics, the rainfall is much greater and more continuous than in this country.

The temperature of a place depends chiefly on three conditions,—latitude, elevation, and contiguity to large bodies of water. At sea level in the tropics extreme conditions of heat and moisture produce very great physical discomfort. But even under the equator it is possible to escape the tropical heat of low levels by ascending from 4,000 to 6,000 feet. In the economy of nature there is a certain limit beyond which the two extremes, dryness and equability of temperature, cannot coexist; thus we may find a region so deficient in moisture as to satisfy the requirements of the case, but the very lack of moisture is a condition that facilitates radiation and thus contributes to great extremes of temperature. Regions may be found, as on the lower Nile, where there is a lack of rainfall coupled with a high and moderately uniform temperature. The mean winter temperature of Cairo, Egypt, is 56° F.; mean summer temperature, 83°; a range from winter to summer of 27°. The mean winter temperature of Phœnix, Arizona, is 52°; mean summer temperature, 87°; a range of 35°. It is by no means difficult to find a counterpart of the far-famed Egyptian climate in the great Southwest.

The dryness of the air and the clearness of the sky are the conditions upon which daily ranges of temperature depend; the greater these, the greater the range of temperature

from day to night. While a high summer temperature is characteristic of the Southwest and other portions of the Rocky Mountain plateau, it is a fact that the sensation of heat as experienced by animal life there is not accurately measured by the ordinary thermometer. The sensation of temperature which we usually refer to the condition of the atmosphere depends not only on the temperature of the air, but also on its dryness and the velocity of the wind. The human organism, when perspiring freely, evaporates the moisture of its surface to the dry air of the interior arid regions, and thus lowers its temperature and prevents sunstroke, which, in the more humid regions from the Mississippi valley eastward, occur in great number with the air temperature much less than obtains in the West.

The meteorological instrument that registers the temperature of evaporation, and thus in some measure the actual heat felt by the human body, is the wet-bulb thermometer. The latter, as indicated by its name, is simply an ordinary mercurial thermometer whose bulb is wetted with water at the time of observation.

Effect of Climate on the Races.— Climate is the most potent of any factor in the environment of races. It is climate and soil, plus heredity and form of government, that produce either vigorous or weak peoples. In this respect it is a question if the United States does not possess a constant potential that, all other conditions being equal, places it in a class by itself.

Climate, soil, and good heredity may produce a race large of stature and of great physical endurance, but unless such a people exists under a liberal form of government, in which public education is fostered and the arts and sciences taught, it is unable to employ its strength in those lucrative vocations that alone give a high per capita of wealth; and wealth means power. It is also weak in defending itself, either in war or in commerce, against a people of less numerical strength that is liberally educated, skilled, and humanely governed.

If one reads of the overthrow of political dynasties and the subversion of trade and commerce, it will occur to him that the northmen have usually been conquerors. If we consider the invigorating effect of cold air and marked changes of temperature alone we might expect to find the strongest and most resourceful peoples inside of the Arctic circle; and if we consider fruitfulness of soil alone we might reasonably expect to find the dominant peoples in the tropics. But the fact is that the greatest human potentiality occurs somewhere between these two extremes. The boundaries cannot be accurately determined by the naming of certain parallels of latitude, but a close approximation is made to the truth in the statement that the most vigorous people physically and the most resourceful mentally will be found in the most northerly regions that will produce not simply cereal crops, but an abundance of them.

The sweep of the cold wave, as it is known in the United States, is quite distinctly North American. Nowhere else on fertile plains, unless it be in Russia, does the temperature show such wide oscillation within such short periods of time, nor do the icy blasts sweep over such a broad area. It is probable that much of the physical and the intellectual energy that have caused the United States to excel in agriculture, in manufacturing, and in commerce were caused by the invigorating effect of the cold, dry, highly electrified air of the North American cold wave. The anti-cyclonic systems of air that constitute cold waves have a marked downward component of motion. This motion brings from a considerable altitude to the surface of the earth some of the high electrical potential of the upper air, which is strongly stimulating to man and to other forms of animal life. These cold north winds have a much greater specific gravity than warm and humid winds, and this condition, added to the force with which they come, scatter and diffuse the befouled air near the surface of the earth. Enough has been said to indicate that climate is nearly as important a part of the environment of animal life as it is of the vegetable existence, and that a wide range of annual temperature, if it be not so great as to limit the production of cereal crops, favors the development of strong races of men.

Change of Climate.— Notwithstanding the popular notion to the contrary, there is reason to believe that there has been no appreciable change in the climate of any large area within the period covered by authentic history. Changes in the surface of the earth may be noted within the lifetime of an individual, that are thought to prove that a change of climate has taken place, when the alterations may be due to the persistent action of freezing, thawing, rainfall, and flood. Great changes have occurred during geologic periods, but it is the opinion of the writer that they take place so slowly that thousands of years must elapse before their effect is measurable.

Effect of Forests on Climate.— Extremes of temperature, both heat and cold, are slightly less over forests than over open regions, but the most important effect of forests on climate is the economic conservation of precipitation, diminishing the intensity of floods by restricting the flow-off, and by shading the snow deposited during the winter from the increasing sun of spring and early summer. More moisture is absorbed by the soil when it is covered by forest than when it is cleared of its forest cover, and it follows that deforestation, if extensive, may diminish the supply of springs and streams.

Investigations in Germany and in India seem to indicate that there is an appreciable increase in rainfall as a result of reforestation. In general forests may be looked upon as the effect rather than the cause of rainfall.

Climate and Animals.— The geographic distribution of animals is doubtless the outcome of definite laws — laws that stand in close relation with the past history of the earth through a large portion of geological time. What those laws are forms a subject of great importance in studies of evolution,— a subject, it may be remarked, entirely too great to be adequately treated in the present connection. Naturalists are generally of the opinion that all animals have been produced from those that preceded them by some slow process of transmutation or development, and that this modification of animal forms took place very slowly, as evidenced by the fact that the historical period of nearly 4,000 years has hardly produced any perceptible change in a single species. That marked

changes in the climate of the earth have occurred during the remote past there can be no doubt, and that those changes left a marked impress upon the fauna of the globe there can also be no manner of doubt. The great northern ice sheet and the accompanying cold of the glacial period, if it did not cause the extermination of the receding fauna, doubtless led to its migration to more congenial climates.

The part played in the faunal distribution of of the globe by the present climate seems to be indirect rather than direct, although there are many facts which seem to point to a direct relation. While it is true that the fur-bearing animals of the frozen north are generally to be found in arctic regions, yet they send their representatives far into the temperate latitudes, and indeed into the borders of the regions inhabited by the more exclusively tropical species. On the other hand, the tiger, whose home is naturally associated with the hot districts of India and the Indian Archipelago, is equally at home in the elevated regions of the Caucasus and the Himalayas, where his footprints are not infrequently found impressed in fields of snow. Other groups of animals are more limited in their migrations. Some are so closely adapted to an arboreal life that they never stray far beyond the limits of forest vegetation, while others are so tolerant of climatic change that the limit of their possible range is conditioned only by the character and quantity of the food supply and the interposition of impassable physical barriers.

Climate and Plants.— The factors necessary to the development of plant life are light, heat, soil, and moisture. The ideal conditions as regards these essentials do not usually obtain, or, if they do, multitudes of plants seek to take possession of the region, so that there is a continuous struggle for existence in which many more plants fail than succeed.

The climatic factors heat and moisture are combined in several ways in different parts of the globe, and these combinations give widely different vegetation; thus a maximum of heat and a minimum of water give desert conditions where only specially adapted plants can exist. If, on the other hand, a maximum of heat is combined with a maximum of water, the result will be vegetation such as exists only in the rainy tropics. The possible combinations of the two climatic factors are very numerous, as are also those of soil and the effects of animal life and human agencies. Yet the vegetation of the globe is susceptible of a fairly definite classification. Following Humboldt, and adopting such terms as express in a general manner the vegetation characteristic of each zone, we have the following classification:

Zones of	Average Temperature
1. Palms and bananas	78°—82°
2. Tree-ferns and figs	73°—78°
3. Myrtles and laurels	68°—73°
4. Evergreens	60°—68°
5. Deciduous trees	48°—60°
6. Conifers	40°—48°
7. Lichens, saxifrages, and dwarf shrubs	32°—40°
8. Lichens and mosses	32° and below

While in a general way these zones stretch around the world in wavy belts, somewhat as do the isotherms, similar belts may be found encircling mountain peaks and chains with increasing altitude above sea-level. Indeed it is possible to pass successively from tropic to arctic vegetation on a single mountain peak in the tropics.

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Climate and Climatic Species and Varieties. Although a half century ago it was generally held that changes of climate have not profoundly affected organisms, yet the recent detailed study of variation has shown that climate and local influences have been the causes of origin of probably a very large number of the species contained in our museums and described in biological literature. Among insects, birds, and mammals it has been estimated that from a third to a half of the known species are climatic or local species or varieties, or local races. As is well known, Americans born of foreign parentage are larger than their ancestors, whether English, Irish, Germans, or French; and Boroditch has shown that the children of Americans of both sexes born in the United States, are larger than those of foreign races. This is generally attributable to difference in the climate of the Old and New Worlds, our American climate being drier, more changeable and stimulating than that of Europe. It appears that the introduced English sparrow has undergone a gradual modification since its introduction into this country about 40 years ago. Bumpus has critically examined over 1,700 eggs of this bird, one half from England and the other half from Providence, R. I. It was found that the eggs of the American race or breed vary more than the European, that they are smaller and of a strikingly different shape, being more rounded and with a much greater amount of color variation. This is attributed by the author to a suspension of natural selection. However, this may be, it belongs with the class of facts which show that the modification is primarily due to the change from one climate to another. Cockerell has found that a common European snail (*Helix nemoralis*), introduced into this country soon begins to present variations not known to exist in England, while in the introduced butterfly, *Pieris napi*, 12 American varieties, and of *P. rapæ* four varieties have appeared on American soil within the few years which have elapsed since their appearance and spread on this continent. Where different mammals are transported from temperate to tropical countries the wool tends to become replaced by hair, and other changes occur. The turkey does not vary in temperate regions, but when acclimated in India it degenerates in size, is incapable of rising on the wing, becomes black, and with the long pendulous appendages over the beak enormously developed. Cold has naturally the inverse effect, mammals transported to the

north from the tropics become more or less woolly. As the result of the severe winters and the elevation of Angora in Asia Minor, the cats, shepherd dogs, goats and hares are clothed with a long fleece like wool.

Islands present different climatic features from the mainland being damper, etc., and hence the birds, reptiles, and other animals present slight but constant differences from their allies and probable ancestors on the nearest continents. And not only that of the same group as in the Galapagos Islands, but also each island is tenanted by a distinct local variety of birds. This has also been noticed by Wallace in the East Indian archipelago. The swallow-tail butterflies of islands tend to have shorter tails, and the outlines of the wings differ. Thus the local races become incipient species, and by being isolated are prevented from crossing with the original stock or species, and in this way geographical varieties or representative species are produced. When great changes have taken place in the topography, portions of land cut off from the continent, or continents become divided, species have arisen. Thus in the late Tertiary, Asia and America were continuous, but when Bering Strait was formed, the bison of this country and that of Europe (aurochs) became specialized, becoming different species. In this way multitudes of species have probably arisen over all parts of the world.

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Climate in the Treatment of Disease. The relations of climate to medicine are peculiarly significant. The influences of heat, cold, moisture, and sunlight are definite, and to many individuals, sound as well as unsound in mind and body, the problem of life's continuance depends on their climatic surroundings. Many people can live with comfort in Colorado who would die of tuberculosis in a comparatively short time in the Eastern States. Nor is tuberculosis the only diseased condition that demands a certain climatic environment. Chronic emphysema, Bright's disease, heart disease, etc., may be influenced for good or for evil by climate.

Medically speaking, climates may be divided into a number of arbitrary classes. Manifestly such are subject to an immense amount of variation. A physiological classification given by Solly is into the following groups. Sea climates, on the ocean, on islands, or on the coast; land climates, low, up to 2,500 feet; medium, 2,500 to 4,500 feet; high, 4,500 feet and over. Again, climates may be sub-divided into cold and hot, either being dry or moist. All such classifications are arbitrary, and their exceptions to general rules are many.

Ocean climates vary according to the latitude, and the proximity to the Gulf Stream. Apart from such particulars, however, ocean climates are characterized by their equability, not only in the daily range of temperature, but, winter and summer as well, the presence of a large body of water, tends to equalize temperature, moisture, winds, etc. Humidity is a second feature of ocean climates. The moisture in the air acts as a veil, as it were, and and this mitigates the fierce heat, and at night gives up the heat to the air. High grades of humidity with great heat are extremely prostrating. Sea air is impregnated with the vapors of salt, and perhaps those of iodine and bromine, and it is free from dirt and bacteria. Ozone is always great in amount. Ocean climates are apt to be soothing. They increase the appetite greatly; there is increased inclination to sleep and increased bodily metabolism. When not too bracing and exciting, ocean climates are well adapted to the treatment of neurasthenia.

Island climates, if the islands are not very large, are practically ocean climates. Coast climates partake of a double nature. Because of the disturbing influences of increased land heat radiation, coast climates are less equable. They are usually less humid, precipitation being more active; winds often play a very important factor in coast climates, hence a knowledge of the local conditions is essential to estimate correctly the qualities of any given coast climate, although all coast climates bear a family resemblance to ocean climates.

Low inland climates are usually characterized by high barometric pressure, lessening with the elevation, and more or less humidity, becoming less as the distance from the ocean increases. Mountain ranges modify this greatly, as in California, for instance, where the Coast Range causes the precipitation of moisture on one side of the range, leaving the other side very dry although very close to the sea. The dryest, low inland climates are those usually in the interior of the continent; the proximity of large bodies of inland water, however, modifies these. The moist, inland, low climates that are warm are the poorest for therapeutic purposes. They are enervating, depressing, and mosquito-ridden, hence malarious and noxious in many particulars. The moderately moist and warm climates, such as are found in Florida, for instance, and in many coast regions, as southern California, act as sedatives to the nervous system and are excellent in neurasthenic conditions. They are adapted to convalescents and to chronic invalids, particularly in Bright's disease, tuberculosis, and chronic cardiac troubles.

Moderately moist and cold climates, such as are found at Saratoga, in the Adirondacks, in Wisconsin, at Baden-Baden, Wiesbaden, etc., may be called indifferent climates. They are valuable as changes, and, being near large centres of population, are readily reached, and amusements, games, etc., with good regimen, work benefit to those who have been overdoing. Moist and cold climates are not desirable therapeutically. Tuberculosis abounds in such climates.

Dry and warm climates are found in west Africa, Egypt, Nubia, southwestern Texas, southern California, and the less elevated regions of Utah and Arizona. Tuberculosis, chronic joint conditions related to rheumatism, Bright's disease, heart disease, neuralgias, and neurasthenias, all do well in this type of climate. It seems, as an all-around climate, the best type. Thus far in the United States the comforts to be found in cities with this climate do not commend themselves to travelers. European and African travel is much preferred, although there is little question but that the American resorts are their equals from a climatic, but not from an historic point of view, nor from «comfort to the traveler» standpoints.

Mountain climates are characterized by clean air, low humidity, increased light ozone, and

rarefied air. The effects on the body by the rarefied air are marked. There is increased respiratory activity, and increased heart action, that later may become irritable. Persons in good health usually accommodate themselves, but the aged and weak are inconvenienced by high climatic conditions. Sleep is usually improved in those able to accustom themselves to the changed conditions, and muscular and nervous power is increased thereby. To the overworked business man, a rest in the not too high mountains, if his heart can stand exercise in the rarified air, mountain climates are excellent. Consult: Hinsdale and Weber, 'Climatology.'

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Climax (Gr. κλιμαξ, a ladder or stairs), a rhetorical figure in which a series of propositions or subjects are presented in such a way that the least impressive comes first, and there is a regular gradation from this to the most impressive or final; opposed to «anti-climax,» in which the ideas are presented in the reverse order.

Climbing-fern (*Schizæaceæ*), a family of ferns, mostly tropical, which have various peculiarities. It contains 5 genera and 75 species, two of which are represented in eastern North America. One, *S. pasila,* or curly grass, is a rare fern sometimes found in wet soil in the pine barrens of New Jersey during the months of August and September. The other is the Hartford fern (*Lygodium palmatum*), occurring in most thickets and open woods along the eastern seaboard of the United States during the summer months. The plant is a slender and flexible climber, with palmate leaves, surmounted by a panicle of forked pinnules, making it a very desirable decorative house-plant.

Climbing-fish, or **Climbing-perch,** a spiny-rayed fish (*Anabas acandens*) belonging to the family *Anabantidæ* which, with the *Osphromenidæ* constitute the sub-order *Labyrinthici,* characterized by the enlarged and peculiar labyrinthine structure of the superior pharyngeal bones, which are formed of excessively delicate plates of bone covered in life by a moist membrane and enclosing air-spaces between them.

In the climbing-perch the labyrinthine organ is greatly developed and extremely complex, and serves as an air-breathing organ of such great importance that the fish readily suffocates if prevented from having access to the air. To a fish which inhabits small stagnant pools, where the water contains but a small supply of dissolved air, such an apparatus is almost indispensable, and the climbing-perch, like a number of other fish which live in similar situations, regularly breathes free air. It has the very remarkable habit of leaving the water, especially during rains, and ascending the trunks of palm-trees for as much as six or eight feet, for the purpose of capturing insects. This habit is so well known to the natives of the East Indies that their name for the climbing-perch is said to mean «the fish that climbs trees.» The early accounts were, however, received with much skepticism, but have been fully and repeatedly confirmed. The feat is accomplished partly by means of the tail and spiny anal fin, but chiefly through the peculiar structure of the gill-cover, of which the opercular bone has a serrated edge, which clings firmly to surfaces, and the subopercular is so freely movable that it serves the purpose of a sort of leg, first extended forward and attached, then by appropriate muscles the body is advanced an inch or so at a time. The climbing-perch and all related forms are found only in the Indian and Indo-Malayan region.

Climbing Plants. See LIANAS.

Clinch, Charles Powell, American poet and play-writer: b. New York 20 Oct. 1797; d. there 16 Dec. 1880. For many years he was editorial writer, and literary and dramatic critic for the press; also writer of many poems, theatrical addresses, and dramas. Among the latter are: 'The Spy'; 'The Expelled Collegiates'; and 'The First of May.'

Clinch River, a stream that rises among the hills in the southwest part of Virginia, passes into Tennessee, flows through the valley between Clinch Mountain and Powell Mountain, and unites with the Holston at Kingston, to form the Tennessee. Its length is estimated at above 200 miles, for more than half of which it is navigable by small boats.

Cline'dinst, Benjamin West, American artist: b. Woodstock, Va., 1860. He is a painter of portraits and pictures in the genre style, and in 1900 was awarded the Evans prize of the American Water Color Society. He is best known as a popular illustrator of stories in the leading illustrated magazines, the 'Century,' 'Harper's Magazine,' and 'Scribner's Magazine,' especially containing much of his work.

Cling'man, Thomas Lanier, American senator: b. Huntsville, N. C., 27 July 1812; d. Raleigh, N. C., 4 Nov. 1897. He graduated at the University of North Carolina 1832, adopted the legal profession, and was a member of the State legislature 1836–40. He was elected to Congress as a Whig and with the exception of the 29th Congress, served continuously from 4 Dec. 1843 to 14 June 1858, when he was appointed United States senator. During his service in the House he took part in all the leading debates, not missing, it is said, a single day's session, and for a time was chairman of the Committee on Foreign Affairs. His speech on the causes of Henry Clay's defeat, led to a duel with William L. Yancey. He later joined the Democratic party. Entering the Confederate army as a colonel, he was promoted brigadier-general 17 May 1862, commanding the North Carolina troops, and served until his surrender with Gen. J. E. Johnston in April 1865. After the War he was chiefly engaged in mining and scientific pursuits. He made contributions to the sciences of geology and mineralogy, and in 1855 measured and made known the highest point in the North Carolina Mountains, since called «Clingman's Peak,» and in 1858 determined the highest point of Smoky Mountain, now called «Clingman's Dome.» The important mica mines in Mitchell and Yancey counties were first opened by him. He published a volume of 'Speeches and Writings' (1877); 'Follies of the Positive Philosophers' (1878); and 'The Tobacco Remedy' (1885).

Clingman's Dome, a peak of the Smoky Mountains, near the boundary between Tennessee and North Carolina. It was so named

in honor of Thomas L. Clingman. Its height is 6,619 feet above the sea-level.

Clin'ic, a place in which practical instruction in medicine is given; also the process of instruction. Clinics are usually held in dispensaries, where, by reason of free treatment, many patients congregate, thus affording good clinical material.

Clink-stone (so named from its sonorousness), grayish felspathic rock of the trachytic group, with a slaty structure, and generally divisible into tabular masses that are sometimes used as roofing-slates.

Clinometer, klī-nŏm'ę-tėr, an instrument used for taking the dip and strike of rock strata. In its commonest form it consists of a sort of protractor with a pendulum attached. When the clinometer lies horizontally the indicator points to 0°, and when inclined the amount of inclination is shown at once by the pendulum. It is most convenient to combine compass and clinometer in one instrument.

Clinopo'dium, a genus of herbs or low shrubs of the mint family (*Labiatæ*). containing about 50 species, of which 9 occur in the southeastern United States and California. The plants are known under the common names of wild basil, calamint, bed's-foot, and basil balm.

Clinton, Charles, American colonist, ancestor of the Clintons in New York: b. County Longford, Ireland, 1690; d. Ulster, now Orange County, N. Y., 19 Nov. 1773. His grandfather was an adherent of Charles I., and after the defeat of the royalists fled for refuge to the north of Ireland; and his mother was daughter of a captain in the parliamentary army. Having determined with a number of his friends to emigrate to America, he chartered a ship, and sailed for Philadelphia 20 May 1729. After a passage marked by the attempt of the captain to starve the passengers in order to possess their property, and in which after the death of several, among whom were a son and daughter of Mr. Clinton, it was proposed, but not attempted, to wrest the command from the captain, he was landed with his companions 4 October at Cape Cod. The place for a permanent settlement was selected in the spring of 1731 in Ulster County, N. Y., about 6 miles west from the Hudson River, and 60 miles north from New York. Clinton was chiefly occupied as a farmer and land surveyor, but was also judge of the county court, and in 1756 was appointed lieutenant-colonel, and served with two of his sons in the expedition against Fort Frontenac.

Clinton, De Witt, American statesman: b. Little Britain, New Windsor, Orange County, N. Y., 2 March 1769; d. Albany 11 Feb. 1828. His descent on the father's side was from English ancestors long domiciled in Ireland, and on the mother's side he was of French extraction. His education was begun in a grammar school near his home, continued at the academy in Kingston, Ulster County, and completed at Columbia College, where he bore away the college honors in 1786. He immediately engaged in the study of the law and was admitted to the bar in 1788. His ardent temper and earnest ambition carried him at once into the political field, and his sentiments, sympathies, and affections determined his position under the banner of his kinsman, George Clinton, the chief within the State of the Republican party. While the question of the adoption of the Federal constitution was yet a subject of popular discussion, he proved his zeal and controversial power by writing a series of letters signed "A Countryman," in reply to the celebrated letters of the 'Federalist.' He entered the legislature in 1797 and the State Senate in 1798, soon becoming the leader of his party in the State. In 1801 he became United States senator, resigning in 1803 to assume the office of mayor of New York. He remained undisturbed in the mayoralty from 1803 until 1807, when he was removed. He was reappointed in 1809, was displaced in 1810, was restored in 1811, and thenceforward continued therein until 1815. Within this period of nearly 12 years, Clinton was also a member of the Senate of the State from 1805 until 1811, was lieutenant-governor from 1811 to 1813, and during a portion of that time also held a seat in the council of appointment. He was an unsuccessful candidate for the Presidency in 1812. He adopted early and supported ably and efficiently the policy of the construction of canals from Lake Erie and Lake Champlain to the tide-water of the Hudson, and showed to his fellow citizens, with what seemed a spirit of prophecy, the benefits which would result from those works to the city, the State, and the whole country, in regard to defense, to commerce, to increase of wealth and population, and to the stability of the Union. In 1815 he presented a memorial to the legislature in behalf of the construction of the Erie Canal and in 1817 a bill was passed authorizing the work. In 1817 he was elected governor of New York and re-elected in 1820. He declined re-election in 1822, but was again elected in 1824, and after overcoming constant, unremitting, and factious resistance, he had the felicity of being borne, in October 1825, in a barge on the artificial river which he seemed to all to have constructed from Lake Erie to the bay of New York, while bells were rung and cannons saluted him at every stage of that imposing progress. No sooner had that great work been undertaken in 1817 than the population of the State began to swell with augmentation from other States, and from abroad; prosperity became universal; the older towns and cities expanded, new ones rose and multiplied; agriculture, manufactures, and commerce were quickened in their movements, and wealth flowed in upon the State from all directions. He was re-elected governor in 1826, dying while in office. Consult Hosack, 'Memoir of De Witt Clinton' (1829); Renwick, 'Life of De Witt Clinton' (1840); Campbell, 'Life of De Witt Clinton' (1849).

Clinton, George, Vice-President of the United States: b. Little Britain, Ulster County, N. Y., 26 July 1739; d. Washington, D. C., 20 April 1812. He was a son of Charles Clinton (q.v.) and served as lieutenant under his brother James at the capture of Frontenac, but afterward studied law. He was a member of Congress in 1776, and voted for the Declaration of Independence, but was summoned to the army as brigadier-general before it was prepared for signature. In 1777 he was elected governor and at the same time lieutenant-governor of the State of New York, which latter office was, on his acceptance of the other, conferred upon Mr. Van Courtlandt. He held the office of governor during the next 18 years, for which

eventful period the history of his life is that of the State. He was again chosen governor after spending five years in private life, in 1801, and in 1804 became Vice-President of the United States.

Clinton, Sir **Henry,** English general: b. about 1738; d. Gibraltar 23 Dec. 1795. He was the grandson of Francis, sixth Earl of Lincoln, served in the Hanoverian war, and was sent to America as major-general in 1775. He took part in the battle of Bunker Hill, and in the battle on Long Island which resulted in the evacuation of New York by the Americans; was made Knight of the Bath in 1777, proceeded up the Hudson that year in a vain effort to relieve Burgoyne, and was promoted to the chief command of the British army in America in 1778. After being forced by Washington to evacuate Philadelphia, he commanded an expedition to South Carolina in 1780, and blockaded and captured Charleston. He sailed from New York with 7,000 men to relieve Cornwallis on the very day that the latter capitulated. He was superseded by Gen. Carleton in 1781, returned to England the next year, and died soon after he had been appointed governor of Gibraltar. He wrote a narrative of his conduct in America (1782), and a rejoinder to Lord Cornwallis' observations on it (1783); also observations on Stedman's 'History of the American War' (1784).

Clinton, James, American military officer: b. Little Britain, Ulster County, N. Y., 9 Aug. 1736; d. there 22 Dec. 1812. He was the fourth son of Charles Clinton (q.v.). With his father he served at Frontenac, in 1758, as captain, and commanded in 1763 the forces raised to protect Ulster and Orange counties against the Indians. He accompanied Montgomery to Quebec in 1775, and was appointed brigadier-general the following year. While his brother George was governor of New York, he was overpowered at Fort Clinton by the superior force under Sir Henry Clinton, and being severely wounded narrowly escaped with his life. He afterward served against the Indians under Sullivan in 1779 and was present at the surrender of Cornwallis. After the peace he occupied many distinguished civil stations.

Clinton, Canada, a town of Huron County, Ontario, situated on the Buffalo & G. branch of the Grand Trunk Railway, about 32 miles northwest of Stratford. Its industries are numerous. There are salt-wells, a tannery, a grain-elevator, and a flour-mill, and factories for the production of carriages, organs, threshing-machines, fanning-mills, etc. There are several churches and a collegiate institution. Pop. about 3,000.

Clinton, Ill., city and county-seat of De Witt County, situated on the Illinois C. R.R., about 42 miles northeast of Springfield. The chief industry of the region is farming. There are machine shops here, and the city has an electric-lighting system and water-works, several churches and two public schools. Pop. (1900) 4,452.

Clinton, Ia., city and county-seat of Clinton County, situated on the Mississippi River and on the Chicago & N. W., Chicago, M. & St. P., Chicago, B. & Q., Chicago, R. I. & Pac., and Iowa Midland, 128 miles west of Chicago and 60 miles southeast of Dubuque.

Industries.— The city is a trade centre for a region of 50 miles radius and has large manufacturing and other industries, including lumber mills, furniture factories, sash and door factories, iron bridge works, gasoline engines, boats, automobiles, wagons, harness, boxes, brick, locks, and railroad machine shops.

Public and Educational Institutions, Etc.— The city has a good public library, hospitals, business colleges, Wartbury Lutheran College, Mount Saint Clare Academy, Our Lady of Angels Seminary, churches of all denominations, public schools, five banks with a combined capital of $800,000, electric lights and railways and an assessed property valuation of over $2,000,000.

Government.— The present form of government is by a mayor and a council of nine members elected biennially. Pop. (1903) 23,370.

Clinton, Mass., a town of Worcester County, 12 miles northeast of Worcester and 40 miles west of Boston; on the Nashua River, and the Boston & Maine and N. Y., N. H. & H. R.R.'s.

Industries, Etc.— The chief industries are the manufacture of wire-cloth, ginghams, and carpets. Here are located the Lancaster Mills, with 2,100 employees; the Bigelow Carpet Co., with 1,250, and the Clinton Wire-Cloth Co., with 500.

Public Institutions, Buildings, Etc.— There is a national bank, with a capital of $200,000 and average deposits of $375,000. The Bigelow Free Public Library contains 25,000 volumes. The churches are Congregational, Baptist, Methodist, Presbyterian, Unitarian, Catholic, and Adventist. There are also the Clinton Hospital and the Clinton Historical Society.

Government.— The government is administered by means of town-meetings. The board of selectmen holds office for three years and appoints the chief of police and other subordinate officials.

History.— Up to 1850 Clinton was a part of Lancaster (q.v.), but it was then incorporated as a town. Pop. (1900) 13,667; (1903 est.) 14,639.

Clinton, Miss., a town of Hinds County, about 10 miles from Jackson. Its only interest lies in its being an educational centre. Among other institutions of learning is Mississippi College (q.v.), with nearly 300 students, and a school for colored students.

Clinton, Mo., a city and county-seat of Henry County, 37 miles northwest of Sedalia, on Missouri, K. & T., the St. Louis & San F., and Kansas City, Clinton & Springfield R.R.'s.

Industries, Etc.— Clinton has 3 flour mills with a combined capacity of 3,200 barrels daily; 2 corn-meal mills, capacity 750 barrels daily; cooperage and railroad division shops, ice plant and foundry and gas-engine factory. It has 2 banks with a combined capital of $75,000, and has an annual business of $25,000,000.

Educational Institutions, Etc.— Clinton has an excellent public school system, and also colleges for men and women, including Bind College for Women and Clinton Business College.

Government, Etc.— The city was first settled in 1837, became a borough in 1858 and a city in 1876. It is governed by a mayor and a council of eight members elected for two years. Pop. (1903) 6,000.

Clinton, N. Y., a village of Oneida County, situated on the New York, O. & W. R.R. In

the neighborhood there are stone quarries. The chief interest of the place lies in its educational institutions. Here is located Hamilton College (q.v.), and there are seminaries for young women, an academy and a union school. Pop. (1900) 1,340.

Clinton Bridge Case, a case in the United States supreme court, December term 1870; a leading precedent as to the rights of railroad traffic *v.* river navigation, although it specifically decided only the right of Congress to take pending adjudications out of the hands of the courts by special acts, and to legalize any bridge as a post-road under its power to control interstate commerce. The Chicago, I. & N. R.R. Company proposed to bridge the Mississippi from Clinton, Iowa, to Albany, Ill., under authority from those States. One Gray filed a bill in equity in the circuit court of Iowa, praying for a preliminary injunction pending hearing for a final injunction, on the ground that the bridge was an obstruction and danger to navigation. Before the final hearing, however, the bridge was built, and Congress passed a special act 27 Feb. 1865, declaring it a lawful structure and a post-route, prescribing rules for the operation of the draw, and providing that all suits for obstruction to navigation should be brought in the circuit court of the State involved. The defendants on final hearing objected to the reading of proofs, on the ground that this statute closed the case, and the court so found. On appeal to the supreme court, the appellant argued that the act did not intend to legalize its maintenance in whatever condition it might be, or bar suits to abate that condition as a nuisance; and that it was unconstitutional if it did, as taking private property without compensation. The supreme court affirmed the judgment of the court below, but admitted that a suit at common law for damages would have raised a different set of questions.

Clinton Stage, in American geology, the middle member of the Niagara Series of the Silurian System. It comprises shales and shaly sandstones with some limestones, and is typically developed at Clinton, N. Y. From New York the series extends southward along the Appalachians to Alabama, reaching its maximum thickness of over 800 feet in Pennsylvania. From the Appalachians the series stretches 1,000 miles westward, except for the area of the Cincinnati anticline, to Wisconsin, where the Series is represented by limestones. From one to three beds of oölitic hematite (fossil iron ore), from 1 to 10 feet thick, are found in the Clinton at many points along the Appalachians and have yielded considerable ore. See IRON ORE; NIAGARA SERIES; SILURIAN SYSTEM.

Clinton's Big Ditch, a phrase applied to the Erie Canal, connecting the Hudson River with the Great Lakes. The name was given in derision because the canal was planned and carried to completion by De Witt Clinton.

Clinto'nia, a genus of plants of the lily-of-the-valley family (*Cornwallariaceæ*), named after De Witt Clinton, naturalist and governor of New York. It comprises six species, four of which are natives of North America, the other two being Asiatic. Yellow clintonia (*C. borealis*), has greenish-yellow drooping flowers, with blue berries. It grows in moist woods from Newfoundland south to North Carolina, and westward to Wisconsin and Minnesota. The white clintonia (*C. umbellulata*) is found in the woods of New York and New Jersey, and as far south as Georgia, and westward through Tennessee.

Clio, klī'ō, daughter of Zeus (Jupiter) and Mnemosyne (Memory), the muse of history. She is represented with a wreath of laurel upon her head and a roll of papyrus in her left hand. She was the mother of Hyacinthus and Hymenæus. There was also a sea nymph named Clio, daughter of Oceanus and sister of Beroe, who figures in Greek mythology.

Clionidæ, klī-ŏn'ĭ-dē, a family of *Pteropoda* (q.v.), which lack the shell and external gills, have the body spindle-shaped with wing-like fins situated near the head, and the head provided with short tentacles. They are pelagic animals of remarkable transparency, and live in vast numbers in the Arctic and Antarctic seas. Their chief popular interest lies in the fact that one species, *Clio borealis,* although only about an inch in length, furnishes the chief food of the great whalebone whales of the North. The whalers call the schools of these pteropods brit and deem their presence a good sign of whales.

Clipper, the word used to designate a modern construction of large sailing vessel. The peculiarities of these vessels are, their long sharp bow, their greatest beam lying abaft the centre of the ship, and their depth of keel. The speed attained by the opium and slave traders had attracted the attention of naval architects generally, and the shipbuilders of Great Britain (notably those of Aberdeen and Liverpool) and of America vied with each other in producing vessels which, while preserving fair carrying capabilities, should, as the primary requisite, be fast sailers. In this they succeeded to a remarkable extent, and the feats of the Atlantic, Australian, and China clippers, some of which attain an average speed during the voyage of over 15 miles an hour, used to be a topic of great interest and excitement among those connected with shipping and ocean traffic. Owing to the improvements in steam vessels, and the many advantages possessed by them over sailing vessels, clippers, as a special type of ship, are now little heard of.

Clissold, Augustus, English clergyman: b. about 1797; d. Tunbridge Wells, 30 Oct. 1882. He was graduated from Exeter College, Oxford, in 1823 was ordained priest, held the curacies of Saint Martin-in-the-Fields and Saint Mary, Stoke Newington, and about 1840 withdrew from the ministry. He had become a very close student of the writings of Swedenborg, and though retaining through life his connection with the Church of England, he was president of the Swedenborg Association, became a life member of the Swedenborg Society, and liberally assisted it with funds. Clissold translated and published at his own expense Swedenborg's 'Principia Rerum Naturalium' (1845–6) and 'Œconomia Regni Animalis' (1846). He wrote also many original works, the larger part on Swedenborg and Swedenborgian views.

Clisthenes. See CLEISTHENES.

Clitomachus (Gk. *Κλειτόμαχος*), Greek philosopher: b. Carthage about 190 B.C.; d. Athens about 110 B.C. He went to Athens about 146

B.C., where he became identified with the Third, or New, Academy, of whose founder, Carneades, he was one of the most distinguished disciples. On the death of Carneades in 129 B.C., Clitomachus succeeded to the academic chair. Carneades wrote nothing, and Clitomachus was the chief expositor of the system of the New Academy. Diogenes Laërtius is authority for the statement that he wrote 400 books on philosophical subjects. Cicero, who appears to have devoted considerable study to the work of Clitomachus, praises him highly in the 'Academica.' He followed in his teachings the largely skeptical views of Carneades, denying the possibility of attaining absolute truth, or any certain criterion of truth. Of his works there remain only a few titles and some renderings by Cicero in the 'Academica.' See ACADEMICS; GREEK PHILOSOPHY.

Clitus, klī'tŭs, son of Dropis, and brother of Hellanice, the nurse of Alexander the Great. He was one of the generals of Philip and Alexander, and saved the life of the latter in the battle of the Granicus by cutting off the hand of Rhosaces, who had just lifted up his arm to kill Alexander. Notwithstanding this service, however, Alexander killed him in a fit of anger.

Clive, Catherine Raftor, KITTY CLIVE, English actress: b. London 1711; d. 6 Dec. 1785. She was the daughter of a poor Irish gentleman living in London, and coming to the notice of Colley Cibber, manager of Drury Lane Theatre made her début there at 17. She achieved instant success and till her retirement from the stage in 1769 was one of the most popular actresses of the time, her forte being comedy. She married George Clive in 1732, but was separated from him later. She was intimate with many of the literary and social lights of her day, among others Horace Walpole. Consult Fitzgerald, 'Life of Mrs. Catherine Clive' (1888); Doran, 'Annals of the English Stage' (1888).

Clive, Mrs. Archer. See CLIVE, CAROLINE WRIGLEY.

Clive, Robert, BARON OF PLASSEY, English soldier and statesman: b. Shropshire, 29 Sept. 1725; d. London 22 Nov. 1774. His father obtained for him the place of a writer in the East India Company's service, and in his 19th year he went in that capacity to Madras. Two years later Madras surrendered to the French, but Clive escaped to Fort Saint David, where he entered the military service. He took part in the unsuccessful attempt to capture Pondicherry in 1748. When the British opposed Chunda Sahib, whom the French wished to make nabob of the Carnatic, and their candidate was besieged in Trichnopoly by Chunda Sahib, Clive was sent in 1751 to attack Arcot, the capital of the Carnatic, which he captured without opposition, and later compelled a detachment of Chunda's troops to retire. He then relieved Trichnopoly, and captured the forts of Covelong and Chingleput. In 1753 he went to England for a time, and on his return to India (1755) he was given the government of Fort Saint David. He was soon called to Madras to command the relief expedition sent to Bengal, where the nabob Suraj-al-Dowlah had taken Calcutta. Clive took possession of that city, and with a very inferior number of men entered the nabob's camp and captured his cannon. The nabob then offered terms of peace very advantageous to the English. Clive very shortly formed a plot to dethrone Suraj-al-Dowlah and place Mir Jaffier on the throne. In the famous battle of Plassey (21 June 1757) Clive's force of 3,000 men put to flight the nabob and his army of more than 50,000. Mir Jaffier now wished to govern without British interference, but the rebellions against him forced him to seek the aid of Clive, who was appointed governor of Bengal. Clive again went to England in 1760, where he was raised to the Irish peerage, and was elected member of Parliament from Shrewsbury. A disagreement between Mir Jaffier and the British governor officiating in Clive's absence caused Clive's return to India in 1764. He found the trouble with Jaffier settled, and devoted himself to the reform of the civil service in Bengal, and the restoration of discipline in the army. After his final return to England (1767) severe attacks were made upon him for his conduct in India, and a parliamentary inquiry followed which resulted in the passing of the resolution that he "had rendered a great and meritorious service to his country." But the worry due to the attacks and the trial, together with his failing health, so depressed him that he committed suicide.

Cloaca, a sewer, an underground drain or conduit. The Roman Cloaca Maxima (the greatest or main sewer) is said to have been constructed, or at least begun, under the auspices of King Tarquinius Priscus, about 588 B.C. It is still used in the drainage of Rome. It received numerous other branches between the Capitaline, Palatine, and Quirinal Hills. It is formed of three concentric rows of enormous stones, piled above each other without cement. The height inside is about 13 feet and its width is about the same.

In anatomy a cloaca is a part of the intestine in which the intestinal, ovarian, and urinary outlets terminate. This structure exists in birds, in reptiles, in the amphibia, and in the mammalian order *Monotremata.* In the *Rotifera* also the perivisceral cavity terminates in a dilatation or cloaca, which forms the common outlet for the digestive, generative, and water vascular system. There is a cloaca also in insects, and one also in tunicated mollusks. The latter is sometimes called the atrial chamber. In the embryonic development of man there is a period during which a cloaca, like that of the inferior animals, exists.

Clock, an instrument for measuring and indicating the time of day, sometimes also for showing the day of the month, the year, the movements of the sun, moon, planets, etc. The position of the sun in the heavens undoubtedly furnished primitive races with their first idea of time. This was followed by the invention of the sun-dial (q.v.)— a natural sequence of the observation of the length of shadows. This being of no service at night or on cloudy days, the hour glass (q.v.) followed. The clepsydra (q.v.) was invented long before the Christian era, and is said to have been in use 2,000 years. The clepsydra having been developed into a device with a dial and indicator operated by the current of water, the next improvement was the substitution of a weight for the water to operate the index. Archimedes is credited with this device. The necessity of some contrivance to regulate the descent of the weight led to the

invention of the escapement and pendulum, a rude form of which is said to have been produced by Gerbert of Auvergne, afterward Pope under the name of Sylvester II, who died in 1003. In an old chronicle it is related that Charlemagne received a clock from Harun Alraschid in 809, to which small bells were attached, and in which figures of horsemen, at the hour of 12, came forth through doors and retired again. There is a more exact description of this work of art in the Franconian annals, attributed to Eginhard, in which it is particularly said to have been a clepsydra, and that at the end of each hour little balls of metal fell upon a bell and produced a sound. In the 12th century clocks were made use of in the monasteries, which announced the end of every hour by the sound of a bell put in motion by means of wheels. From this time forward the expression "the clock has struck," is often met with. The hand for marking the time is also made mention of. Of William, abbot of Hirschau, who died at the end of the 11th century, his biographer relates that he invented a horologium similar to the celestial hemisphere. Short as this account is, it still appears probable that this abbot was the inventor of clocks. In the 13th century there is again mention of a clock given by the Sultan Saladin to the Emperor Frederick II. This was probably put in motion by weights and wheels, as it marked the hours, the course of the sun, of the moon, and the planets in the zodiac. In the 14th century there are stronger traces of the present system of clock-work. Dante mentions clocks. Richard, abbot of St. Albans, made a clock in 1326, which indicated the course of the sun and moon, as well as the ebb and flow of the tide. Large clocks on steeples were first made use of in the 14th century. In 1340 a monk named Peter Lightfoot made for Glastonbury Abbey a clock with an escapement and regulator for securing equable motion. At the time of the Reformation it was removed to Wells Cathedral, where part of it still remains. In 1835, the mechanism being entirely worn out, the clock was supplied with new works and the dial somewhat remodeled, and a minute circle and index added. At the base of the arched pediment which surmounts the square of the dial is an octagonal projection from which rises a panelled turret. Around this, fixed to two rings of wood, are sets of horsemen which formerly revolved in opposite directions as the hour was struck.

Of all horological machines, the successive clocks at Strasburg Cathedral have perhaps attracted the most attention as mechanical curiosities. These have been three in number. The first was constructed about 1352, the second in the latter part of the 16th century. Early in the 19th century it was evident that reconstruction was necessary, and this was ultimately entrusted to Charles Schwilgue, who entered on his task in 1838 and completed it about the middle of 1842. On the 2d of October of that year the new life of the resuscitated marvel was solemnly inaugurated. On the floor level is a celestial globe indicating sidereal time, and the rising, setting, and passage over the meridian of Strasburg of all stars visible with the naked eye. Behind this is a calendar showing months, days of the month, dominical letters, and all feast days. Above the calendar is a gallery with allegorical figures representing the days of the week (Sunday, Apollo drawn in a chariot by horses; Monday, Diana drawn by a stag; Tuesday, Mars; Wednesday, Mercury; Thursday, Jupiter; Friday, Venus; Saturday, Saturn), which pass in order from left to right. Above this is a dial for showing ordinary time, a planetarium, and a globe showing phases of the moon. Next come movable figures representing the four ages of man, which strike the second stroke of each quarter on a bell. A genius seated beside the ordinary dial strikes the first note of each quarter with a sceptre; the genius on the opposite side turns an hour-glass at each hour. Death strikes the hour with a bone. Above, a procession of the 12 Apostles passes at noon before Christ, bowing at his feet, while he makes the sign of the cross. During the procession a cock perched on the top of the left-hand turret flaps its wings, ruffles its neck, and crows three times.

A clock at Berne, which dates from 1527, presents some curious features. Three minutes before the hour a wooden cock crows and claps its wings; in another minute a procession of bears (baren, referring to the name "Berne") passes around a seated figure of a bearded old man; the cock (above the arch, and to its right) then crows again. The hour is struck on a bell at the top of the tower, by a foll with a hammer, and at each stroke, the bearded figure raises his sceptre and opens his mouth, while he turns an hour-glass; a bear inclines his head at the same time. Then the cock crows again.

Another celebrated clock is at Venice, dating back to the 17th century. It has a dial of blue and gold, and is surmounted by bronze figures which strike the hours upon a bell. On Ascension Day, and for 14 days after, figures of the Magi come forth in procession and salute the Virgin and Child (as shown above dial) when the clock strikes twelve.

Yet another is the clock of the English Houses of Parliament at Westminster. It was designed by Lord Grimthorpe (then Mr. E. B. Denison) and was first set going in 1860. The tower is 320 feet high, and the dials are 180 feet from the ground. Each of them is 22½ feet diameter, of opalescent glass set in an iron framework. The hour figures are two feet long and the minute spaces one foot square. The works contain three trains — one drives the hands, another the mechanism for striking the hours, the third the chimes. The pendulum is fully 13 feet long and weighs nearly 700 pounds. The going part of the clock requires winding once a week, the striking parts twice. The hour bell weighs 13 tons, the quarter bells collectively eight tons. Though there are clocks with larger dials, this clock is probably the most powerful as well as the most accurate of all large time-keepers. It cost more than $110,000.

Clock and Watch Industry. See WATCHMAKING, MODERN.

Clock-work. It is usual with writers on clock-work to consider the moving part, or that which measures the time, as independent of the striking department of a common clock; the first being called the watch, and the second the clock department. This method we shall follow, as it tends greatly to the simplification of the subject. An end view of the watch movement of a common clock is shown in the plate, fig. 1. The work-wheel is contained within two brass plates, SS.TT, connected together by four pillars, two

of which are seen in the drawing. Between these two plates a barrel, C, is placed, moving on the pivots *bb*, entering the plates, and which terminate the axis, *a, a*. A catgut band passes round the barrel, being guided in winding by a spiral groove cut on the circumference. To the end of this catgut band, or cord, a weight, P, is attached, which descending by its own weight, will uncoil the cord and cause the barrel to turn on its axis; and were no obstruction offered, this motion would continue until the catgut were exhausted or the weight reached the ground. This, however, is prevented by the action of a click fixed to the wheel DD, which click strikes against the right sides of the teeth of a ratchet-wheel attached to the barrel. The teeth of the wheel DD act upon the leaves of the pinion turning upon the pivots, *c, c*. The wheel EE is fixed upon the axis of the pinion *d*, and thus the motion given to that pinion by the wheel DD is transferred to the wheel EE, from thence to the pinion *e*, and afterward to the wheel FF, which again gives motion to the pinion *f*, upon the axis of which is fixed the swing-wheel, GH. The swing-wheel, as will be seen in fig. 2, has teeth of the ratchet form, in which the pallets, IR, play. These pallets are connected by a cross-piece, as seen in the drawing, which is fastened to an arbor going through the back plate of the frame, as seen in fig. 1, and carrying the lever, XU, which has a forked end, to receive the pendulum. To the brass bar, A, screwed to the frame of the clock, there is attached a small steel spring, *y*, by which the pendulum is suspended. The pendulum consists of a slender rod, with a heavy bob at the one end, being suspended at the other. The length of time which the pendulum takes to vibrate will depend on its length, that is, on the distance between the centre of suspension and the centre of gravity of the bob.

On the laws of the motion of pendulums, such remarks shall only be made here as are necessary for the illustration of the movement of clock-work. The length of a pendulum vibrating seconds at London has been found to be 39.1393 inches. This pendulum, although vibrating seconds at London, would not do so correctly in other latitudes, for it has been found by experiment, and may be demonstrated from the known laws of gravity, that the length of the seconds pendulum increases by a certain rate as we advance from the equator to the poles, the length at the equator being 39, and at the poles 39.206 inches. The latitude of the place where the clock is meant to go must therefore be taken into consideration by the maker, and the length of the pendulum regulated accordingly. The pendulum may be made to vibrate half-seconds, seconds, or two seconds, and the number of the teeth in the wheels made to correspond; but when a choice can be made, experience proves that preference ought to be given to a long pendulum. On this subject more shall be said toward the end of this article; meantime we return to the examination of the connection of the pendulum with the swing-wheel. When the pendulum, *y* B, fig. 1, is drawn a little aside from the perpendicular, and then let go, it will move backward and forward, the bob, B, describing the arc of a circle round the centre of suspension, *y;* and from the connection before pointed out between the pendulum and the pallets, IR, fig. 2, it is easy to see that when, by the action of the weight, P, motion is, as shown before, transmitted to the wheel GH, a tooth, H, of this wheel will act upon the pallet, R, move it, and cause that tooth to escape. The motion of the pendulum will then cause the pallet I to come into contact with the tooth G, which again will escape, and so on, each tooth in the wheel escaping the pallets. This department of the clock is denominated the escapement. Various forms of the escapement have been employed at different times, many of which exhibit great ingenuity; that which we have just described is the one in common use; it is very simple, and answers all ordinary purposes sufficiently well. In tracing the times of the revolutions of the wheels, we refer to fig. 1, where the wheel EE revolves once in an hour. The pivot, *c*, of this wheel passes through the plate, and is continued to *r*, upon which the minute hand is fixed. This extremity, *r*, which carries the minute hand, is the end of a long socket fastened into the centre of the wheel NN, the teeth of which act upon the wheel O, whose pinion, *p*, moves the wheel *gg* fixed upon the socket, which turns with the wheel N. The hour hand is fixed upon the barrel of the wheel *gg*, which, of course, turns once round in 12 hours.

From this description the reader will perceive that the whole of the wheels, as likewise the pendulum, are kept in motion by the descending of the weight, P, until the cord which is coiled round the barrel has been run out. The clock is again wound up by means of a key which fits on the square end of the arbor, Q.

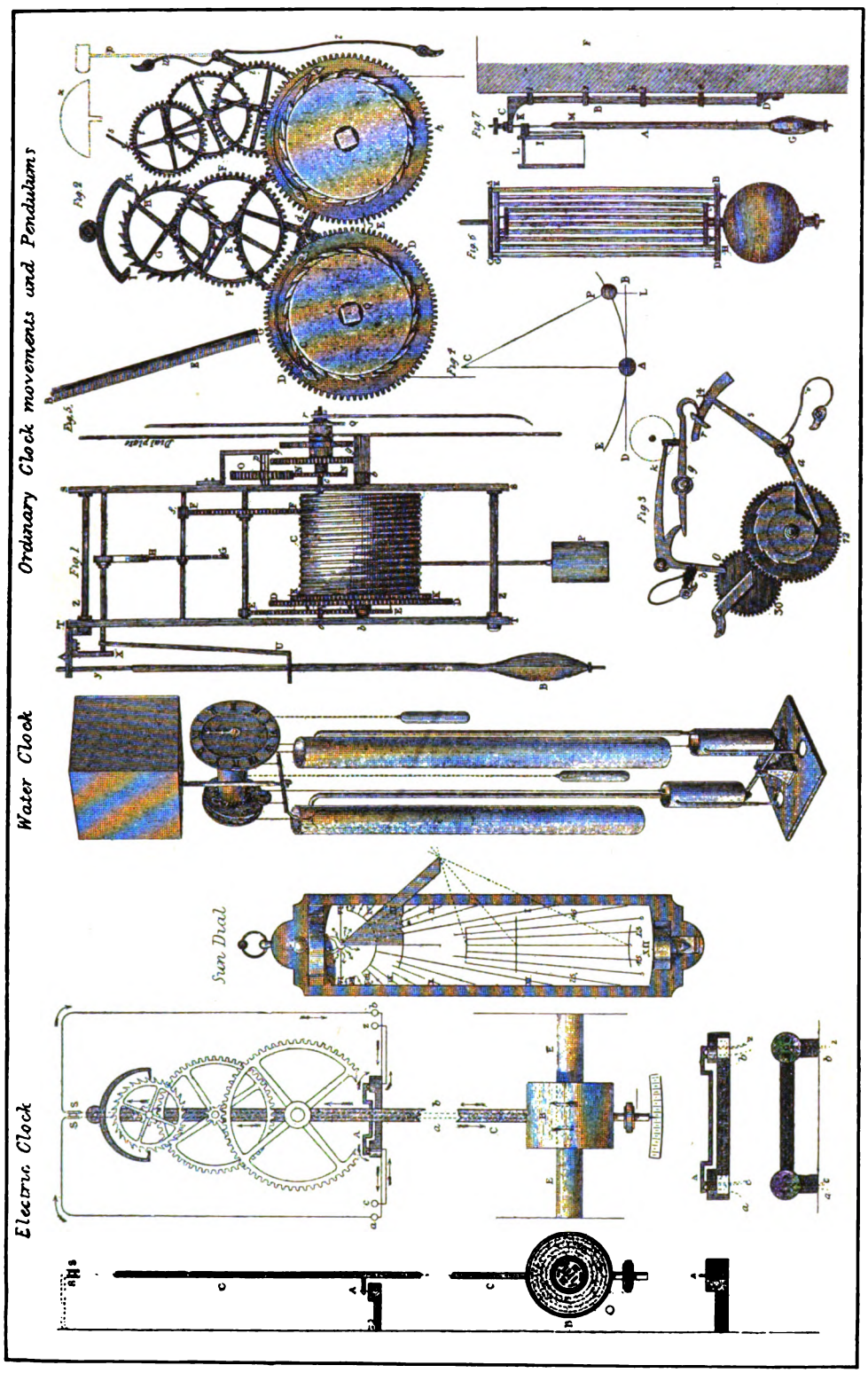
For the purpose of winding the clock, the click, *c*, fig. 2, is moved by the inclined side of the teeth of the ratchet-wheel, K, which turns with the barrel, while the wheel D is at rest, but it continues to move so soon as the cord is coiled upon the barrel. The click falls and checks the teeth, thus allowing the wheel D to move, the click being kept in the teeth of the wheel by means of the spring, A. If the pendulum of the clock be a seconds pendulum, it will make 3,600 vibrations in an hour; but a half-seconds pendulum, whose length is about 9 25-32 inches long, will make double that number, that is 7,200 vibrations in an hour; and, supposing the latter to be employed, it then follows that, since the teeth of the swing-wheel, GH, must all act on each of the pallets, each tooth causing one vibration of the pendulum, if the swing-wheel have 30 teeth, the pendulum will make 60 vibrations during one of the swing-wheel's revolutions. Hence, since 60 is contained in 7,200 120 times, the wheel GH will turn 120 times in an hour. If the wheel E have 72 teeth, and the pinion six, then the pinion will revolve 12 times for one revolution of the wheel. The pinion C turns the wheel F, which has 60 teeth; and the pinion *e*, making 10 revolutions for one of the wheel F, makes 120 while E performs one. The pinion *f* moves GH, causing it to turn round and make the pendulum vibrate 60 times for every revolution; and as the pinion *f* turns the wheel G, the pendulum must make 60 × 120 or 7,200 vibrations while the wheel E makes one turn. This last wheel, then, turns once in an hour. The wheel N, on the same axis, must likewise turn in one hour, and the minute hand is fixed upon a tube on the axis of this wheel. This is fixed on pretty tight, so that the hand, being

carried round by friction, may be moved so as to be set at any figure on the dial-plate without affecting any of the wheels. The wheel N, having 30 teeth, drives the wheel O, having the same number, which therefore revolves in an hour. O carries the pinion, P, of six leaves, acting upon the wheel *gg* of 72 teeth; and the pinion will therefore make 12 turns for one of the wheel *gg*, which must take 12 hours to revolve, and upon the axis of this accordingly the hour hand is fixed.

We have hitherto confined our attention to the going or watch part of the clock; we will now endeavor to explain the construction of the striking department. The prime mover of the striking department is a weight, attached to a cord wound round a barrel, in fig. 2, similar to the barrel in the clock department. The wheel *h* on this barrel turns a pinion of eight leaves fixed on the same arbor as the wheel *i*, which again turns a pinion of eight leaves, on the arbor of the wheel *k*, of 48 teeth. On the same arbor with the wheel *t* of 48 teeth there is fixed a pinion driven by the wheel *k*, and the wheel *t* again drives another pinion of six leaves, on whose axis a broad flat piece of metal, S, is fixed, called the fly, which in revolving strikes the air, and the resistance thence arising retards the motion of the train. Eight pins project from the side of *i*, which, as the wheel turns round, act in succession on the tail of the hammer, causing it to move out from the bell. When a pin leaves the tail of the hammer, it is returned and made to strike the bell, *x*, by the action of the spring *z*. But to prevent the hammer from continuing to press upon the bell, and thus deaden the sound, a small spring, *u*, acts upon the hammer just before it strikes the bell, and lifts it after it has struck. The pin-wheel, *i*, carries a pinion of eight leaves driven by the wheel *k*, of 78 teeth, turning once in 12 hours. On the arbor of the wheel *k*, which passes through the brass plate SS, is fixed a small pinion of one tooth, called the gathering-pallet, seen at *r*, fig. 3. The gathering-pallet, which revolves once for each stroke of the hammer, turns a larger wheel, a segment of which is seen at *s;* this wheel is called the rack, and to it is attached the arm, *b*, whose end rests upon the spiral plate, *v*, called the snail, fixed on the same tubular arbor as the wheel 72, and the hour hand. The snail is divided into 12 parts or steps, each of which corresponds to an hour; their circumferences are parts of circles struck to different radii, decreasing in a certain proportion each step, the length of each being one twelfth part of the circumference of the circle on which it is struck. These circular arcs form so many slips, constituting the snail, against which the arm *b* of the rack is pressed by the spring *w*, which is opposed by the hawk's-bill, *g*, a click acting on the teeth of the rack; *bk* is the warning-piece, being a three-armed detent, one arm of which is bent at the end and passes through the plate SS in order to catch a pin fixed in the arm of the wheel *t* (fig. 2). The other arm, *b*, takes a direction so as to meet a pin on the wheel O. In fig. 3 the parts are represented as in motion, and the motion would continue were it not that at each stroke of the hammer the gathering-pallet, *r*, lifts the rack one tooth each turn — the hawk's-bill retaining the rack until a pin in the end of the rack is brought in the way of the gathering-pallet lever, and thus stops the motion of the wheels. At the end of every hour the pin in the wheel O touches the end *b*, moving it toward the spring, thus lowering the end, *k*, to the circle of motion of the pin in the wheel *t* (fig. 2). The end of the hawk's-bill is at the same time lowered by the end of the short tail, in consequence of which the other end, *g*, is raised so as to clear the head of the rack, S, when the rack is thrown back by the spring *w*, until the end of the arm A is pressed against the snail. The wheels are set in motion by the weight, when, by the falling back of the rack, the pin in it clears the gathering-pallets; but a few minutes before the striking of the bell, the whole is stopped by the pin in the wheel *t* falling against the end, *k*. The motion of the wheels during this action produces that noise called the warning of the clock. When the hammer is about to strike at the end of the hour, the end of the arm *b* of the wheel O slips over its pin, and it is raised against the end, *k*, by a small spring. The hammer, *p*, is raised by the pin-wheel, *i*, and the bell is struck. The gathering-pallet takes up a tooth of the rack each turn, the hawk's-bill retaining it until the pin of the rack comes under the gathering-pallet, and checks the motion of the striking department until the next hour. The number of teeth that the rack falls back will depend upon the number of strokes made by the hammer, and from the form of the snail the rack falls back differently every hour, the hammer making one additional stroke each hour, from one to 12. If, by any cord or other communication, the arm *b* should be moved between any two hours, then the striking part will be put into motion, and the arm A remaining in the step of the snail, the last hour will be struck, which is called repeating.

From this description it is easy to see that a clock may be made to go for any length of time without winding up, by increasing the number of teeth in the wheels, or, what comes to the same end, diminishing the number of hours in the pinions. The same may also be effected either by lengthening the cord to which the weight is attached, or by increasing the number of wheels and pinions. The moving power in clocks with short pendulums, called time-pieces, is frequently not a weight, as is above described, but a spring, such as that employed in watches, for a description of which apparatus see WATCH.

Upon the pendulum depends the regularity of the clock's motion. A heavy body, *p*, (fig. 4) attached to the end of a cord or slender rod, PC, capable of moving round the centre C, forms the common pendulum. The body or bob, P, will, if undisturbed, remain in the lower point, A, of the arc PE, but if drawn to one side, as shown in the figure, and then let go, it will, by the action of gravity, have a tendency to fall to the centre of the earth, in the direction of PL; but because of the rod or cord, PC, it describes the arc PA, being part of a circle of which C is the centre. When the bob has reached the lowest point, A, it has acquired such velocity as to carry it on to the point E, from which it descends and rises again toward A. These alternate motions backward and forward, continue; but by reason of friction and the resistance of the air, the length of the arcs described by the bob will continually decrease until the action of gravity causes the pendulum



to cease its motion altogether. We have already seen how the stopping of the pendulum is prevented from a new impulse being given at every vibration by the action of the teeth of the swing-wheel upon the pallets. It may be demonstrated that if two pendulums describe similar arcs, the times of their vibrations are as the square roots of the lengths of the pendulums, and also that the lengths of the pendulums are as the squares of the number of their vibrations in equal times, or as the squares of the times of vibration. Wherefore, assuming the length of a seconds pendulum to be 39.1386 inches, it follows, from the foregoing statement, that the length of a half-seconds pendulum will be about 9.8, and a quarter-seconds about 2.45 inches. The bob may be dispensed with, and a simple rod, BG, (fig. 5) employed, whose length is greater by a third than the length of the pendulum with the bob.

We have before alluded to the effect of gravity in causing a difference in the time of vibration of the same pendulum in different latitudes; but there is another circumstance affecting the time of vibration of a pendulum which we must here consider — we mean the effect of heat and cold in lengthening and shortening the pendulum; so that the time of the going of a clock is influenced by variations of temperature. This circumstance for a long time rendered the clock a very unsafe guide to the navigator in determining the longitude, and accordingly several very ingenious contrivances have been made to remedy this defect. These contrivances are called compensation pendulums, because they contain within themselves means of compensating for variations in length caused by the differences of temperature. The mercurial pendulum of Graham, invented about 1721, is exceedingly simple, and serves well to illustrate the principle upon which compensation pendulums are constructed. Graham's pendulum consists of a steel rod, at the end of which is fixed a glass jar containing mercury; so that when the rod expands by heat the jar is lowered, while at the same time the heat expands the mercury, and thus the centre of oscillation is raised, and, the one expansion counteracting and compensating for the other, the length of the pendulum remains unchanged. This contrivance, though simple and ingenious, is in little use, being exceedingly difficult of adjustment. The gridiron pendulum of Harrison consists of five, seven, nine, or any odd number of rods of different metals which effect compensation in a manner that will be understod by reference to the pendulum represented in fig. 6. The two outer rods, AB, CD, are of steel, fastened by means of pins to the cross-pieces AC, BD. The rods EF, GH, are of brass, and fastened in a similar way to the lower bar, BD, and to EG, the second bar from the top. The two next rods are of steel, and fastened to the cross-bars IK and EG. The next two are fastened to the cross-bar LM and IK, and are of brass. The central rod, to which the bob is attached, is made of steel, and fastened to the cross-piece LM, and passes freely through the cross-pieces BD, IK. The effect of the steel rods is to lengthen the pendulum on expansion by heat, or to shorten it on contraction by cold; while this is compensated by the contra expansion and contraction of the rods of brass in the following manner: When, by increase of temperature, the two outer steel rods expand, the cross-bar BD, together with the rods attached to it, will descend, and thus the pendulum will be lengthened; but the two next brass rods fastened in BD will also expand and raise the cross-piece EG, whereby the next two rods of steel will likewise be raised. These two last-mentioned rods will also expand, and therefore the cross-piece IK will be lowered. To this cross-piece the two next rods of brass are fastened, and they will likewise expand and raise the cross-piece LM, which elevation will compensate for the depression of the bob by the expansion of the centre-rod. This description of pendulum answers the purpose of keeping correct time exceedingly well, and is accordingly employed where accuracy is essential, as in the clocks of observatories. In Crosthwaite's compensation pendulum A and B are two rods made of steel, similar to each other in every respect, the rod B being supported by a bracket, D, and the top formed into a gibbet at C. The rod B is firmly fixed into a large piece of marble, F, set into a wall so adjusted that the rod may be moved up or down between the brass staples 1, 2, 3, 4, which touch only in a point in front and behind. The rod A carries at its lower extremity the bob G, 24 pounds weight, the upper end being suspended by a spring at the gibbet C. All this apparatus is unconnected with the clock, to the back of the plate of which, at K, two cheeks are secured in a line with the verge, L. The maintaining power is applied in the usual way of regulators at M by means of a cylindrical stud, and here the compensation, if so it can be called, takes place. For while the rod B expands, A must raise the upper end C, the lower end being immovable, but its expansion will be accompanied with a similar expansion of the rod A, which will lower the bob. It is to be observed that the top of the rod A is attached to the gibbet by means of two slender chains which pass through between two brass plates, whose lower edges will form the centre of suspension of the pendulum. This pendulum, though much more simple, is not so invariable as a well-constructed pendulum of the gridiron construction.

Clodd, Edward, English writer: b. Margate, Kent, 1 July 1840. He entered commercial life in 1860 and has been secretary of the London Joint Stock Bank from 1872. He is the author of 'The Childhood of the World' (1872); 'The Childhood of Religions' (1875); 'Jesus of Nazareth' (1880); 'Myths and Dreams' (1885); 'Story of Creation' (1888); 'Story of Primitive Man' (1895); 'Primer of Evolution' (1895); 'Pioneers of Evolution' (1897); 'Grant Allen' (1900); 'Story of the Alphabet' (1900); 'Thomas Henry Huxley' (1902).

Clodia, one of the three sisters of Publius Clodius Pulcher. She was married about 60 B.C. to Quintus Motellus Celer, who died the following year, probably from poison. Cicero having rejected her advances, she conceived a mortal hatred against him, and, in concert with her brother, used every possible means to effect his ruin. On her accusing Cœlius Rufus of an attempt to poison her, Cicero undertook his defense, and depicted her dissolute life in a speech which is still extant.

Clog-almanac, an almanac or calendar made by cutting notches or characters on a clog or block, generally of wood. The block had generally four sides, three months for each edge. The number of days is marked by notches, while various symbols are used to denote saints' days, the golden number, etc.

Cloisonne, in ceramics, a method of enameling, applies for the most part to metal, since the effects are more easily attained thus than when it is applied to porcelain; specimens of the latter sort being, indeed, chiefly regarded as curiosities. In cloisonné work (so-called from *cloison,* a partition), fine metallic walls of the same material as the basis (for example, copper) are soldered by a strong cement by one edge to the basis; and these walls in this manner form numerous cells or compartments, in which the vitrifiable enamel pastes of various colors are placed. The enamel is then vitrified by several firings — three or four generally being required before enough enamel can be applied to afford an approximately level surface — and subsequently is ground and polished to a high degree. The Gauls in Roman times and previously made cloisonné, and it was employed for decorative purposes in shrines, altar-pieces, and church plate in the Middle Ages. It has not since been used until recent experiments were attempted. The Oriental cloisonnés are well known, particularly the Japanese. The art is said to have been introduced into Japan from China in the 16th century of the Christian era. Japanese cloisonné is made chiefly at Owari, Kioto, Tokio, and Osaka. In later specimens of the Japanese work the partitions are reduced to a minimum, apparently making no separation between the color masses of the enamel. The finest examples of the Oriental cloisonnés display great brilliancy.

Cloister (O. F. *cloistre,* Lat. *claustrum,* bar, enclosed place), a court enclosed by covered walks. The latter are, strictly speaking, the cloisters, the central space being termed the cloister garth. The walks, or ambulatories, are open on the side toward the garth and when appertaining to monastic or collegiate establishments were intended for the use of monks or nuns or the clergy attached to the Church. The cloisters are usually, though not invariably, placed on the south side of the church. They are commonly square on the plan, having a plain wall on one side, a series of windows between the piers or columns on the opposite side, and covered with a vaulted or ribbed ceiling. They form part of the passage of communication from the church to the chapter-house, refectory, and other parts of the establishment. The chapter-house usually opens from the east walk, the refectory and certain other domestic buildings of a monastic house, from the south walk.

Cloister and the Hearth, The, a novel by Charles Reade, published 1861. The masterpiece of this vigorous novelist recreates the 15th century, and presents to modern eyes the Holland, Germany, France, and Italy of the Middle Ages, as they appeared to mediæval people. The dramatic quality of the story, its vivid descriptive passages, the force and individuality impressed on its dialogue, its virile conception of the picturesque brutality and the lofty spirituality of the age it deals with, the unfailing brilliancy of the novelist's treatment of his theme, and its humorous quaintness, place 'The Cloister and the Hearth' among the great historical romances of the world.

Clonmel, klŏn'mĕl, Ireland (Gælic, that is, «Vale of Honey»), a municipal borough situated on both sides of the Suir; part in Tipperary and a small part in Waterford; and 90 miles southwest of Dublin. Three stone bridges cross the Suir and connect the parts of the town; it has good streets, well paved and well lighted. Clonmel was founded by the Danes, and has long been noted for its love of learning. The fame of the schools established by the Franciscans in the 13th century extended to all the seats of learning on the Continent. The chief edifices now in the town are an Episcopal church, two Roman Catholic churches, a Franciscan abbey, the court-house, jail, barracks, free library, town-hall, convents, schools, lunatic asylum, etc. The trade is chiefly in grain, cattle and provisions; and there are flour-mills, creameries, a brewery, etc.

Laurence Sterne, the novelist, was born in Clonmel, and Lady Blessington, the writer, was born near by. Pop. 8,500.

Clontarf, klŏn'tärf, Ireland, a town in county Dublin, on the northern shore of Dublin Bay, some three miles northeast of Dublin. It is a much frequented watering-place, and is historically interesting as the scene of Brian Boroimhe's victory over the Danes in 1014. Pop. 5,200.

Cloots, Jean Baptiste von, zhŏñ bäp tēst fŏn klōts, Prussian baron, well known during the Revolutionary scenes in France under the appellation of Anacharsis Cloots; d. 24 March 1794. He was born at Cleves in 1755, and became possessed of a considerable fortune, which he partly dissipated through misconduct. He traveled in different parts of Europe, and formed an acquaintance with many eminent individuals, among whom was the celebrated Edmund Burke. The first work in which he distinguished himself was the ridiculous masquerade called the 'Embassy of the Human Race,' partly contrived by the Duke de Liancourt. On the 19th of June 1790, Cloots presented himself at the bar of the national assembly, accompanied by a considerable number of enthusiastic followers of various nationalities, English, German, Italian, Spanish, and others. He described himself as the orator of the human race, and demanded the right of confederation, which was granted him. At the bar of the assembly, 21 April 1792, he made a strange speech, in which he recommended a declaration of war against the king of Hungary and Bohemia, proposed that the assembly should form itself into a diet during a year, and finished by offering a patriotic gift of 12,000 livres. On the 12th of August he went to congratulate the legislative assembly on the occurrences of the preceding 10th, and offered to raise a Prussian legion, to be called the Vandal Legion. The 27th of the same month he advised the assembly to set a price on the heads of the king of Prussia and the Duke of Brunswick, praised the action of John J. Ankarstrœm, the assassin of the king of Sweden, and, among other absurd expressions, he said, «My heart is French and my soul is sansculotte.» He displayed no less hatred to Christianity than to royalty. In September 1792 he was nominated deputy from the department of the Oise to the national conven-

tion, in which he voted for the death of Louis XVI. "in the name of the human race." He became an object of suspicion to Robespierre and his party, was arrested and condemned to death.

Close Time, a period of the year during which certain animals are protected by law, and are not allowed to be caught or killed. Such animals are chiefly those that are killed for food or sport, and include birds, fishes, and quadrupeds, as well as certain others — crabs, lobsters, and oysters, for example.

Clo'sure (often needlessly *clôture,* the same word in French), the European substitute for the American "previous question": the power of shutting off debate when the speaker or the majority think it has exhausted legitimate argument and is used for mere obstruction. As the equity of neither deciding power can be guaranteed, it is also a possible weapon of mere "gag-law"; but it has shown itself to be the only method in which parliamentary institutions can be worked. In Congress the "previous question" exists in the House, but not in the Senate, and this possibility of indefinite blocking of public interests by a single unscrupulous member, has caused an active movement for introducing it into the Senate also. In the British Parliament no such rule existed till 1882, debate being unlimited; and the fairness of its members, and their unity of feeling as Englishmen, had prevented any serious ill results. But about 1872 Isaac Butt, the leader of the Irish Home Rule party, began the policy, carried on after his death by Parnell, of putting a stop to all legislation on English subjects until all Irish demands had been granted, by talking against time, making irrelevant motions, calling for divisions on every motion, etc. For many years Parliament struggled under this, extremely loath to tie down the immemorial freedom of debate, but was finally forced to act, and in 1882 passed a "closure" rule, which allowed the speaker, on request of 40 members, to pronounce debate closed and call for a vote. In 1887 this was modified to require the petition of 200 members, or of only 100 in case the negative vote is less than 40. The French *clôture* dates from Louis Napoleon's accession in 1851.

Clotaire (klō-tār) **I.,** son and successor of Clovis (q.v.), first king of the Franks in Gaul, reigned as sole king from 558 to 561. CLOTAIRE II., a king of the same Merovingian dynasty, reigned over the Franks 30 years later.

Cloth. See WEAVING.

Cloth of Gold, Field of the. See FIELD OF THE CLOTH OF GOLD.

Clothes-moth, a moth (*Tinea pellionella*), of the family *Tineidæ,* in which the wings are long and narrow, pointed at the end, and with a long finger. It is pale buff-yellow, with no definite markings. It may be seen flying about the house the last of May, or still earlier if the weather be warm, when it lays its eggs in woolens. The young caterpillar is whitish, and begins, on hatching, to construct a flattened cylindrical case in which it lives, dragging the case about with it. The mischief is done by the worm, the caterpillar working through the next 10 months, finally changing to a pupa in its case, and the best preventative is cold storage at a temperature of 40° F., or the use of naphthalium or camphor. Woolen garments should be carefully brushed and put away in cotton sacks or in camphor trunks, or wrapped tightly in stout paper, or stored in large pasteboard boxes rendered tight by gumming a strip of wrapping paper around the edge, so as to seal the box completely. Consult: Packard, 'Guide to the Study of Insects'; Howard and Marlatt, 'The Principal Household Insects of the United States'; 'Bulletin 4 of the United States Department of Agriculture.'

Clothing, the artificial coverings worn by human beings for protection against the weather and from motives of decency. Nothing is more necessary to a comfortable state of existence than that the body should be kept in a nearly uniform temperature. The skin, by increase of the perspiration, carries off the excess of heat; the lungs, by decomposing the atmosphere, supply the loss; so that the internal parts of the body are preserved at a temperature of about 98° under all circumstances. In addition to the important share which the function of perspiration has in regulating the heat of the body, it serves the further purpose of an outlet to the constitution, by which it gets rid of matters that are no longer useful in its economy. The excretory function of the skin is of paramount importance to health, for if the matters that ought to be thrown out of the body by the pores of the skin are retained, they invariably prove injurious. When speaking of the excrementitious matter of the skin the sensible moisture which is poured out in hot weather, or when the body is heated by exercise, is not meant; but a matter which is too subtle for the senses to take cognizance of, which is continually passing off from every part of the body, and which has been called insensible perspiration. This insensible perspiration is the true excretion of the skin. A suppression of the insensible perspiration is a prevailing symptom in almost all diseases. It is the sole cause of many fevers. Very many chronic diseases have no other cause. In warm weather, and particularly in hot climates, the functions of the skin being prodigiously increased, all the consequences of interrupting them are proportionably dangerous. Besides the function of perspiration, the skin is an organ of absorption. It is also the part on which the organ of feeling or touch is distributed. The skin is supplied with glands which provide an oily matter that renders it almost impervious to water, and thus secures the evaporation of the sensible perspiration. Were this oily matter deficient, the skin would become sodden, as is the case when it has been removed — a fact to be observed in the hands of washerwomen, when it is destroyed by the solvent powers of the soap. The hair serves as so many capillary tubes to conduct the perspired fluid from the skin. The three powers of the skin, perspiration, absorption, and feeling, are so dependent on each other that it is impossible for one to be deranged without the other two being also disordered. For if a man be exposed to a frosty atmosphere till his limbs become stiff and his skin insensible, the vessels that excite the perspiration and the absorbent vessels partake of the torpor that has seized on the nerves of feeling; nor will they regain their lost activity till the sensibility be completely restored. The danger of suddenly attempting to restore sensibility to frozen parts is well known. If the addition of warmth be not

very gradual, the vitality of the part will be destroyed. This consideration of the functions of the skin will at once point out the necessity of an especial attention, in a fickle climate, to the subject of clothing. The chief end proposed by clothing ought to be protection from the cold; and it never can be too deeply impressed on the mind (especially of those who have the care of children), that a degree of cold amounting to shivering cannot be felt without injury to the health, and that the strongest constitution cannot resist the benumbing influence of a sensation of cold constantly present, even though it be so moderate as not to occasion immediate complaint, or to induce the sufferer to seek protection from it. This degree of cold often lays the foundation of the whole host of chronic diseases, foremost among others which are found scrofula and consumption. Persons engaged in sedentary employments must be almost constantly under the influence of this degree of cold, unless the apartment in which they work is heated to a degree that subjects them, on leaving it, to all the dangers of a sudden transition, as it were, from summer to winter. The inactivity to which such persons are condemned, by weakening the body, renders it incapable of maintaining the degree of warmth necessary to comfort without additional clothing or fire. Under such circumstances a sufficient quantity of clothing of a proper quality, with the apartment moderately warmed and well ventilated, ought to be preferred to any means of heating the air of the room so much as to render any increase of clothing unnecessary. To heat the air of an apartment much above the ordinary temperature of the atmosphere, we must shut out the external air; that of the close room becomes extremely rarefied and dry; which circumstances make it doubly dangerous to pass from it to the cold, raw, external air. But in leaving a moderately well warmed room, if properly clothed, the change is not felt.

The only kind of dress that can afford the protection required by the changes of temperature to which high northern climates are liable is woolen. Those who would receive the advantage which the wearing of woolen is capable of affording must wear it next the skin; for it is in this situation only that its health-preserving power can be felt. The great advantages of woolen cloth are briefly these: The readiness with which it allows the escape of sweat through its texture; its power of preserving the sensation of warmth to the skin under all circumstances; the slowness with which it conducts heat; the softness, lightness, and pliancy of its texture. Cotton cloth, though it differs but little from linen, approaches nearer to the nature of woolen, and on that account must be esteemed as the next best substance of which clothing may be made. Silk is the next in point of excellence, but it is very inferior to cotton in every respect. Linen possesses the contrary of most of the properties enumerated as excellencies in woolen. It retains the matter of perspiration in its texture, and speedily becomes imbued with it; it gives an unpleasant sensation of cold to the skin; it is very readily saturated with moisture, and it conducts heat too rapidly.

There are several prevailing errors in the mode of adapting clothes to the figure of the body, particularly among women. Clothes should be so made as to allow the body the full exercise of all its motions. The neglect of this precaution is productive of more mischief than is generally believed. The misery and suffering arising from it begin while the child is yet in the cradle. Girls have for a while the same chance as boys, in a freedom from bandages of all kinds; but as they approach womanhood they are subjected to trammels in the form of stays. The bad consequences are not immediately obvious, but not the less certain on that account. The girl writhes and twists to avoid the pinching which must necessarily attend the commencement of wearing stays tightly laced. The posture in which she finds ease is the one in which she will constantly be, until at last she will not be comfortable in any other, even when she is freed from the pressure that originally obliged her to adopt it. In this way most of the deformities to which young people are subject originate, and, unfortunately, it is not often that they are perceived until they have become considerable, and have existed too long to admit of remedy.

Clothing and Furnishing Trade. The history of the manufacture of ready-made clothing in the United States is comprehended in a period of perhaps 70 years. There do not appear to be any records of the earliest days of the trade, and its origin is lost in the obscurity of time. It is probable, however, that the cradle of this important industry, in which vast fortunes have been made and lost, was at New Bedford, Mass., where, so far as I can learn, the first ready-made clothing was manufactured to supply the immediate and pressing needs of the sailors returning from whaling voyages, or to stock their slop-chests for new adventures on the sea. These goods were of the coarsest materials, but they served the purpose. This first systematic attempt to make up clothing for immediate wear must have been at least as early as 1830, and it is possible that it was before that date. At the beginning of the 19th century every man went to the draper, as he was called, for his raiment. Clothing ready to wear, according to our modern development of the idea, had not then been thought of. Whoever he was who first conceived the idea of ready-made clothing, though he left no name for posterity to honor, his invention was destined to have a great influence upon the industries of his day and upon the commercial history of his country. Beginning in a small way by supplying returning sailors who could not wait for the usual slow processes of shears and goose, the demands increased so that presently many dealers found it expedient to make up in advance a small stock of garments, to meet a sudden, if not over-critical, demand. The idea reached Boston in due course, and then New York, where the trade was stimulated, a few years later, by the requirements of emigrants to the newly discovered gold-fields of California. The business soon assumed a considerable importance, and the dealers began systematically to operate small factories on their premises.

In the earlier days the demand for ready-made clothing grew most rapidly in West and South. In those then somewhat remote parts of the country there were not the facilities for manufacture that existed about the commercial centres of the East. The wholesale production of ready-made clothing here naturally followed. George Opdyke, once mayor of New York, was

one of the earliest to engage in this business. About 1831 he commenced to manufacture clothing in Hudson Street, New York, opening a store in New Orleans. Some three years later his brother-in-law, John D. Scott, moved from Baptist-town, N. J., to New York, and took charge of the business of the factory, the firm being changed to John D. Scott & Company. They subsequently opened retail stores in Charleston and Memphis, which, with the wholesale store, were carried on until 1865, the firm being then dissolved by the death of Scott. They made their clothing of the coarser grades, largely for field hands in the South, but supplied the planters with garments of good quality. John T. Martin went to St. Louis, where he did a very prosperous business in the days before the War, retiring upon a large fortune many years ago. Thomas Chatterton began in New Haven as a dealer about 1840, and in 1846 he first handled ready-made clothing and entered the field as a manufacturer. In 1856 he went to New York, where his store was at 60 Liberty Street. It is interesting to note that he paid a rental for the whole building that he occupied, of but $2,800 a year. He afterward moved to Warren Street, the firm then being Lewis, Chatterton & Company. John H. Browning, the father of the writer of this article, commenced business as a dry-goods jobber in New York in 1832, under the firm name of Browning & Hull. In 1848 John H. Browning started a branch store in California, making his first shipments mostly of dry goods; but soon changed it into a clothing store and forwarded large amounts of cheap clothing, mostly gray flannel shirts and trousers for the use of the miners. The writer of this article commenced to take charge of the clothing department of his father's business in 1850, and remained with him until the spring of 1858, when he became associated with John E. Hanford, formerly of the firm of Lewis & Hanford, and engaged in the manufacture of clothing for the South and West. Their business was exceedingly prosperous until the breaking out of the War, when they had over $500,000 worth of assets in the Southern Confederacy confiscated. After the War broke out, the firm of Hanford & Browning, in the month of May 1861, procured a contract from Quartermaster-General Thomas, of Philadelphia, for $1,250,000 worth of clothing, which in those days was considered a very large undertaking. After this large contract had been entered into and the cloth purchased from the mills, one Saturday afternoon the firm received a telegram from Quartermaster-General Meigs, of Washington, repeated by Quartermaster-General Thomas, of Philadelphia, which read:

> We understand you have awarded a contract to Hanford & Browning, of New York city, of $1,250,000 for army clothing. Is it possible? If so, stop it at once, as it is largely in excess of any possible demand.
>
> QUARTERMASTER MEIGS.

John E. Hanford immediately started for Washington, and arrived there as our soldiers were returning from the unfortunate battle of Bull Run, and, on being admitted to Quartermaster-General Meigs' office, and with him going over the figures at which the contract was taken, the firm was again ordered to go ahead and supply the goods as quickly as possible. So rapid was the demand for army goods that cloth purchased from Hunt & Tillinghast for overcoats under that contract at 76 cents a yard, advanced to $1.50 a yard before the contract was completed. The original price to the government for the overcoats was $6, but the price had to be raised to $10. The firm of Hanford & Browning dissolved about 1862, and the business was conducted for the next three years under the firm name of Browning, Button & Kimball, and then changed to William C. Browning & Company, under which name it continued until 1868, when the present firm of Browning, King & Company was started. The house has retail stores to-day in 15 cities, a wholesale house in Chicago, and a large factory in New York.

It is impossible at this date to preserve anything like a chronological order in recalling the names of others of the early manufacturers whose operations developed the industry that to-day has attained such great proportions. But among them, as they are called to mind haphazard, were John T. Martin & Company, from whom, through a succession of changes, has sprung the present house of Rogers, Peet & Company, in which Mr. Martin is a special partner, and his son, William R. H. Martin, is a partner; Brooks Brothers, who started business at Catherine and Cherry streets, New York, in 1845, trading with the sailors along the waterfront, and whose descendants still conduct the business at Broadway and Twenty-second street; Lewis B. Brown & Company, who were in the southern trade, and the head of which, having been forced under by the War, went into the real-estate business and founded the New Jersey summer resort called, in imitation of his own name, Elberon; A. T. Bruce & Company; Little, Pyan & Carhart, afterward, in 1862, becoming successively Schaeffer, Whitford & Company, Carhart, Whitford & Company, and, in more recent days, Hackett, Carhart & Company; H. & J. Paret; Daniel Devlin; C. T. Longstreet & Company; Archibald Young & Company; and Garrett, Young & Scott. Among other antebellum clothiers who have since achieved distinction in other fields of activity are the late Jesse Seligman, who began as a clothing dealer, then engaged in selling British dry goods, and finally wound up in the banking business in Wall Street; and John J. Cisco, at one time assistant sub-treasurer of New York. In those early days there was but a single Hebrew in the wholesale business; but a large number of Hebrews went to California as retailers of goods made in New York. They made a great deal of money, partly by the difference in exchange. Now the big wholesale business is largely in the hands of the Jews, as one may see by the bewildering array of signs in Broadway; while the retail business is largely in the hands of Christians.

The breaking out of the War caused great changes in the clothing business. Many New York manufacturers having a large trade with the South lost enormous sums, while others, whose trade was in the West and North, derived great benefits by the sudden demand for clothing in large quantities. John T. Martin and many others did a very large business in manufacturing uniforms for the government troops. These goods were made in the homes of the workmen at first, but afterward, as the demands increased, factories were established, and the business was greatly stimulated. The unsettled conditions due to the prolongation of

the War and the depreciation of the certificates with which the government paid, made the business one of many hazards; but a few of the larger and more responsible dealers, having faith in the government, reaped their reward in the re-establishment of credit and the corresponding appreciation of the government certificates from 70 to 80 cents to par. In the fall of 1865, when the War closed, the clothing business took its greatest jump, and the manufacturers were not able to supply the immediate demand for clothing for the soldiers returning home. Millions of dollars were spent for clothes that year.

The first circumstance to increase the powers of production to a point somewhat equaling the demand for cheap clothing was the introduction of the Singer sewing-machine about the year 1850. It was not regarded as wholly satisfactory at first, because machine-stitching would rip, and the hand-made garments were much firmer. The invention of the lock-stitch, remedying the principal fault, brought the machines into general use, and made possible the manufacture of the enormous volume of clothing used during the War. Previous to the invention of the sewing-machine clothing had of necessity been made by hand, and great quantities of it were sent out to the country towns round about New York, Boston, and Philadelphia, to be sewed by the wives and daughters of farmers and sailors through the winter. This clothing was used to supply the country trade, and was not as fine as that made in the cities; for, as a rule, the labor employed in the villages was cheap and unskilled.

It was not until some years after the War — perhaps about 1870 — that cutting-machines were first introduced into the wholesale manufacture of clothing. The long knife was the first improvement upon the old-fashioned shears of former years, and this, operating something like a saw, made possible the cutting of some 18 thicknesses of clothing to one thickness cut by shears. The Fenno and Worth cutting-machines came later, the blade being a circular disk, revolving rapidly, and cutting as many as 24 thicknesses of cloth with the speed and accuracy of a buzz-saw. By these modern agencies hundreds of suits can be cut and sewed by machinery in the time formerly required by the delving draper in fashioning a single garment. The ancient goose still holds its supremacy, however, as the only accepted implement for pressing garments, no improvements having suggested themselves in its form. Electricity has, however, taken the place of the furnace, in some instances, for heating the goose.

As the industry grew apace, and the number of persons to whom it gave employment increased, a certain method was naturally evolved, and a division of labor was arranged by which specialists in different details of the work of manufacture were developed. Formerly one tailor made a whole suit; now a dozen hands may be employed to advantage on a single garment. There is, first of all, the skilled designer, upon whose taste much depends; the cutter, who in the best-regulated shops is a deft artist in his way; another sews certain parts of a garment only; there are vest makers and "hands on pants," as the phrase is; and still others make buttonholes, that difficult operation now being performed by machinery.

Clothing for boys developed separately and along its own lines. Smith & Davidson were among the earliest to devote themselves to children's garments. During the War the firm became Peck, Randolph & Smith, and in 1865, Mr. Smith went to Williamsburg and started the present house of Smith, Gray & Company. W. T. Runk & Company was another pioneer house in the manufacture of clothes for boys, and it continues to-day under the firm name of Hippel, Tillard & Runk, a son of the founder of the house perpetuating the name. Dayton & Gilbert were very large handlers of children's garments, and the house still survives as Dayton & Close. William Banks & Company, in Chambers Street, New York, and Barrett & Schaeffer, in Murray Street, were also in the business up to the time of the War. Previously children's clothing had been made at home, as women's gowns are nowadays, by dressmakers.

With all these vast improvements in the methods of manufacture came a wider demand for clothing of higher grade, and at about the time of the close of the War persons of taste began to wear ready-made garments. A few leading houses in New York led the way, and, though progress was slow, little by little the early prejudice, founded upon the character of the "slop" clothes first introduced, was overcome. Men who had fancied that they could never wear "hand-me-downs," as they were vulgarly called, soon found that in respect neither of style nor of material was the best ready-made clothing inferior to the handiwork of the merchant tailor. That point being once made clear, there was a wonderful advance in the quality of goods manufactured, until to-day one can hardly fancy what an uphill road the early manufacturers traveled before the high quality of their wares was recognized. Now perhaps nine tenths of the men and boys of the country wear clothing made ready to put on, and they are as well dressed as the other one in ten. The custom tailor still has, and I do not doubt will retain, a monopoly of those extreme fancies of the fashionable which justify their claims to exclusiveness. But the multitude is clothed by the clothier, not by the tailor, if that distinction be recognized. And if it be true, as I think it is, that the condition of a people is indicated by its clothing, America's place in the scale of civilized lands is a high one. We have provided not alone abundant clothing at a moderate cost for all classes of citizens, but we have given them at the same time that style and character in dress that is essential to the self-respect of a free, democratic people. In Europe no such advance has been made as yet, although a considerable quantity of ready-made clothing is manufactured in Germany, France, and England. They have not, however, progressed far beyond the point at which we started.

Statistically speaking, the figures of the trade are difficult of access. In 1860 there were 303 manufacturers in New York, making goods to the amount of $17,011,370; and there were 352 manufacturers in Philadelphia, producing goods worth $9,984,497. According to the census office reports we find that in 1900 woolen goods and worsteds manufactured in the United States amounted in value to $238,744,502, and cotton and silk manufactures respectively to $339,200,320 and $107,256,258.

More than three fourths of the woolen cloth made in this country is consumed in the manufacture of ready-made clothing, the remainder going to the individual merchant tailors. A considerable proportion of imported woolens is used also in goods of the better class.

The figures that follow are from the United States census returns for the six years indicated in the table. They present, more compactly than I could put the facts in any other form, a view of the extent and development of the clothing industry since 1850. It must be stated that the figures for 1850 include the clothing and tailoring trades together. Here is the summary:

PRODUCTION OF MEN'S GARMENTS.

Year	Capital	Wages	Materials	Products
1850....	$12,509,161	$15,032,340	$25,730,258	$48,311,709
1860....	27,246,093	19,856,426	44,149,752	80,830,555
1870....	50,223,380	30,746,579	86,794,706	148,660,253
1880....	79,861,696	45,940,353	131,363,282	209,548,460
1890....	128,253,547	51,075,837	128,846,857	251,019,609
1900....	120,620,351	45,505,778	145,295,248	276,861,607

It was about the year 1870 that art entered definitely into the manufacture of clothing. Following the panic of 1873 there was a great increase in the patronage of the ready-made clothing dealers. At that time the quality of the goods made was raised, and the competition between the clothiers and tailors was more nearly on even terms.

Of the furnishing-goods trade I can speak only at second-hand. In the year 1820 nearly all of New York's wholesale business was located in Pearl, Water, Cliff, and adjacent streets south from Fulton Street; and William Street was the great thoroughfare of the New World metropolis — then a city of 120,000 inhabitants. Two years later, in 1822, was established the firm of Luke Davies, which later became Luke Davies & Son, and subsequently passed out of existence with the failure of their successors, Robert K. Davies & Company, in 1890. Luke Davies was not only the father of what has since grown to be a large branch of trade, but also the godfather, as he gave the industry its name of "furnishing goods." It was in a building at the corner of William and John streets that this firm had its rise. At that time traveling salesmen had not been invented, and the annual or semi-annual visit of the country merchant to New York was an event for him,— and for the jobber,— for during the spring and fall seasons the rush of trade was enormous. Of the country buyers visiting New York, those from the east and north came by Long Island Sound or the North River on sloops or schooners. Over the wholesale and retail stores were boarding-houses where the country merchants stayed while buying goods. There were not many American manufacturers then, and nearly everything that one could wear was imported.

The origin of the men's furnishing trade began with the demand for custom shirts; and as the business of manufacturing shirts increased, other lines were added, as, for example, the making of "stocks" (for neckwear), suspenders, and jean underwear.

Out of the house of Luke Davies have come nearly all of the long-established houses now existing in the trade. In 1857 Joseph S. Lowrey left Davies to organize the firm of Lowrey, Donaldson & Company, which is now conducted under the firm name of Joseph S. Lowrey & Company; in 1867 Messrs. Fisk and Flagg also left the Davies establishment and founded the present firm and business of Fisk, Clark & Flagg; and from these two branches have grown many of the firms which now control the largest lines in special departments in the manufacture of men's wear.

In 1832 the shirt trade of America was founded as a systematic industry by David & Isaac N. Judson, at that time prosperous clothing merchants in William Street. They had considerable trade with the south,— for in that day luxurious expenditure was mainly confined to that section,— and orders for clothing were frequently accompanied by orders for "custom-made" shirts, whose execution they entrusted to casual seamstresses. Orders for this class of goods increased steadily, and soon a regular department became necessary; and out of this grew the manufacture of "stock" shirts, in distinction to custom-made. What was incidental before 1832, in that year had become of sufficient importance to require a separate establishment, and the first shirt factory in America was founded at the corner of Cherry and Market streets, New York. The old building is standing yet, in a district not much altered by the passage of 60 years, and looking much as it did then, except for the change in the human surroundings that attends the expansion of a little city into a great metropolis. For eight years the Judsons were the only manufacturers of shirts. In 1840 the house of Davies established their factory, and the firm of T. A. Morrison & Company also began operations, the latter firm still existing under the title of Hutchinson, Pierce & Company. The manufacture of each of the articles which are comprised in the aggregation known as men's furnishing goods has become a separate industry within the last decade, and the trade is now divided into many branches, of which shirts, collars, and cuffs, underwear, neckwear, hosiery, etc., each forms a distinct industry, requiring special skill and special machinery in its manufacture.

It is interesting to recall the fact that the inventor of the Winchester firearms was one of the early manufacturers of shirts; and the circumstances under which he found himself in the business are curious. He was a carpenter in Baltimore, and had fitted up a furnishing-goods store there for a man who had previously failed. Mr. Winchester took the stock as security for his bill, and came to New York for advice as to the expediency of continuing the business himself. He went to New Haven in the early forties to open a shirt factory, and began with one assistant to cut out shirts. It was not long before he was turning out 2,000 dozen a week. But Mr. Winchester was a restless genius, and with the outbreak of the War he turned his attention to firearms, and became interested in the manufacture of the weapon that has since made his name famous.

WM. C. BROWNING,
Browning, King & Company, New York.

Clotho, one of the three Fates or Destinies who are represented by the ancient classical writers as spinning the thread of life. Clotho held the distaff, Lachesis spun the thread which Atropos cut when the span of life was reached.

In zoology, Clotho is a genus of snakes of the tribe *Viperina*, family *Viperidæ*. *C. arietans* is the puff-adder of the Cape of Good Hope. In astronomy, Clotho, is the name of the 97th asteroid, discovered by Tempel 17 Feb. 1868.

Clotil'da, St., the daughter of Chilperic, king of Burgundy: b. 475; d. Tours 545. In 493 she became the wife of Clovis, king of the Franks. She was the chief means of securing the conversion of her husband to Christianity, and largely influenced his life. After his death she lived a life of austerity at Tours. She was canonized a few years after her death. Her remains were buried in the Church of St. Géneviève at Paris, and burned at the Revolution to prevent their desecration; the ashes are still in the Church of St. Leu.

Clôture, klō-tür. See CLOSURE.

Cloud, St., or **Clodoald,** son of Clodomir, and grandson of Clovis, king of France. After the death of his father, and the murder of his two brothers, he became a monk, and found refuge in a monastery near Paris, which took from him the name of St. Cloud. He died there in 560.

Cloud'berry, a plant (*Rubus chamæmorus*) called also knobberry, mountain bramble, and mountain raspberry, is found in peat-bogs and swamps from Maine and New Hampshire westward and northward to Alaska. The plant is of humble growth, the leaves few, large-lobed, and kidney-shaped, the flower large and white, the fruit orange-red, and of an agreeable flavor. It is a native of the northern parts of America, Europe, and Asia. In Great Britain it is chiefly confined to elevated moors. In Norway and Sweden it is much more abundant; the fruit is highly valued, and makes excellent preserves.

Cloud-burst, a sudden and violent rainfall, covering a limited territory, and of brief duration. It occurs in the hottest season, and most frequently on the slopes of mountains and in arid regions, and is generally accompanied by severe and continuous lightning. The cloud-burst is caused by the contact of a warm current of air, surcharged with moisture, with a cold current, the result being swift condensation and immediate precipitation of the water formed.

Clouds, masses of minute globules of water or crystals of ice and snow suspended in the atmosphere.

The minute globules of water that make the cloud are evidently condensed from the invisible moisture that is always present in the air in greater or less quantities. The studies of Aitken, J. J. Thompson, Wilson, and others have thrown considerable light on the processes of condensation. If pure, dry air,—that is, air from which all dust and traces of electricity have been removed,—be mixed with pure vapor of water, and the moisture be cooled below the temperature of saturation, it will be found that condensation of water vapor does not generally occur. If, however, fine dust be injected into the pure mixture without altering its temperature or pressure, a fine mist is developed at once. It has also been discovered that if a charge of electricity, however small, be introduced, condensation takes place at once. From these experiments it is inferred that nuclei of some sort, such as dust particles or electric particles, are necessary for the formation of water globules, other conditions being favorable.

The original classification of clouds by Howard in 1803 took account of form only. A more recent classification—the one now in general use—takes account of both the form of the cloud and its altitude. In this system three principal forms are recognized, namely, cirrus, cumulus, and stratus, with their modifications. These three main classes present the most obvious differences in form and shape; they develop at widely different altitudes and move with varying velocities. It is possible to further subdivide each class into a number of varieties, and in practice this is done when an observer becomes skilled in distinguishing the special forms and subdivisions of the main types.

The definitions of the principal types as recommended by the International Cloud Committee, and generally adopted by meteorologists, are given below.

Cirrus (Ci.).— Isolated feathery clouds of fine fibrous texture, generally of a white color, frequently arranged in bands, which spread like the meridians on a celestial globe over a part of the sky and converge in perspective toward one or two opposite points of the horizon. (In the formation of such bands Ci. S. and Ci. Cu. often take part.)

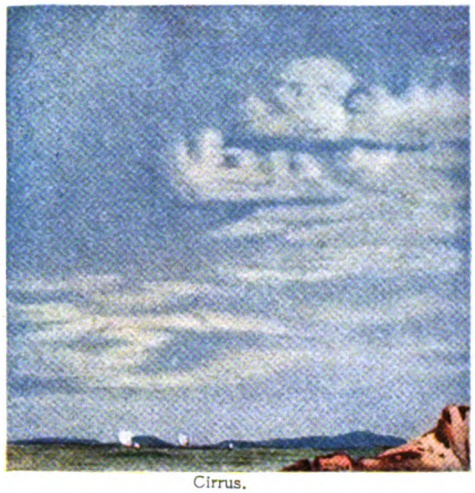
Cirrus clouds are the highest of all and move with the greatest velocity. They develop up to a height of about 10 miles, although their mean height is a little over 6 miles, being higher in summer than in winter. Their average velocity in winter is about 75 miles per hour, and in summer 65 miles per hour. They may be formed by mixture of air strata of different temperatures, or by the cooling of a moist streak in the upper atmosphere by expansion and radiation. In the latter case, if the surrounding air be very dry, the newly formed cloud is soon dissipated.

Cirro-stratus (Ci. S.).— Fine whitish veil, sometimes quite diffuse, giving a whitish appearance to the sky, and called by many cirrus haze, and sometimes of more or less distinct structure, exhibiting tangled fibres. The veil often produces halos around the sun and moon.

This cloud, as its name indicates, is one of the composite forms. Its structure is much on the same order as that of pure cirrus; in fact it is generally composed of cirrus fibres tangled and interlaced in a most complex manner. The variety of forms, however, is practically unlimited, and it undergoes rapid changes, especially in advance of a cyclonic disturbance. Like cirrus, it is composed of crystals of snow or ice, develops at a great elevation and moves with high velocity.

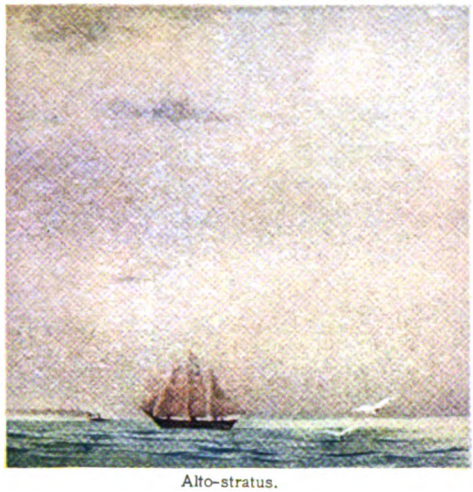
Cirro-cumulus (Ci. Cu.).— Fleecy cloud. Small white balls and wisps without shadows, or with very faint shadows, which are arranged in groups and often in rows.

This is a broken layer of cloud, of which the component masses are not fibrous, like cirrus, but more or less rounded. A second, although rather rare form of cirro-cumulus is the mackerel sky of northern Europe. The cloudlets in this case are rounded, but not fleecy. The altitude of cirro-cumulus ranges from four to six miles, and its movement, like cirrus and cirro-stratus, is quite rapid.

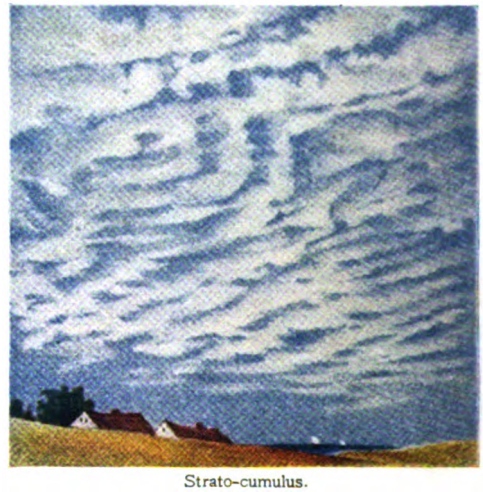


Cirrus.

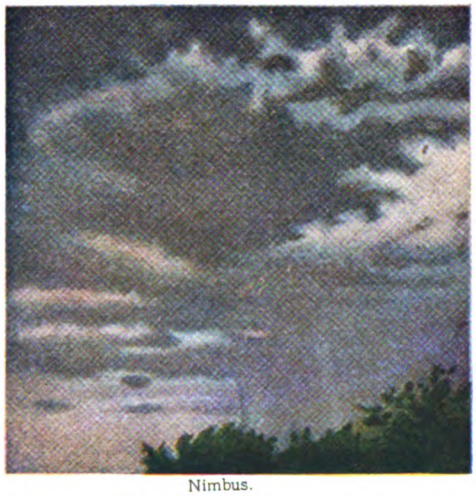
Curris.



Alto-stratus.

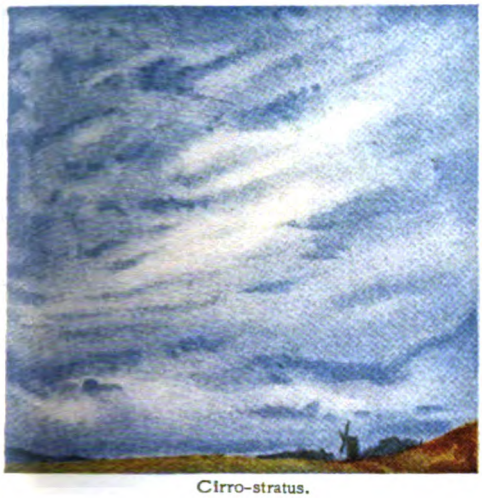


Strato-cumulus.



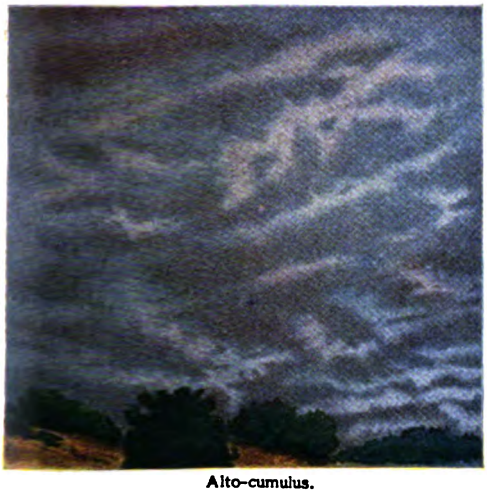
Nimbus.

Cumulus.



Cirro-stratus.

Cirro-cumulus.

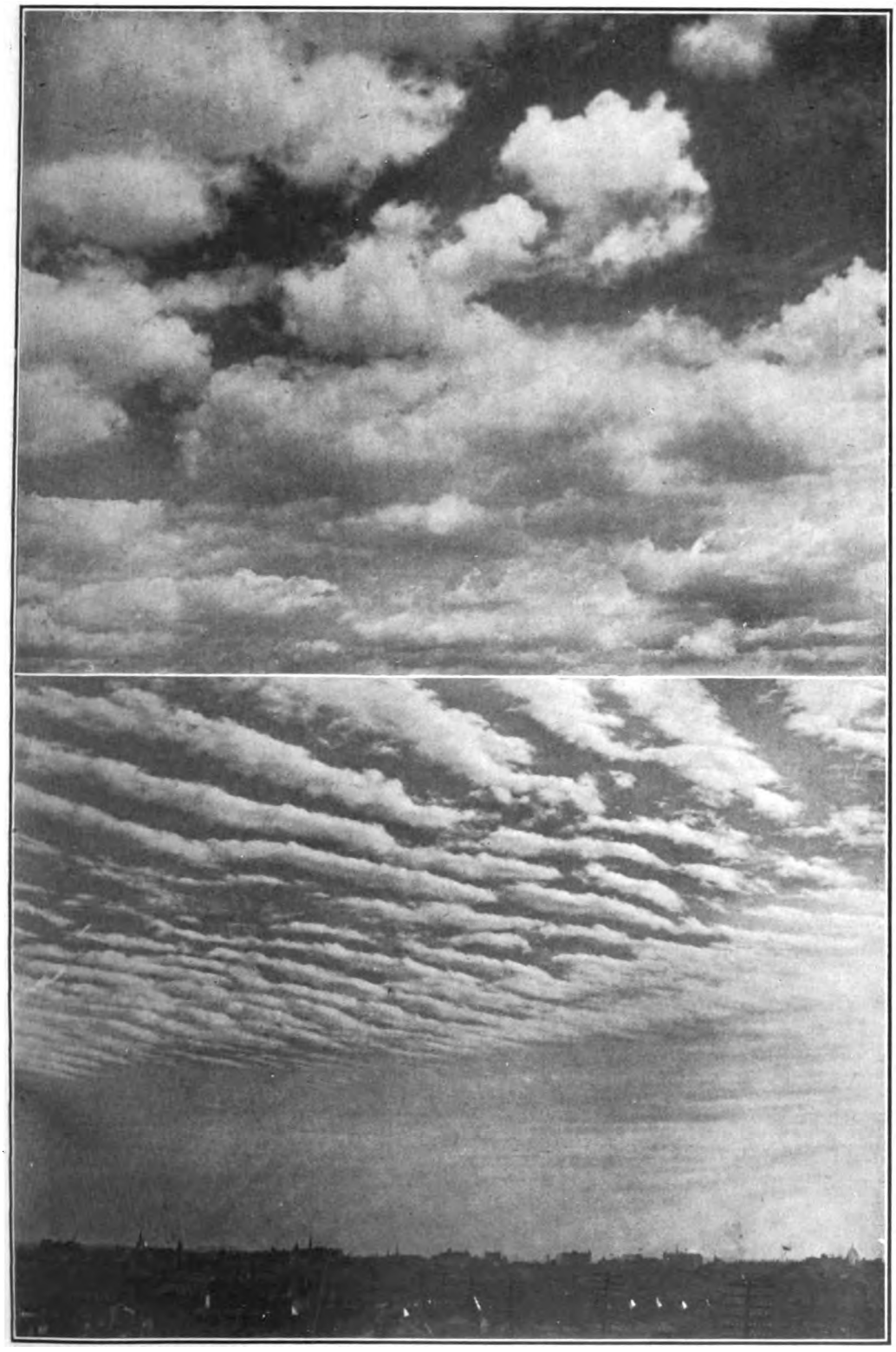


Alto-cumulus.

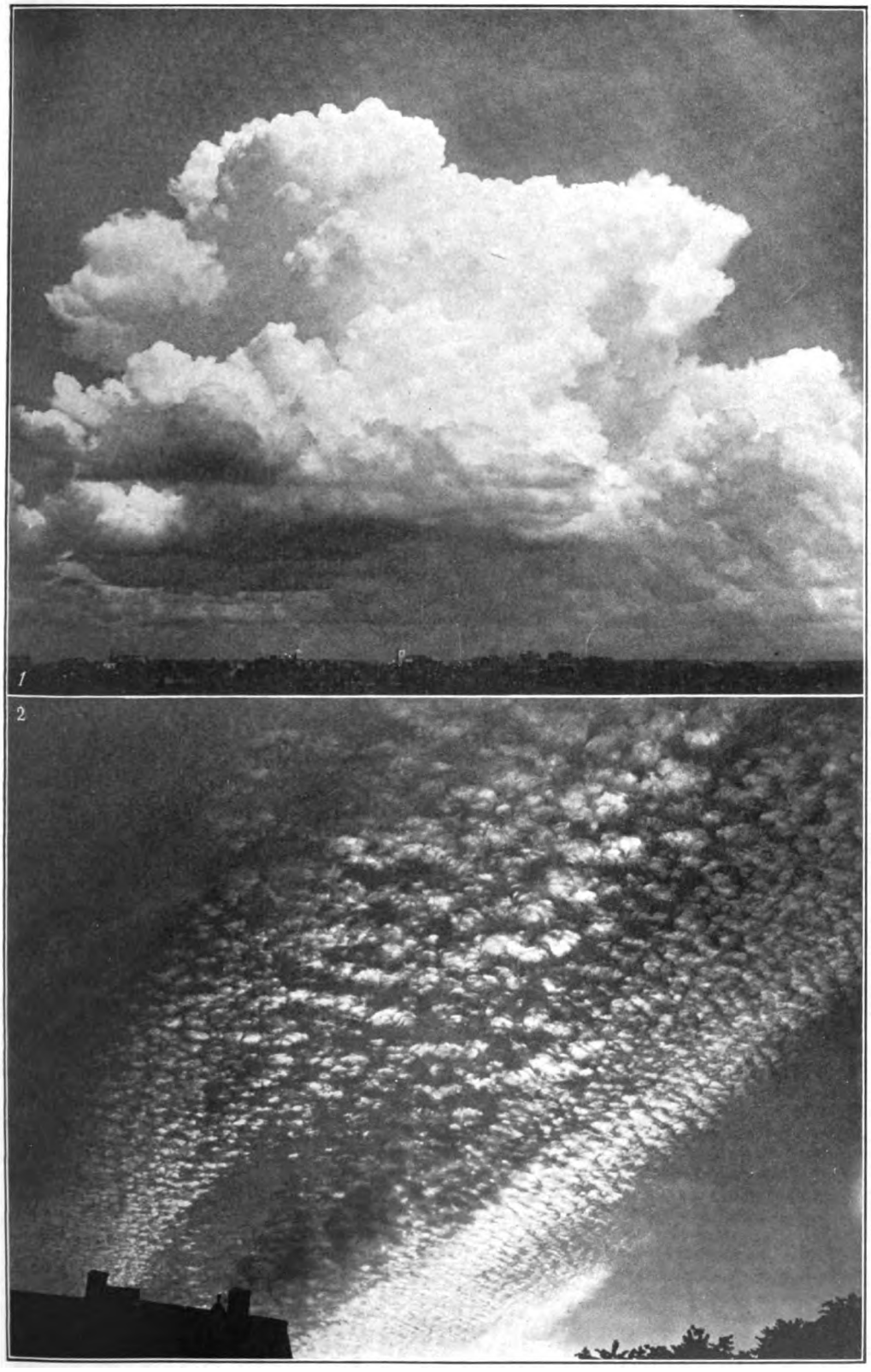
Nimbus.

Cumulus.

Cumulus-nimbus.



1. CUMULUS. 2. STRATO-CUMULUS.



1 CUMULUS

2. CIRRUS

Cumulus (Cu.).— Woolpack clouds. Thick clouds whose summits are domes with protuberances, but whose bases are flat. These clouds appear to form in a diurnal ascensional movement which is almost always apparent. When the cloud is opposite the sun the surfaces which are usually seen by the observer are more brilliant than the edges of the protuberances. When the illumination comes from the side this cloud shows a strong actual shadow; on the sunny side of the sky, however, it appears dark with bright edges. The true cumulus shows a sharp border above and below. It is often torn by strong winds, and the detached parts (fracto-cumulus) present continual changes.

This cloud is undoubtedly formed by the condensation of water vapor in the summit of an ascending column of air. The flat base of the cloud marks the level when the condensation temperature is reached, and the upper dome-shaped summit represents the head of the air column protruding into colder space. In the temperate latitudes it is usually a cloud of the warm season and forms at an altitude of about a mile above the surface of the earth. Its average rate of movement ranges from about 20 miles per hour in summer to 30 in winter. There are many special varieties and forms of cumulus cloud.

Alto-cumulus (A. Cu.).— Dense fleecy cloud. Larger whitish or grayish balls with shaded portions, grouped in flocks or rows, frequently so close together that their edges meet. The different balls are generally larger and more compact (passing into S. Cu.) toward the centre of the group, and more delicate and wispy (passing into Ci. Cu.) on its edges. They are very frequently arranged in lines in one or two directions.

Alto-cumulus clouds may occur when the ascending currents are not strong enough or do not persist long enough to form thick cumuli, or they may represent the vapor that is condensed in the upper portion of a series of atmospheric waves as suggested by Von Helmholz. The alto-cumulus level ranges from one and a half to two miles. It is higher than the cumulus level, although the summits of cumulus clouds often penetrate into and above it. The mean velocity of alto-cumulus clouds is about 40 miles per hour, being somewhat higher in winter and lower in summer.

Cumulo-nimbus (Cu. N.).— Thunder cloud; shower cloud. Heavy masses of clouds, rising like mountains, towers, or anvils, generally surrounded at the top by a veil or screen of fibrous texture ("false cirrus") and below by nimbus-like masses of clouds. From their base generally fall local showers of rain or snow, and sometimes hail or sleet. The upper edges are either of compact cumulus-like outline, and form massive summits, surrounded by delicate false cirrus, or the edges themselves are drawn out into cirrus-like filaments. This last form is most common in spring showers. The front of thunderstorm clouds of wide extent sometimes shows a great arch stretching across a portion of the sky, which is uniformly lighter in color.

Cumulo-nimbus clouds are of massive dimensions and the most impressive of all clouds in the realm of nature. The upper surface of this cloud, which is sharp and well defined in the earlier stages of its formations, becomes soft and wispy soon after rain begins to fall from its base. The cloud itself may be divided into three planes, namely, the lower, consisting of vapor, the middle of water, and the upper of ice or snow. The tops of some of these clouds reach 6 or 8 or even 10 miles into the atmosphere. Prof. Bigelow computes that the temperature in one of the loftiest of these clouds ever observed fell from 79.5° F. at the ground to —74° F. at a height of nearly nine miles.

Stratus (S.).— Lifted fog in a horizontal stratum. When this stratum is torn by the wind or mountain summits into irregular fragments they may be called "fracto-stratus."

This cloud, as its name implies, is merely a horizontal sheet floating at a low elevation and without any special structure. It is generally formed by the intermingling at the surface of contact of air strata of different temperatures, and it indicates a horizontal flow of air rather than an ascensional movement in the case of cumulus clouds.

The average elevation of stratus clouds is less than half a mile, and their average velocity about 15 miles per hour.

Strato-cumulus (S. Cu.).— Large balls or rolls of dark cloud, which frequently cover the whole sky, especially in winter, and give it at times an undulated appearance. The stratum of strato-cumulus is usually not very thick, and blue sky often appears in breaks through it. Between this form and the alto-cumulus all possible gradations are found. It is distinguished from nimbus by the ball-like or rolled form, and because it does not tend to bring rain.

This cloud is not sufficiently uniform to be called stratus, nor sufficiently lumpy to be called cumulus. It is a cloud of moderate elevation, about 9,400 feet in summer, and 7,800 feet in winter, and its rate of movement varies from 20 to 30 miles per hour. It is often a thin cloud through which patches of blue sky can be seen. Again it covers the sky completely, and presents a gentle undulating surface with a tendency to break up into long parallel rolls or bars.

Alto-stratus (A. S.).— Thick veil of a gray or bluish color, exhibiting in the vicinity of the sun and moon a brighter portion, and which, without causing halos, may produce coronæ. This form shows gradual transitions to cirro-stratus, but, according to the measurements made at Upsala, was only one half the altitude.

The average height of this cloud is about three and a half miles in summer and three miles in winter. Its average velocity ranges from 40 to 50 miles per hour.

Nimbus (N.).— Rain cloud. Dense masses of dark formless clouds with ragged edges, from which generally continuous rain or snow is falling. Through the breaks in these clouds there is almost always seen a high sheet of cirro-stratus or alto-stratus. If the mass of nimbus is torn up into small patches, or if low fragments of cloud are floating much below a great nimbus, they may be called "fracto-nimbus" ("scud" of the sailors).

As soon as rain falls from a cloud it is called a nimbus, whatever its form before the beginning of rain, with one exception, namely, when rain begins to fall from a lofty cumulus cloud it is called a cumulo-nimbus to distinguish it from a system of pure nimbus clouds, the latter being flatter and more in the nature of a sheet cloud.

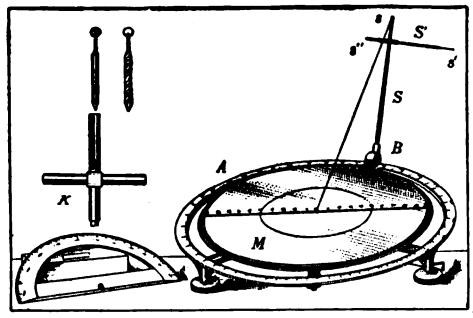
Colors of Clouds.— The brilliant colors sometimes assumed by clouds at sunrise and sunset are probably caused by selective absorption and reflection of light by dust particles or vapor haze in the atmosphere. The clouds of the day-time, especially those having a great elevation, are white, since they reflect the greater part of the light incident on them.

The bases of cumuli are generally of a dark shade, while the portions in shadow are mostly of a pearl gray.

Thunder clouds sometimes have an olive-green tint, and this is thought by some observers to portend high winds and heavy rainfall.

Utilization of Clouds in Weather Forecasts. — This subject has been the subject of considerable study by Ley, Abercromby, and others in Europe, and by McAdie, Clayton, and the writer in the United States. In forecasting weather changes from synoptic charts the clouds frequently show the advance of a cyclonic disturbance, but not before the same information is given by the circulation of the surface winds and the fall in the barometer. Unfortunately it is not possible to fully describe and telegraph the significant features of the various cloud forms so that they may be available at a central weather station; in the case of a solitary observer, however, some skill in making local predictions of the weather may be attained by a careful study of cloud forms in connection with falling weather.

Methods of Observation. — The kind, amount, and direction of clouds form a part of meteorological observations whether made for purposes of weather forecasting or for purely climatic studies. In the last-named event it is chiefly desired to know the extent of sky covered with cloud on the average of the season, since one is then able to judge of the nature of the climate with respect to sunshine. In weather forecasting it is important to know, not only the kind of cloud observed, but both its direction and apparent velocity, although in actual practice the last named is rarely attained. This information is best obtained by means of the nephoscope. An excellent form of nephoscope was devised by Prof. C. F. Marvin, United States Weather Bureau, in 1896. Prof. Marvin's nephoscope is shown in the illustration.



The Improved Nephoscope.

The circular frame, A, is mounted upon three leveling-screws, and its upper surface is graduated to degrees, numbered from 0 to 360, the numbers increasing in a direction contrary to the direction of motion of clock hands. The plate and mirror, M, revolve smoothly within the circular rim, A, being carried upon a hollow vertical axis at the centre. The arm, B, carrying the sighting staff, S, also revolves upon the central axis, the outer end traversing the narrow annular space between the mirror and graduated rim. The staff, S, is telescopic in construction, and is attached to the arm at B by a hinge which permits the staff to be inclined from the vertical to any extent, but always in a plane perpendicular to the mirror. The top portion of the staff is provided with a crosshead, which is surmounted by a small sighting-knob, s. The crosshead is adapted to receive the secondary staff, S', which slides with gentle friction through the crosshead, and is tipped at either end with small secondary sighting-knobs, s' and s''. By reason of the telescopic construction of the staff, S, the crosshead can not only be turned about in any direction, but it and the sighting-knob, s, can be raised by various amounts, being held in place by friction. The hinge at B is made in such a manner that when the staff, S, is placed in a vertical position, the small rod sliding inside can be forced down into a hole in the hinge, the effect of which is to lock the hinge so that the staff is held rigidly in a vertical position.

In using the nephoscope the observer looks down upon the mirror, M, and observes the reflection of the cloud. By moving his eye he brings a point of the cloud image and the reflection of the sighting-knob, s, into coincidence at the centre of the mirror. The head should be held so that the knob is always seen at the centre of the mirror. The cloud image will then appear to move away from the centre of the mirror. The mirror is then revolved until the graduated line becomes parallel with the motion of the cloud, when its direction of motion may be read off and its apparent velocity determined by timing the image as it passes along the graduated scale of the mirror.

Other forms of the nephoscope have been devised and used, mostly in European countries, and Prof. Cleveland Abbe, of the United States Weather Bureau, has devised a very convenient form of nephoscope for use on vessels at sea.

In determining the height of clouds, direct observations of their angular altitude are made by two observers at the ends of a measured base-line, whence the altitude may be computed by trigonometric formulæ. The same results may be obtained by photography, but the method is not so direct, and the computations are more laborious.

ALFRED J. HENRY,
Prof. of Meteorology, U. S. Weather Bureau.

Clouds, The, a comedy by Aristophanes; acted in 423 B.C. Though one of the most interesting and poetic of the author's plays, the people refused to hear it a second time. But its literary popularity counterbalanced its failure on the stage.

Clouet, kloo-ā, French family of artists, descendants from Flemish ancestry. 1. JEHAN, yā'hän, the first known of the family, was in 1475 a resident of Brussels. 2. His son JEHANNET, yā-hän'nĕt: b. 1485; d. 1541, migrated to France and located at Tours. In 1518 he went to Paris and became court painter to Francis I. A portrait of the king, in the Louvre, is said to have been painted by this artist, also another portrait of the king, in the Pitti Gallery, Florence, is credited to him. Several other pictures in European galleries are said to have been painted by him. In all the style is that of the Flemish school. 3. FRANÇOIS, frän-swä, son of Jehannet: b. 1510; d. 1572. succeeded his father as court painter to Francis I., and retained the position under Henry II., Francis II., Charles IX., and Henry III. His

works are mentioned in the records of the court. Some authorities mention a brother of François, but of him nothing positive is known.

Clough, Anne Jemima, English educator: b. Liverpool, Eng., 20 Jan. 1820; d. Cambridge 27 Feb. 1892. She was a sister of Arthur Hugh Clough (q.v.), and after a girlhood spent in Charleston, S. C., opened a day school in 1842. Becoming interested in the general subject of education the North of England Council for Promoting the Higher Education of Women was founded through her efforts, and from this sprang the idea of the Cambridge higher local examinations. Lectures for women having been established at Cambridge in 1869 Miss Clough, in October 1871, took charge of a house of five women students, out of which grew the present Newnham College, over the administration of which she presided until her death. During her busy career she accomplished much for the higher education of English women. See B. A. Clough, 'Memoir of Anne J. Clough' (1897).

Clough, klŭf, **Arthur Hugh,** English poet: b. Liverpool 1 Jan. 1819; d. Florence, Italy, 13 Nov. 1862. He studied under Arnold at Rugby, then at Balliol College, Oxford, and became a fellow of Oriel College in 1842. In 1848 he visited Paris, and spent the winter of the following year in Rome. In 1849 he became head of University Hall, London, but resigned in 1852 and went to America, where he lived for a few months at Cambridge, Mass. On his return next year he was appointed an examiner in the education office. His poems were published, along with a genial memoir, by F. T. Palgrave in 1862; his poems and prose remains, with letters and a memoir, were also published by his wife in 1869. 'The Bothie of Tober-na-Vuolich' (1848), is his best known poem; others are 'Dipsychus' and 'Amours de Voyage.' They are masculine and vigorous in tone, and contain many noble thoughts, and strokes of genuine humor, alternating with passages of deep pathos and tenderness. He is affectionately commemorated in Matthew Arnold's 'Thyrsis' and 'Scholar Gipsy.'

Clough-Leighter, klŭf'-lā'tėr, **Henry,** American organist and composer: b. Washington, D. C., 13 May 1874. He studied at Columbia University 1887–9, and at Trinity University, Toronto, Canada. He was organist at various Washington churches 1890–99, of Grace Church, Providence, R. I., 1899–1900, and since 1900, has been instructor in musical ethics and theory in the Howe School of Music, Boston, Mass. Among his many compositions are a Festival Service in D major (1896); 'Te Deum Laudamus,' G major (1898); 'Te Deum Laudamus,' G minor (1901); song, 'Like a Rose Should Be' (1901).

Clous, John Walter, American soldier: b. Germany 9 June 1837. He came to America in 1855 and engaged in business. He enlisted in the United States army 2 Feb. 1857, and was promoted second lieutenant 29 Nov. 1862. He took part in the siege of Yorktown, the Seven Days' battles in June 1862, Malvern Hill, Second Bull Run, Antietam, Frederickburg, Chancellorsville, and Gettysburg, being twice brevetted for gallant conduct at the latter. He served on the frontier and in Indian campaigns 1868–86, as judge advocate in many important trials and cases 1862–86, was assistant to the judge advocate-general 1886–90, and professor of law at West Point 1890–6. During the Spanish-American war he was appointed a brigadier-general of volunteers, and served on the staff of Maj.-Gen. Miles. He attained his lieutenant-colonelcy 12 Feb. 1892. He is the author of lectures on 'Military and Martial Law and Suspension of the Writ of Habeas Corpus,' delivered at Union College in the Butterfield lecture course.

Clove, the unexpanded flower-bud of an East Indian tree (*Caryophyllus aromaticus*) somewhat resembling the laurel in its height and in the shape of its leaves. The flowers grow in clusters, and the petals are small, rounded, and of a bluish color; the seed is an oval berry. The Molucca Islands, where the raising of different spices was formerly carried on by the Dutch colonists to a great extent, appear to be the native land of the clove, and the best are still brought from that quarter. At one time, however, in order to secure a lucrative branch of commerce in this article to themselves, the Dutch destroyed all the trees growing in other islands, and confined the propagation of them to that of Ternate. But both clove- and nutmeg-trees were transplanted from the Moluccas into the islands of Mauritius and Bourbon, and the clove is now cultivated with success in many warm countries, including Zanzibar and the West India islands. At a certain season of the year the clove-tree produces a vast profusion of flowers. The operation of gathering is performed between the months of October and February, partly by hand, partly by hooks, and partly by beating the trees with bamboos. The cloves are subsequently dried by exposure to the smoke of wood fires, afterward to the rays of the sun. When first gathered they are of a reddish color, but by drying they assume a deep-brown cast. This spice yields a very fragrant odor and has a bitterish, pungent, and warm taste. It is most frequently used in culinary preparations. When fresh gathered, cloves will yield, on pressure, a fragrant, thick, and reddish oil; and by distillation a limpid essential oil.

The medical value of cloves is due to the presence of eugenol, $C_{10}H_{12}O_2$, in the volatile oil. Eugenol is extremely active, acting like the phenol, or carbolic acid group, to which it is related. Clove is a marked local anæsthetic, a strong antiseptic and bactericide, an excellent stimulant to the sympathetic nervous system, expelling flatus from the stomach and the intestines, by increased peristalsis, and increasing the flow of the gastric and intestinal juices. Its value in toothache is due to its anæsthetic and bactericidal properties. A number of new compounds of eugenol are on the market. Benzoyl-eugenol and cinnamyl-eugenol are used in the treatment of tuberculosis.

Clove-bark, the bark of various aromatic trees, used in the manufacture of drugs and spices. A tree (*Dicypellium caryophyllatum*) of Brazil supplies a cinnamon-like cylinder which is commonly known as clove-bark in the American markets, and is used in medicine as cassia caryophyllata. The name is often given also to culilawan and cinnamon.

Clove-pink, or **Clove gilly Flower,** the carnation (*Dianthus caryophyllus*), more especially a whole-colored, clove-scented variety of it.

Clover, Lewis Pierre, American lawyer and journalist: b. Springfield, Ill., 1864. He was educated at Racine College, Wisconsin, and admitted to the bar of Illinois in 1885. He is a great-grandson of Ninian Edwards, a former governor of Illinois, and grandson of Ninian W. Edwards, a distinguished Illinois lawyer. He is a grand-nephew of Mary Todd Lincoln. He has been a member of the staff of the New York *Evening Sun* for several years, writing upon legal subjects and proceedings.

Clover, species of the genus *Trifolium,* belonging to the pea family (*Papilionaceæ*) and to the natural order *Leguminoseæ.* Of *Trifolium* about 300 species have been described; they are most abundant in the north temperate zone, a few in South America and South Africa. Some are very important in agriculture, either for pasturage, fodder, or for soil-improvement.

The word "clover" is also applied to species of related genera, as bur-clover (*Medicago*), sweet clover (*Melilotus*), bush and Japanese clovers (*Lespedezas*), prairie clover (*Petalostemon*), etc.

The true clovers (*Trifolium*) are herbs with mostly three foliate leaves; purple, pink, white, or yellow small flowers in dense heads or spikes; and straight membranous pods containing one to four seeds.

The most important species to the farmer is the common red clover (*Trifolium pratense*), now naturalized here, but believed to be a native of Europe and northern Asia. It has been grown in England for over 300 years. It is a more or less hairy perennial, growing from six inches to two feet high. The leaflets are usually three in number, short-stalked, springing from the same point, oval, and often having a whitish horseshoe mark in the centre. The flower-heads are dense, oval or ovoid, about one inch long; florets sessile or nearly so, red, rarely white, remaining erect in fruit; calyx sparingly hairy. It is one of our best forage plants for nutritive value, high yield, and good range of adaptability; it is commonly found in meadows and pastures, and is used as a green manure. It flowers from April to November. The seed weighs about 60 pounds to the bushel, and, if sown alone, 10 to 12 pounds will sow an acre.

Perennial red clover (*Trifolium pratense perenne*) may be regarded as an offshoot of common clover, from which it differs in being of longer duration and hardier. Zigzag clover, Cow-grass and Marl-grass or Mammoth clover (*Trifolium medium*) may be an offshoot of *T. pratense,* from which it differs in being a larger plant, having zigzag stems, the flower heads larger, longer stalked, and often of a deeper purple color, with a practically smooth calyx tube. The leaflets have no horseshoe mark. It is native of Europe and Siberia and blooms during the summer.

Alsike or Swedish clover (*Trifolium hybridum*) is an erect perennial, growing one to two feet high. Its flowers are pink to white and are open about the same time as those of timothy. It is suited to heavy clay soils and is the only clover that will stand irrigation. It has smaller and shallower roots than common clover. It is sometimes sown alone, when, owing to its small seed, four pounds per acre is sufficient. It is better suited to mixtures. It was introduced into Great Britain from Sweden in 1834.

White, Dutch, or honeysuckle clover (*T. repens*) is a common perennial, low-growing plant with white to pinkish flowers, native of Europe, Siberia, and perhaps of the northern United States. Its method of seeding makes it permanent. As its yield is small it is seldom grown alone, but is often incorporated in mixtures. It is a bee-plant and is common on nearly all soils. See DUTCH CLOVER.

Crimson, carnation, Italian or scarlet clover (*T. incarnatum*) is an erect, hairy annual, growing six inches to three feet high. The leaflets are nearly sessile, the flower-heads are terminal, oblong, or ovoid, one to two and a half inches long; flowers red, purple, pink, or white, sessile; calyx hairy. It is often grown as a catch or cover crop in orchards, etc., and sometimes for grazing and hay. It is quite ornamental and is now grown by the florist.

Yellow clover or hop clover (*T. agrarium*) is a hairless or slightly hairy annual clover, growing 6 to 18 inches high, with small yellow flowers which are open between May and September. It is common along roadsides and waste places.

T. procumbens is also called yellow clover, or hop clover; it is more spreading and hairy than the above. It is common on dry soils.

Alexandrian or Egyptian clover (*T. alexandrinum*) is an annual, bearing oval, pale yellow, or whitish flowers. As it is an important fodder in Egypt it is presumed that it will be of value for the southern States.

Moliner's clover (*T. molineri*) is a biennial with pale flowers. Rabbit-foot, stone or old field clover (*T. arvense*) is a common annual of no value.

T. dubium or *minus* is the least hop clover or hop-trefoil, also called yellow suckling clover, and is regarded by some as the true shamrock.

Uses and Feeding Value.— Clovers are grown for hay, pasture, soiling, silage, green-manuring, cover-crops, and soil improvement. Clovers or some other legume should have a place in every rotation, because of their deep, fleshy root system and capacity for appropriating free nitrogen from the air in the soil by means of bacteria on their roots. Their deep roots penetrate the subsoil and transfer valuable plant food to the surface soil, which is liberated when they decay. It has long been known that the growing of legumes improved the soil; Pliny recommended that such crops be grown previous to grain crops. The wisdom of this is now supported by recent research. In 1888 it was announced that the nodules on the roots of leguminous plants were colonies of bacteria, and that their work was to take up nitrogen from the soil-air for the benefit of their host; hence we have the fact that a large quantity of nitrogen may be removed from the soil for a series of years in the form of clover-hay or alfalfa hay — yet the surface soil be richer in nitrogen at the end of the period than it was at the beginning. Plowing a crop of clover under as green-manure is a very effective way of enriching the soil in humus. This is now practised in orchards to a considerable extent; the tillage they receive and the

crops removed rapidly deplete the fertility of the land, hence the introduction of the practice of seeding down the orchards during the summer with some legume, as crimson clover, cow-peas, soy-beans, etc., to add humus, protect the land from washing during the fall and winter, and in wet seasons, by using up the moisture, to aid in maturing the buds of the trees and enable them to stand the winter; the crop being plowed under the following spring when cultivation begins.

The average percentage composition of clover is given as —

	Protein	Nitrogen-free extract	Ether extract	Crude fibre	Ash	Water
Red clover, green..	4.4	13.5	1.1	8.1	2.1	70.8
Alsike clover.....	3.9	11.0	0.9	7.4	2.0	74.8
Red clover, silage..	4.2	11.6	1.2	8.4	2.6	72.0
Red clover hay....	12.3	38.1	3.3	24.8	6.2	15.3
Alsike clover hay..	12.8	40.7	2.9	25.6	8.3	9.7

With ruminants the average coefficient of digestibility is —

	Dry matter	Protein	Nitrogen-free extract	Crude extract	Crude fibre
Red clover, green..	66	67	78	65	53
Red clover hay....	61	62	69	62	49

At the Wisconsin station, clover cut three times in one year yielded 25 tons of green forage per acre; this may be regarded as a maximum yield. The first cutting, made 29 May contained only 8.2 per cent of dry matter, and was on this account unsatisfactory as a soiling crop, although, generally speaking, this crop is a most valuable one for this purpose, being relished by all stock. The total dry matter contained in the three crops was nearly four tons per acre.

If given in excess while green, or grazed, it is liable to cause bloat. To prevent this, give dry fodder in addition, and do not turn the animals out when they are very hungry or the dew is on. Clover pasture is excellent for growing pigs, and they may be fattened on it.

Experience has shown that the best time to cut clover for hay is when one third of the heads are turning brown. As ordinarily cured it is liable to be dusty, hence it is not considered a satisfactory feed for horses. For growing and idle horses, bright, clean clover hay is both economical and valuable. Hay from over-ripe crimson clover is dangerous for horses; the bristly hairs, accumulating in the intestines, form balls, causing stoppages and death. Clover hay is a most valuable forage for cattle, especially milch cows; 10 to 12 pounds may be fed daily, its high nitrogen content permitting a reduction of the amount of concentrated feed. It is one of the best coarse fodders for sheep, and when chaffed fine is used for feeding laying hens in winter.

Clover Diseases.—The common diseases are: Clover rust (*Uromyces trifolia*), which appears in various stages on the leaves, leaf-stalks, and stems of the plant, particularly white clover. White minute cups appear in spring or early summer, accompanied or followed by small brown spores, which are finally followed by darker spores which live through the winter and germinate the following spring.

Clover rot (*Sclerotinia trifoliorum*) attacks many legumes. The disease causes a browning of the stem and leaves, which are soon spotted with a white mold, which ultimately forms solid, wavy black bodies often half an inch long. These produce mushroom-like bodies the following spring. Burning over the infested field and a proper rotation of crops are advocated for both diseases.

A leaf-spot (*Pseudopeziza trifolii*) is often destructive, especially during a wet fall. The leaves are covered with small black spots. Dodder (q.v.) is a parasitic plant responsible for considerable loss in some places.

Clover Insects.— Of the various insects which injure clover the following are prominent: The clover-root borer (*Hylastes trifolii*) which has in some sections killed out the clover the second year, thus necessitating a change in the rotation of the crops. The clover-stem borer (*Languria mozardi*) is widely distributed. The clover-leaf beetle (*Phytonomus punctatus*) is a weevil which feeds at night, consuming all parts of the plant. The clover-leaf midge (*Cecidomyia leguminicola*) is one of the worst pests; the eggs are laid in the blossoms, where the larvæ feed on what should be the seed. They pupate in the ground or in the seed. There are two or three broods annually. Various insects attack the stored hay, the most common being the clover-hay worm (*Asopia costalis*).

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Clover-weevil, a kind of weevil, of the genus *Apion,* different species of which, or their larvæ, feed on the leaves and seeds of the clover, as also on tares and other leguminous plants. *A. apricans,* of a bluish-black color and little more than a line in length, is especially destructive. See Weevil.

Cloves, Oil of. See Cloves.

Clo'vis, king of the Franks: b. 465; d. Paris 27 Nov. 511. He succeeded his father Childeric in the year 481, as chief of the warlike tribe of Salian Franks. He united with Ragnacaire, king of Cambray, declared war upon Syagrius, the Roman governor at Soissons, and utterly routed the Romans near Soissons, in 486. Soissons was then made the capital of the new kingdom of the Salian Franks. Clovis married Clotilda of Burgundy, who had been educated in the Christian faith, and was desirous that her husband also should become a Christian. When he was hard pressed in a battle against the Alemanni at Tolbiac in 496, Clovis called on the God of Clotilda and the Christians. Consequently, when the victory was won, and territory of the Alemanni submitted to him, he was solemnly baptized at Rheims, 25 Dec. 496, with several thousand Franks, men and women. Hos-

tilities soon broke out between Alaric, king of the Visigoths, and Clovis. In the battle fought at Vouglé, near Poitiers, the latter gained a complete victory, slaying his enemy with his own hand. After this victory Clovis received the honor of the consulship from the Emperor Anastasius. In the last year of his reign Clovis had called a council at Orleans, from which are dated the peculiar privileges claimed by the kings of France in opposition to the Pope.

Clovis II., king of Neustria and Burgundy: d. 655. He was the second son of Dagobert, whom he succeeded in 638.

Clovis III., king of France: d. 695. He was the son of Thierry III., whom he succeeded in 691 at the age of nine. He reigned five years, under the guardianship of Pepin d'Heristal, mayor of the palace.

Clowes, klowz, **Frank,** English chemist: b. Bradford, Yorkshire, 1848. He was educated at the Royal School of Mines, London; Royal College of Science, Dublin; and the University of Würzburg, and was professor of chemistry at University College, Nottingham, 1881–97, and emeritus professor since 1897. He has published: 'Text-book of Practical Chemistry and Qualitative Analysis'; 'Text-book of Quantitative Analysis'; 'Elementary Practical Chemistry'; 'Introductive Quantitative Analysis' (1890); etc.

Clowes, Sir **William Laird,** English naval critic and miscellaneous writer: b. London 1 Feb. 1856. He was educated at King's College, London; and from 1876 to 1895 was correspondent for various newspapers. He has written much on naval development and on art and sociology. His works include: 'The Naval Pocket Book,' issued annually; 'The Needs of the Navy'; 'Four Naval Campaigns' (1902); and the novels, 'The Captain of the Mary Rose' (1892); 'Blood is Thicker Than Water' (1894); 'The Great Peril' (1893); 'The Double Emperor' (1894); 'Told to the Marines' (1902); and also 'The Miniature Cyclopedia' (1888); 'Black America' (1892); 'Eclogues' (1889). He has been editor and chief contributor to 'The Royal Navy; a History from the Earliest Times to the Present' (1897–1902). He was knighted in 1902.

Clown, a role peculiar to the stage of English-speaking people, but bearing some resemblance to the *gracioso* of the Spaniards, and the *Hanswurst* of the Germans. The origin of the word is uncertain, some deriving it from the Latin *colonus,* in the sense of a peasant farmer, and others connecting it with certain Scandinavian and other Teutonic words. On the old English stage the clown was the privileged laughter-provoker, who, without taking any part in the dramatic development of the piece represented, carried on his improvised jokes and tricks with the actors, often indeed addressing himself directly to the audience instead of confining himself to what was going on on the stage. In Shakespeare, on the contrary, a distinct part was assigned to the clown, who no longer appears as an extempore jester, although the part he plays is to a certain extent in keeping with his traditional functions. At a later period the clown was altogether banished from tragedy, and allowed to appear only in the after-piece, performing grotesque dances, singing comic songs, etc. He is now confined to the pantomime and the circus, in the former of which he plays a part allied to that of the French Pierrot.

Cloyd's Mountain, Battle of. On 3 May 1864 Gen. George Crook of the Union army marched from Fayette, W. Va., to break the Virginia & T. R.R. at the New River bridge. He had 11 regiments of infantry and 2 batteries of artillery, in all about 6,100 men, brigaded under Col. H. G. Sickel, C. B. White, and R. B. Hayes. He marched through Raleigh, drove a small Confederate cavalry force from Princeton, and on the 8th reached Shannon's Bridge, seven miles from Dublin, where he was joined by 400 cavalry. Here he found next morning that the Confederates — three regiments and a battalion of infantry and two batteries — under Gen. A. G. Jenkins and Col. John McCausland, were barring his way, strongly posted behind log and rail breastworks, on a steep and thickly wooded spur of Cloyd's Mountain, with guns sweeping the road and open country in front. Crook opened on the position with artillery, and then, under cover of the timber, sent White with his own brigade and two regiments of Sickel's to turn the enemy's right, and the moment they were engaged Sickel and Hayes charged directly to the front across a meadow swept by artillery and musketry fire, and up the steep ridge. Parts of the line were repulsed, again to rally and go forward, and after a hard contest, in which bayonets and clubbed muskets were used across the works, they were carried, the Confederates retreating to Dublin, leaving, as Crook reports, 230 unwounded men as prisoners, and two guns, in his hands. The Union loss was over 600, that of the Confederates about 500. Gen. Jenkins was mortally wounded and left on the field. Crook followed the retreating troops, and when near Dublin encountered about 500 of Gen. John H. Morgan's command, under Col. Smith, that had come from Sattville, and endeavored to cover McCausland's retreat. These Crook drove back, and at night he occupied Dublin. On the 10th he marched to Newborn and thence to New River Bridge, which McCausland tried to save, but after a two-hours' artillery duel in which Crook had 11 men killed and wounded, he seized and destroyed the bridge and the railroad for a considerable distance, then marched by way of Union, Alderson's Ferry, and Lewisburg to Meadow Bluff, which he reached on the 19th, his march harassed by the enemy's cavalry. Crook's entire loss was 109 killed, 513 wounded, and 72 missing. On his return march he was obliged to leave 200 of his wounded, with surgeons, who were captured. The Confederate loss, as reported, was 76 killed, 262 wounded, and 200 missing or captured. Consult: 'Official Records,' Vol. XXXVII; Pond, 'The Shenandoah Valley in 1864.'

E. A. Carman.

Cloyne, Ireland, a town 16 miles southeast of Cork. It has an ancient cathedral, near which is a round tower, a Roman Catholic chapel, a free school, founded by Bishop Crow in 1726; besides national schools. From 1638 to 1833 it was the see of a bishop belonging to the Established Church of Ireland, but in the latter year it was united with Cork and

Ross. 'From 1734 to 1753 George Berkeley, the philosopher, was bishop of Cloyne. Pop. 1,300.

Club, a company of persons associated for some common object — social, literary, political, etc. It has been claimed that social clubs were known to the ancient Romans, but the evidence of their existence is scanty. Inscriptions tell of clubs of Roman citizens in foreign cities, and also of military clubs. For several centuries the club has been a peculiar institution in England, and of late it has become a prominent feature in American life. It is not easy to determine at what time clubs originated in England, but Occleve mentions one to which he belonged (during the reign of Henry IV.), called "La Court de Bone Compaignie." In 1659 Aubrey explained the word "clubbe" as meaning "a sodality in a taverne." He adds, "Here we had a balloting-box and balloted how things should be carried." The earliest London club of any celebrity was established about the beginning of the 17th century, at the Mermaid Tavern, Friday Street (otherwise known as Bread Street). Among its members were Shakespeare, Sir Walter Raleigh (the founder), Beaumont, Fletcher, Donne, and Selden. Ben Jonson figured at another club, which met at the Devil Tavern, near Temple Bar. It appears certain that clubs existed alongside of coffee-houses in the 17th and 18th centuries. At that time, however, their character was very different from what it is now. The coffee-houses of those days were the nearest representatives of the modern clubs, while the clubs were commonly nothing but a kind of restaurants or taverns where people resorted to take their meals. There was one feature, however, which was peculiar to clubs from the first, and distinguished them from coffee-houses; namely, that while anybody was free to enter a coffee-house, it was absolutely necessary that a person should have been formally received as a member of a club, according to its regulations, before he was at libery to enter it. Almack's, Brooks', and White's were among the best known coffee-houses. Among the earliest of the London clubs was the Kit-Cat Club, formed in the reign of Queen Anne. Among its 40 members, who used to meet at the shop of a pastry-cook (Christopher Cat or Katt), in order to do justice to certain mutton pies for which he was famous, were six dukes, among them the Duke of Marlborough; five earls; many of the most distinguished leaders of the Whig party, such as Sunderland, Halifax, Sir Robert Walpole, and others; and several of the leading authors of the day, among them, Vanbrugh, Congreve, Addison, and Steele, the last two owing to the club idea the form given to the 'Spectator.' Another club formed about the same time was the Beefsteak Club. Originally these two clubs had no pronounced political views, but in the end they began to occupy themselves with politics, the Kit-Cat Club being Whig, and the Beefsteak Club, Tory. There have been several Beefsteak clubs since. During the last century it was common to give eccentric names to clubs, and the conditions of being admitted to membership in any one of these clubs were as a rule equally remarkable. Among these may be mentioned the Surly Club; the Split-farthing Club; the Ugly Club (of which Wilkes was elected president for life, and Mirabeau was an honorary member); the Unfortunate Club; the Lying Club, the members of which were not permitted to utter a single truth during their sittings, unless they had been expressly authorized to do so by the president. Perhaps the most celebrated club of the 18th century was that which was first called The Club, but which was afterward known as the Literary Club. It was founded in 1764, and numbered among its members Dr. Johnson, who was for a long time its president, Sir Joshua Reynolds, Edmund Burke, Oliver Goldsmith, Edward Gibbon, and other distinguished men. In 1864 the 100th anniversary of its foundation was celebrated. In the rules which Dr. Johnson wrote for another club, the Apollo, he coined the still-serviceable word, "clubbable." In 1800 there were only half a dozen clubs existing in London, and within a century there were 100, with a total membership of 80,000. The most important London political clubs of the present day are the Carlton Club, founded by the Duke of Wellington, and the Reform Club. The former is the principal club belonging to the Conservative party in the kingdom, and the building in which its members meet, which is the most palatial edifice of the kind in the kingdom, may be regarded as the headquarters of the Conservative party. This club was founded in 1832, and the number of its members is 1,600. The Reform Club, the building belonging to which stands next to that of the Carlton Club, was long the great club of the Liberal party, founded in 1837, members 1,400. Among the other important London clubs are the National Liberal (7,000 members), Constitutional (6,550), United Service, Athenæum, Army and Navy, Travelers, Garrick, Primrose (5,600), etc. Similar clubs were started in the chief cities of England and in the colonies.

The first French society to take the name club was Le Club Politique, established in 1782, and a few years later, Le Club de Boston, or Club des Américains, was formed in Paris. The political clubs had no regular form, as they were tolerated only during revolutionary epochs. The Club des Jacobins, the Club des Feuillants, the Club des Cordeliers, and the Club de Montrouge were the most famous clubs of the time of the first French Revolution, and formed the storm-centres of that movement. None of the French clubs survived the *coup d'état* of 9 Nov. 1799, by which Napoleon overthrew the Directory. Two clubs were formed during the revolution of 1830, but they were both dissolved by the law relating to associations. At the revolution of February 1848 hosts of clubs started into existence, the most celebrated of which was the Central Republican Society (*Société centrale républicaine*), but their duration was short, for the Constituent Assembly in the following year ordered them all to be closed.

About the same periods as in France, political clubs were introduced into Italy, Germany, and Spain, especially during the time of the first French Revolution and that of 1848. In Germany, however, they were put down by a law of the empire in 1793, and in 1832 a federal decree was issued prohibiting all kinds of political societies and assemblies. In 1848 the number of clubs found in Italy, and particularly

in Germany, was very great, but their collapse was as sudden as their rise. Later in the century municipal clubs, somewhat on the "good government" order arose in Prussia. The city of Berlin had 75 such organizations in 1896. Some of these clubs maintain death-benefit and savings-bank features. Social clubs of the English type have not spread rapidly on the Continent. In France the name *cercle* was given to clubs of this nature. The most fashionable clubs of Paris are Le Cercle de la rue Royale and the Jockey Club. Many sports besides horse-racing are represented in the club life of the French capital. The automobilists, and the devotees of yachting, fencing, etc., have their separate organizations. There are also cercles for army officers, for literary men, for artists, and one connected with agricultural interests. Alpine clubs (q.v.) are found in many European countries. The French society of that name has numerous branches. Catholic clubs of workingmen exist in different parts of the country.

Although clubs were not unknown in the United States toward the close of the 18th century (the Hoboken Turtle Club dating back to that period), yet their spread and development were slow previous to the Civil War. Among those ante-dating the War may be named, the Union Club of New York (1836), the Somerset Club of Boston (1857), and the Maryland Club of Baltimore (1857). The Union League Club of New York (1863) grew out of the purpose to defend and perpetuate the national integrity, to encourage loyalty to the Federal government. Other Union League clubs were formed later in Philadelphia, and other cities; and in all the important centres of the country there grew up large and flourishing societies of a political or social nature, or such as combined the two features. The Manhattan Club became the chief social Democratic club of New York. The St. Nicholas Club represented a different type, a society founded upon a similarity of ancestry or antecedents and endeavoring to preserve historical associations. As these organizations have increased in number they have become more varied in character, until not only politics, science, art, music, literature, sociology, religion, philanthropy, and professional, commercial, social and sporting life are all represented, but the subdivisions are bewildering and continually increasing. Athletic clubs of various kinds are numerous and popular, abroad as well as in America, especially those for golfers and cyclists. The Cycling Tourists' Club, with headquarters in London, has a membership of 45,000.

University clubs draw together the college-bred men of various sections or cities. The largest one of the kind in the United States is that in New York, which had in 1902, 2,566 members. The city has also a Yale, a Harvard, and a Princeton Club. The Reform Club, organized in 1878, works for good government and agitates the tariff question. Among the largest clubs of the metropolis in addition to those already mentioned are the following: New York Athletic, 2,800 members; New York Yacht, 1,300; Century, 1,172; Army and Navy, 1,200; Metropolitan, 1,040; Players, resident 500, total 1,000; Lotus, resident 600, total 956. Others noteworthy for special characteristics are: The Knickerbocker Club, Authors' Club, Press Club, Grolier Club, Catholic Club, Holland Society, etc. The Chicago Athletic Club has 2,500. In Philadelphia, in addition to the Union League, the Manufacturers' Club, the Art Club, the Rittenhouse, and the New Century, are numerically strong. Clubs devoted to the cultivation of vocal music are largely formed of the German element in our cities. Prominent among these societies are the Liederkranz, the Arion, and the Mendelssohn.

Wherever the Anglo-Saxon race is represented in sufficient numbers, even in the remotest parts of the globe, the club idea has taken root, and we find English-speaking clubs or such as are suggested by or modeled upon English originals. India has more than 140 clubs; Pekin has its Reform Club; Cairo its Cycling Club, and Zanzibar its Golf Club. The Scotch Thistle Club of Hawaii shows its origin in its name and springs from the same source as the Caledonian clubs of America. Indeed, the tendency of men of a common blood to seek, when on a foreign soil, a social bond of unity, accounts for a special type of club. The line between organizations calling themselves societies and those known as clubs, is not always distinctly marked, but in general it may be said that where the social element is slight or lacking, the term club is inappropriate. This element entered largely into organization of many women's clubs in the early history of such societies, but their literary, professional, and especially their philanthropic features have become more prominent of late years. See Boys' Clubs; Girls' Clubs; Mothers' Clubs; Women's Clubs; Workingmen's Clubs.

Club-fingers. See Hand.

Club-foot (Lat. *Talipes*), a congenital distortion of the foot, of which there are several varieties. Sometimes the foot is twisted inward (*T. varus*); sometimes the heel is raised and the toes only touch the ground (*T. equinus*); sometimes the foot is twisted outward (*T. valgus*); or it rests only on the heel (*T. calcaneus*). The deformity consists at first in the contraction of the muscles and tendons of the feet, but ultimately the bones become distorted. If attended to in time, the foot may be gradually coaxed to its natural shape, and even in more advanced cases the deformity is usually curable by modern surgery.

Club-moss, the common name of the *Lycopodiaceæ,* a natural order of the mosses, containing four genera and 110 species, two of which, lycopodium and psilotum, are found in America, and two in Australia only. The club-mosses are found as gigantic fossils in the Upper Silurian, Devonian, and Carboniferous periods, and are a marked feature of the rocks of the two latter periods. See Lycopodium.

Club-root, Anbury, or **Finger-and-Toe** (*Plasmodiophora brassicæ*). This fungous disease is known under the above common names; it attacks turnips, cabbages, cauliflowers, and allied plants, often seriously injuring the crop. The term "club-root" arose from the club or wart-like excrescences which result from a plant being infested; owing to the tendency of the root to split up in this manner the term "finger-and-toe" is also applied. In Europe these knob-like growths cannot be regarded as conclusive evidence of this disease, as they may be

due to attacks of a gall insect. This fungus belongs to a very low order known as the slime-fungi; it can readily enter the young host plant, where it grows and reproduces rapidly; by the time the host should be mature, in fall, the fungus has formed millions of spores, which live over winter. The fungus can live for years in the soil, and no means of killing it is known, although applications of lime and potash reduce its ravages considerably. Methods of prevention are advocated, as, keeping the land free from cruciferous weeds, as wild mustard, etc., and destruction of all affected roots by burying with quicklime, or burning.

Clumber Spaniel, a short-legged spaniel averaging from 30 to 35 pounds in weight. Its legs are somewhat bowed, and its feet are large. It is a good swimmer, and is valued for its retrieving qualities, and its silence while hunting.

Cluniacs, or **Congregation of Cluny.** See CLUNY.

Cluny, klü-nē, or **Clugni,** a monastery of that branch of the Benedictine order known as the Congregation of Cluny, or as Cluniacs. It was founded in 912, at Cluny, 15 miles from Macon on the Saone. In the 12th and 13th centuries Cluny was perhaps the most notable monastic foundation in Europe: it had many hundred monasteries under the jurisdiction of its abbot. The first Cluniac house in England was founded by the Earl of Warenne, companion-in-arms of William the Conqueror. The church of the mother, established at Cluny, built in the 11th century, was regarded as one of the wonders of the world: this monument of gothic architecture was at the Revolution secularized by the republican government and was sold to the commune of Cluny, and by them was leveled with the ground. Napoleon, on being invited by the townsmen to visit the place, made reply, «No; you are vandals.» There were suppressed by Henry VIII. in England and Wales 35 Cluniac houses, one of them a convent of nuns.

Cluperidæ, kloo-pē'ĭ-dē, the herring family, fishes of the order *Isospondyli* (q.v.). The oblong, compressed, or nearly rounded body is covered with usually very thin, delicate, and easily detached cycloid scales, but the head is scaleless; the caudal fin is forked, the dorsal and specially the anal fins, elongated, and the last dorsal ray sometimes thread-like and prolonged. The skeleton is remarkable for the great number of delicate rib-like intermuscular bones; the maxillary bone forms the greater part of the upper jaw, and, like the rest of the mouth, is toothless or provided with only minute teeth; the gill-rakers are usually elongated and numerous, and there is no gular plate or bony piece in the floor of the mouth. There are nearly 30 genera and 150 species now known, most of them marine, but many migrating into fresh water to spawn. North America has 15 genera and 40 species. The most important of all food fishes belong to this family, of which the alewife, herring, shad, menhaden, and sardine (qq.v.) may be named.

Cluricaune, kloo'rē-kôn, in Irish mythology, an elf of evil disposition who usually appears as a wrinkled old man, and has knowledge of hidden treasures.

Cluseret, Gustave Paul, güs-täv pōl klüzė-rā, French officer and Communist: b. Paris 13 June 1823; d. Toulon 23 Aug. 1900. He came to the United States soon after the breaking out of the Civil War, and after serving on Gen. McClellan's staff became a brigadier-general. In 1864 he edited the 'New Nation,' in New York. Subsequently he returned to Paris, and was war minister of the commune in April 1871. From Paris he fled to England and Mexico, and was condemned to death by a military tribunal in 1872. He was, however, pardoned and allowed to return to Paris in 1880.

Cluse, Charles de la, shärl dė lä klüz (CLUSIUS), French botanist: b. Arras 18 Feb. 1526; d. Leyden 4 April 1609. He traveled extensively in Europe in pursuit of his favorite science, and by over-exertion and numerous grave accidents, he ruined his health and became a cripple. He was made keeper of the Botanical Gardens at Vienna, and in 1593 accepted the chair of botany at Leyden. His principal works are: 'History of Rare Plants'; and 'History of Plants,' a translation from Dodoens.

Cluster-cup. See ÆSCIDIUM.

Clustered Column, in architecture, a pier which appears to consist of several columns or shafts clustered together; they are sometimes attached to each other throughout their whole height, and sometimes only at the capital and base.

Clutha, kloo'thą, sometimes called MOLYNEUX, the largest river of New Zealand, in the southern part of the South Island. It receives the waters of lakes Hawea, Wanaka, and Wakatipu, and flows in a southeasterly direction through the counties of Vincent and Tuapeka, and then between those of Clutha and Bruce, till it reaches the sea in Molyneux Bay, after a course of 150 miles.

Clut'terbuck, Captain Cuthbert, the feigned editor of three of Scott's novels: 'The Monastery'; 'The Abbot'; and 'The Fortunes of Nigel.'

Cluver, kloo'vėr, or **Cluverius, Philipp,** German geographer and antiquarian: b. Danzig 1580; d. Leyden 1623. He applied himself first to the study of law, but afterward, against the will of his father, almost exclusively to history and geography. Being on that account left without support by his father, he was compelled to enter the service of the Austrian army, but at the end of two years he returned to his favorite pursuits. He now traveled through England, Scotland, France, Germany, and Italy, and then settled in Leyden, where he gave himself up entirely to literary labors till his death. His first geographical work, 'Germania Antiqua,' was published in 1616. Two carefully prepared antiquarian works, one upon Sicily, Sardinia, and Corsica, the other upon Italy, followed. His most important work was not published till after his death. It is entitled 'Introductio in universam Geographiam tam Veterem quam Novam,' and is the first successful attempt at a systematic treatment of geography in the whole extent of its historical and political relations. The first edition appeared at Leyden

in 1629, but it has been frequently republished. The most complete edition is that of Bruzen de la Martinière (1729).

Cluysenaar, Alfred, Belgian artist: b. Brussels 24 Sept. 1837; d. there 23 Aug. 1902. He was the son of a noted architect, with whom he at first studied sculpture, but he was more attracted to painting and subsequently studied art in Brussels and Paris, exhibiting 'A Dominican Meditating' in 1861. Other pictures of his are a 'Vocation,' now in the Brussels Museum, and a 'Mazeppa,' and six large mural paintings for the University of Ghent.

Clwyd, kloo'id, Wales, a river in County Denbigh, rising on the northeast of the Bronbanog, and entering Abergele Bay, after a course chiefly northwest of about 30 miles, during which it is joined by several small tributaries. It is navigable at high water for vessels of 80 tons burden to the town of Rhuddlan, two miles from its mouth.

Clyde, Lord. See CAMPBELL, SIR COLIN.

Clyde, klīd, Scotland, a river which has its sources amid the hills that separate Lanarkshire from the counties of Pebbles and Dumfries, flows by Lanark, Hamilton, Glasgow, Renfrew, Dumbarton, Greenock, etc., and forms finally an extensive estuary or firth before it enters the Irish Sea at the southern extremity of the island of Bute. From its source to Glasgow, where navigation begins, its length is 70 or 80 miles. Its principal tributaries are the Douglas Water, the Mouse, the Nethan, the Avon, the Calder, the North Calder, the Kelvin, the White and Black Cart, and the Leven, Near Lanark it has three celebrated falls — the uppermost, Bonniton Linn, about 30 feet high; the next, Corra Linn, where the water takes three distinct leaps, each about as high; and the lowest, Stonebyres, also three distinct falls, altogether about 80 feet. The Clyde, by artificial deepening, has been made navigable for large vessels up to Glasgow, and is the most valuable river in Scotland for commerce.

Clydebank, a police burgh and town of Scotland, in Dumbartonshire, on the north or right bank of the Clyde, about six miles west by north of Glasgow. It is of modern origin, its chief industry being ship-building. Pop. (1901) 18,654.

Clydesdale, a breed of horses named from the valley of the Clyde in Lanarkshire, Scotland. Clydesdales are about 16 hands high, are compact and muscular in build, and have a long, easy stride. They vary in color, being black, gray, brown, or bay, and are used for draft-horses. Specially fine specimens of this breed are found in the eastern United States, in the service of the municipal fire departments of large cities.

Clydesdale, or **Paisley Terrier.** See DOG.

Clymene, klīm'ę nē, the daughter of Oceanus, and mother of Atlas and Prometheus.

Clymer, klī'mėr, **Ella Dietz,** American poet: b. New York. She began her career as an actress in 1872, but in 1881 she abandoned the stage. She has published three volumes of poems: 'The Triumph of Love' (1878); 'The Triumph of Time' (1884); and 'The Triumph of Life' (1885). She was one of the founders of the «Sorosis» Society, and its president in 1889.

Clymer, George, American statesman: b. Philadelphia 1739; d. Morrisville, Pa., 23 Jan. 1813. He entered mercantile life when a lad and acquired a competence. He was prominent in public affairs prior to the Revolution, and in 1775 became one of the first Continental treasurers. He was chosen in 1776 to succeed a member of the Continental Congress who had refused to sign the Declaration of Independence, to which he promptly affixed his signature, the 38th after John Hancock's. He was active in the patriot cause during the Revolution, was a member of the convention that framed the federal constitution, and in 1788 was elected a member of the first congress under that instrument. In 1790 he declined a re-election, and in the succeeding year was appointed collector of the excise duties on spirits, the collection of which in Pennsylvania led to the whiskey riots. Clymer acted firmly, yet temperately in the troubles, till finding the office distasteful, he resigned it, and was appointed, with Pickens and Hawkins, to negotiate a treaty with the Cherokees and Creeks in Georgia. No man was more averse than he to the assumptions of aristocracy, to the excellencies, honorables, and esquires, who, he said, abounded more in the United States than in any other country in the world. He seldom spoke in public, but when he did his ideas were expressed in language, keen, pithy, and laconic.

Clysters, medicaments introduced into the lower bowel, usually for the purpose of expelling its contents. When used in ordinary cases of constipation a syringe of a peculiar construction, capable of injecting water in a lukewarm state, and either pure or mixed with soap, is often employed with immediate effect; but all kinds of clysters require to be used with moderation, as they have a tendency to impair the energy of the alimentary canal. Enemas are also used to supply nourishment when it is impossible to administer it by the mouth, as in cases of tetanus, spasmodic closure of the œsophagus, etc.

Clytemnestra, klīt-ĕm-nĕs'tra, daughter of King Tyndareus and Leda, and half-sister of Helen. She bore her husband Agamemnon two daughters, Iphigenia and Electra, and one son, Orestes. During the absence of Agamemnon in the war against Troy she bestowed her favors on Ægisthus, and, in connection with him, murdered Agamemnon on his return from Troy, and, together with her paramour, governed Mycenæ for seven years. Her son, Orestes, killed them both.

Clytie, klī'tē, the daughter of Oceanus and Thetis, who pined away through love for Apollo, and was changed by him into a sunflower.

Cnicus (Latin for safflower, which name was first given to the thistle), a monotypic genus of the natural order *Compositæ*. The plant is an annual herb which came originally from the southern part of Europe, and occurs from May to August in waste places along the Pacific coast as well as on the eastern seaboard from Maryland to Nova Scotia. *C. benedictus,* or, as it is sometimes called, St. Benedict's thistle, was formerly used as a febrifuge, but is now rather considered a tonic and diaphoretic.

Cnidus, nī'dŭs, or **Gnidus,** Asia Minor, a town in the province of Caria, and a favorite resort of Aphrodite (Venus), who was hence surnamed the Gnidian Goddess. She had there three temples. In the first, probably erected by the Lacedæmonian Dorians, she was worshipped as Doritis. The second was consecrated to her under the name of Aphrodite Acræa. The third, called the Temple of the Gnidian Aphrodite, and by the inhabitants, the Temple of Aphrodite Euplæa, contained Praxiteles' marble statue of the goddess, one of the masterpieces of art. This was afterward removed to Constantinople, where it perished in a conflagration in 1461.

Cnossus, nō'sŭs, or **Gnossus,** more anciently CNOSUS, or GNOSUS, now MAKRO TEIKHO, the capital of Crete in the time of Minos, was built on the Cæratus, a short distance from the northern coast, and founded by Dorians, who diffused their institutions over the island. Homer mentioned it as already a great city, and the residence of the celebrated Cretan king; it long maintained its preponderance, until it was weakened by the growing importance of Cydonia and Gortyna. It was renowned in mythology by numerous legends of Jupiter, born, married, and buried in its vicinity; of Minos, Ariadne, the minotaur, and the labyrinth. In later times it became a colony of the Romans. Ænesidemus, the skeptic philosopher, and Chersiphon, the architect of the temple of Diana in Ephesus, were born there.

Coach, a large, close, four-wheeled vehicle, generally constructed to carry passengers inside and outside; used for purposes of state, for pleasure, or for traveling. It cannot be determined at what time covered carriages first came to be used, but they were in use among the Romans. The earliest carriages appear to have been all open, if we may judge from the figures of Assyrian and Babylonian chariots found on the monuments discovered amid the ruins of Nineveh and Babylon. At Rome the matrons used to be conveyed on festal occasions in covered carriages called *carpenta,* which was a high distinction, since during the republican period the use of carriages in the city was entirely prohibited. At a later period covered carriages, richly ornamented, were used by the Romans on occasions of state and ceremony. After the fall of the Roman empire they went out of use again, and during the feudal ages the custom was to ride on horseback, the use of carriages being considered effeminate. Although mention is made of them again before the end of the 13th century, they do not appear to have become common until about two centuries later, when, however, they were regarded exclusively as vehicles for women and invalids. But a little later they seem to have been looked upon as appendages of sovereignty, and the German princes vied with one another in the splendor of their equipages, while their use was prohibited to the nobility and their vassals. About 1282 the Queen of Charles of Anjou entered Naples in a caretta, which seems, in some respects, to have resembled a modern coach. In England a kind of carriage called a "whirlicote" was in use in the reign of Richard II.; but coaches, properly so called, are stated by Stow to have been introduced in 1564 by a Dutchman, who became coachman to Queen Elizabeth. Stow adds:

> After a while, divers great ladies, with as great jealousie of the queene's displeasure, made them coaches, and rid in them up and downe the countrie, to the great admiration of all the beholders; but then by little and little they grew usual among the nobilitie, and others of sort, and within twentie years became a great trade of coach-making.

They were, however, for a long period confined to the aristocracy and the wealthy classes. Sometimes six or even eight horses were harnessed to the coach, partly no doubt for the sake of display, but chiefly because the wretched state of the roads required that number. At first coach-wheels were very low, which circumstance also contributed to prevent the attainment of any considerable speed, and to make it necessary to use several horses to draw them; and no one seems to have pointed out the advantages of large wheels until, in 1771, a Mr. Moore for a short time attracted a good deal of attention by pointing out the fact that it was much easier to draw a coach or cart with large wheels than with small ones, and by actually constructing a coach "very large and roomy," which was "drawn by one horse, and carried six persons and the driver, with amazing ease, from Cheapside to the top of Highgate Hill," coming back "at the rate of 10 miles an hour, passing coaches-and-four, and all other carriages it came near on the road." A contemporary account states that this coach had two large wheels, 9½ feet in diameter.

Hackney-coaches were first used in London in 1625. They were then only 20 in number, and were kept at the hotels, where they had to be applied for when wanted. In 1635 an attempt was made to restrain their use by a proclamation of Charles I.; but, this being found unsuccessful, their number was limited, and a commission was given to the Master of the Horse to grant licenses for their use. In this year only 50 were licensed. In 1634 one Capt. Baily, who had formerly been a sea-captain, hit upon the plan of keeping a number of hackney-coaches, with drivers in livery, standing at a particular place (the "Maypole," in the Strand), where they might be had whenever they were wanted. Hackney-coaches now rapidly became more general. The four started by Capt. Baily in 1634 had increased to 200 in 1652, to 800 in 1710, and to 1,000 in 1771.

The following facts relating to the history of stage-coaches are taken from Chambers' 'Book of Days': Stage-coaches were introduced into England about the same time as hackney-coaches. The first stage-coach in London appears to have run early in the 17th century, and about the middle of the same century they appear to have become general both in London itself and in the better highways in the neighborhood. Before the end of the century they were started on three of the principal roads in England. Their speed at first was very moderate, about three or four miles an hour. They could run only in the summer, and even then their progress was often greatly hindered by floods and by the wretched state of the roads generally. In 1700 a week was considered a marvelously short space of time to take to travel from York to London; and even 60 years later a fortnight was spent in going between Edinburgh and London. The first stage-coach

that traveled between Glasgow and Edinburgh, which was set on foot in 1749, occupied two days in the journey. The first efforts to accelerate the speed of traveling was made by a body of Manchester merchants in 1754, who started a conveyance to which they gave the name of the "Flying Coach," and which was intended to cover the distance between Manchester and London in the unusually short period of four days and a half. In their prospectus, the proprietors of the new vehicle made the following announcement:

> However incredible it may appear, this coach will actually (barring accidents) arrive in London in four days and a half after leaving Manchester.

Thirty years later, Mr. Palmer, of Bath, after a considerable amount of opposition, succeeded in inducing the government to put in practice certain suggestions which he made, by which he showed that great saving both in time and money in the conveyance of passengers and letters would be effected. The result was the establishment of the system of mail-coaches, which continued to be the means of traveling in England until their place was taken by the railways. The first mail-coach started between London and Bristol on 8 Aug. 1784.

The manufacture of elegant coaches is a proof of much wealth and mechanical skill in a place, many different artists being employed in their construction, who become skilful only when the demand for their work is considerable. Brussels was once famous for the manufacture of carriages, and many are built there still. Vienna-made coaches, etc., are also in good repute. See also CARRIAGE; CARRIAGE AND WAGON INDUSTRY.

Coach, or **Dalmatian Dog,** a short-haired dog of moderate size and rather handsome shape, white, with numerous round black spots, kept as an attendant upon carriages, and of no use otherwise, except in some parts of northern Europe, where it is used to draw milk-peddlers' carts and other small vehicles. Although called Dalmatian, the breed is believed to have originated in Spain.

Coach-whip Snake, an American snake (*Masticophis flagelliformis*), characterized by a long, narrow head, projecting upper jaw, superior orbital plates large and projecting much over the eyes; nostrils large, lateral, and near the end of the snout; eyes large, iris dark gray; neck small, body long, and tail attenuated like a whip-cord, which it also resembles in the braided appearance produced by the arrangement and dark border of the scales. The color of the head, neck, and a third of the body is glossy black, becoming paler toward the tail, which is tawny brown; the scales of the tail have dark margins; the lower surface in front is bluish slate, behind white clouded with brown; the colors vary in their shades, but near the head it is always black. They sometimes attain the length of seven feet. It moves with great swiftness, and feeds on young birds and small animals; though inoffensive to man, it defends itself bravely, twining its long folds around its enemy. The species is rare, and appears to be confined to South Carolina, Georgia, and Florida. In its general form, in the scales, and in the plates on the head, it somewhat resembles the black snake.

Coadju'tor, a Latin term, nearly synonymous in its original meaning with assistant, and applied by the Romans to a kind of deputies or lieutenants given to magistrates to assist them in a press of business, or supply their place in absence. The term was afterward introduced into the Church and given to persons who were associated with prelates, archbishops, or bishops, to assist them or act as substitutes for them in the discharge of their functions. The appointment usually made the coadjutor the successor of his principal, and in this way great abuses arose. At first the coadjutor was nominated by the king on the presentation of the archbishop or bishop with whom he was to be associated, and who generally took care to present some nephew or cousin, who had been or was about to be ordained, and thus the highest ecclesiastical positions became in a manner hereditary in a certain number of families, contrary to the ecclesiastical maxim which declared them to be purely elective. The abuse once begun made rapid strides until the Council of Trent introduced several reforms, by providing that the nominations of a coadjutor should not take effect except in cases of necessity or manifest utility, the Pope being made sole judge of these cases. Coadjutors, as now understood, are of two kinds, one temporary and revocable, allowed on account of illness or other incapacity, and allowing no right of succession; the other irrevocable and carrying with it the right of succession. The Council of Trent did not favor the "irrevocable right of succession," but the Pope grants it in special cases. A coadjutor differs from a "suffragan," and the words have slightly different meanings in different countries. The term and the office is not confined to the Roman Catholic Church; it is in use also in the Anglican Church.

Coagula'tion (Latin, "to curdle"), the peculiar change from the state of a liquid to that of an amorphous solid, exhibited, under certain conditions, by proteid bodies and their solutions. The hardening of an egg by boiling is a familiar instance of the process. In this case the change is induced by heat, and begins when the temperature reaches 160° F. or thereabouts. Another familiar case is the clotting of blood, which occurs from a very different cause. The blood contains two albuminous substances which are concerned in the phenomenon, and which are known respectively as "fibrinogen" and "fibrinoplastic substance." These are normally held in solution; but as soon as the blood is removed from the body they undergo a change whose nature is not well understood, the product of which is a stringy, elastic, fibrous or jelly-like solid known as "fibrin." In the pure state fibrin is white or gray, but in the blood-clot it appears strongly red, because its fibres imprison multitudes of the red corpuscles of the blood unless special care is taken to prevent this action. Casein, the principal proteid constituent of milk, does not coagulate from the direct application of heat, but it coagulates very quickly when rennet is introduced, and it also coagulates spontaneously under the influence of certain of the products of fermentation that develop in the milk after it has been exposed to the air for a time.

Coahuila, kō-ä-wē'lä, Mexico, a state bounded on the north by the United States, on the east by Nuevo Leon, on the south by San

Luis Potosi and Zacatecas, and on the southwest, west, and northwest by Durango and Chihuahua. Its area is about 60,000 square miles. The capital is Saltillo. The principal mountain ranges are in the districts of Rio Grande and Monclova. Besides these we may mention the Sierra Madre, in the Saltillo district; the Sierra Paila, in Parras; and Sierra Noas, in Viesca. The rivers are: Rio Grande (also called Rio Bravo), forming the boundary line with Texas; the Sabinas, forming the boundary between the districts of Monclova and Rio Grande; the Alamos, Monclova, Patos, Saltillo, Aguanaval, Nazas, and their tributaries. The principal lagoons are those in the districts of Parras, Viesca, and Monclova. Extending from the foot of the mountains northward are sterile plains, where the heat is intense; to the southeast lies the Laguna region, fertile and temperate; the mountainous district, rich in minerals, has frequent frosts. In general the climate is not healthful, the most common diseases being malarial fevers, typhus, rheumatism, and affections of the respiratory and digestive organs. Mining has recently become one of the chief industries. Silver, lead, coal, iron, copper, and gold are found. The first position, however, is still held by agriculture. Cotton, corn, wheat, sugarcane, etc., grow readily; and grape-culture is attracting special attention. The grapes of Parras are considered by some experts equal if not superior to the Malaga and Granada varieties. The state's output of cotton in 1897 was valued at $6,264,632. The value of ixtle produced in the same period was $2,430,338. Cattle-breeding is carried on quite extensively. The export trade is principally with the United States, to which, among other products, are brought ixtle and its various manufactures. The commerce of Coahuila is in the hands of Americans, Spaniards, Germans, and Frenchmen; its total trade is of the estimated value of $11,000,000, or $12,000,000, silver, per annum. Manufactures are: cotton and knitted goods, wines, tanned skins and hides, soap, candles, cheese, shoes, molasses, furniture, pottery, carriages, wagons, and chocolate. The railroad system includes a number of important lines. There are good wagon roads; also telegraph and telephone service and an efficient mail-service. The state is divided into five districts, subdivided into 33 municipalities. Pop. 285,000.

Coaita, kō-ī'ta. See SPIDER-MONKEY.

Coal. No suitable definition of the mineral substance called coal exists. Such a definition as «anything dug out of the ground that will burn» is obviously too loose; at the same time a definition based strictly on chemical composition is of slight value, since coal is a very complex substance and good coals vary greatly in composition. Generally speaking, coal is believed to represent the remains of various kinds of plants. It is found in seams or beds, separated by other beds or strata of clay, shale, grit, or sandstone. Inasmuch as all plant life depends on the energy received from the sun, and as, through the sun's rays, plants are enabled to fix in more or less stable form the carbon of the carbon dioxide from air and soil, it is permissible to define coal as buried sunshine. Such a definition at least indicates the great source of the energy given off as heat and light from a coal fire.

Origin.— Many theories have been advanced as to the origin of coal. Thus coal beds have been attributed to the drying up of petroleum lakes on old land surfaces, to the separation of carbon by some fanciful chemical process from limestone, and to accumulation of seaweeds along old ocean beaches. These theories may be dismissed without discussion; they may help explain some particular instance, but are so unsupported by facts that they are of no wide application. The generally accepted theory applies to practically all kinds of coal deposits and is, briefly, as follows:

When the woody material, cellulose, of the leaves and stems of plants, falls on the ground, it soon oxidizes or decays, and the oxygen, hydrogen, carbon, and nitrogen present pass into the air or soil as gases, the hydrogen and oxygen chiefly as water vapor, the carbon as carbon dioxide, and the nitrogen as ammonia. Finally of the original material, say the trunk of a great tree, only the ash, composed chiefly of silica, alumina, and iron oxide, is left. Thus it happens that the leaves, twigs, and branches that have fallen for thousands of years in a forest are represented by a few inches of vegetable mold or humus, plant substance not yet oxidized to ash. If, however, the ground be covered by water, as in a swamp, air is partly excluded, and decay proceeds so slowly that vegetable or animal remains may be preserved for long periods of time. Still oxidation goes on: the dead plants gradually give up their hydrogen, oxygen, and carbon as water, marsh gas, and carbon monoxide and dioxide, and change to a mass of partly decayed vegetable fibre or even to a black muck.

A damp climate and a land surface from which the rainfall runs off slowly, favor the formation of extensive swamps, though in a climate as damp as that of Ireland peat bogs climb hillsides, the mosses (*Sphagnum*), the chief plant growth in such swamps, dragging up water by capillary action. On the plains of Alaska and Siberia, where the ground is permanently frozen, mosses cover the ground with a thick mat, and such swampy plains are called tundras. In a lake country can be found areas which a little investigation shows were at no very remote date covered by shallow bodies of water, but are now swamps, the original lakes having been filled by the dead mosses, rushes, and other aquatic plants. Along the seashore in a region of average rainfall, where the coast is of low relief and the rivers sluggish, sand-bars form by wave action off shore, and behind these bars are salt lagoons and marshes, changing, farther from the ocean, to brackish, and finally fresh-water swamps.

Fresh or brackish water and a fairly warm though not torrid climate are indicated by the fossils of plants and animals found in or near coal seams. From these facts and from the vast extent of some coal fields it is believed that coal beds represent old coastal swamps, possibly of the type of the Dismal Swamp in Virginia. Now if we suppose such a swamp-covered coast to

sink slowly, the encroaching ocean would cover the accumulated peat and muck with sand and silt until finally the swamp might be buried thousands of feet by sediments from the receding land surface. Instead of steadily sinking, however, the probabilities are that during the great coal-forming epochs the land alternately sank and rose through thousands upon thousands of years, and thus one swamp was buried over another, resulting in those alternating beds of coal, shale, and sandstone characteristic of all coal fields.

The progressive diminution of hydrogen and oxygen compared with carbon is shown by the following table from Percy's 'Metallurgy,' in which carbon is taken at the constant amount of 100:

	Carbon	Hydrogen	Oxygen
Wood	100	12.18	83.07
Peat	100	9.85	55.67
Lignite	100	8.37	42.42
Welsh bituminous	100	4.75	5.28
Pennsylvania anthracite	100	2.84	1.74

The loss of water and of combined carbon, hydrogen, oxygen, and nitrogen, in the change from peat to coal, caused a great loss of bulk. The pressure of overlying strata, or of those earth movements that warp and fold the rock formations, reduced the bulk still more. Thus it can happen that a coal seam one foot thick may represent what was 50 feet of peat in the ancient swamp, and it is fair to assume that an average seam of true coal is not one fifth the thickness of the original peat beds.

Some geologists have believed that when the old swamps now represented by coal seams were accumulating thick beds of peat, the climate was torrid, while the earth's atmosphere contained a higher percentage of carbon dioxide than now. It may be said, however, that a torrid climate is not necessary for the existence of great swamps; and as to a higher percentage of carbon dioxide in the air, were the present land surface of the globe covered with a layer of coal one foot thick, the carbon contained therein, if restored to the atmosphere, would mean an increase in the amount of carbon dioxide of but about .5. This about represents the difference between air in the city and in the country, and the effect of such an increase in stimulating plant-growth is at best doubtful.

As to the age of the coal formations it may be said that true peat deposits are all of later age than the Tertiary, and in North America only peat and incoherent lignite occur in later formations than the middle Tertiary (Miocene) though the early Tertiary (Eocene) formations contain great areas of lignite. In Europe there are lignitic deposits in the Triassic and in the Carboniferous. The great coal-forming age in North America and in Europe was the Carboniferous, though true coals occur in the Permian and in the Triassic, and in North America there are very important coal fields of Cretaceous age. Isolated pockets of coal, but no workable coal fields, occur in pre-Carboniferous formations. See CARBONIFEROUS SYSTEM.

An idea of the relative compositions of peat, lignite, and true coals may be had from the following table:

	H_2O	C	H	O	N	S	Ash
Condensed peat..	20	47.2	4.9	22.9			5.0
Lignite, Alaska..	16.52	55.79	3.26	19.0	.61	.63	4.18
Bituminous coal, Connellsville, Pa.	0.89	82.48	4.50	5.61	1.45	.94	34.1
Anthracite coal, Lykens, Pa....	0.73	82.89	4.53	.40	.64	.68	10.13

Varieties of Coal.—Various elaborate schemes of classifying coal have been advocated, but have not gained popular acceptance. In fact in the coal trade in this country the word coal is often applied to a true lignite. However, since the chief heat-producing element in coal is carbon, a classification in wide use is based on the value of the coal as fuel; that is on the percentage of carbon present and the condition of the carbon.

Part of the carbon is fixed, that is, cannot be driven off by heating in a retort; part is combined with the hydrogen and nitrogen as volatile hydrocarbon compounds which can be driven off. The percentage of fixed carbon is highest in anthracites, but even the semi-graphitic anthracite of Rhode Island contains a considerable percentage of hydro-carbons. The proportion of the volatile hydrocarbons to the fixed carbon in a coal is called its fuel ratio. On this basis the distinctions usually made are lignite, bituminous, semi-bituminous, semi-anthracite, and anthracite. Cannel coal, in which the percentage of volatile hydrocarbons is very high, is believed to be of different origin from other coals. It may represent accumulations of seeds, spores, resins, or gums, and possibly of fish remains, in pools in the ancient swamps. Generally speaking, in anthracite the volatile matter is below 6 per cent, in semi-anthracite below 10 per cent, in semi-bituminous between 12 and 18 per cent, and in bituminous above 18 per cent. In cannel coal the volatile matter may be as high as 50 or even 65 per cent.

Lignite, or brown coal, is brown to black in color, though the powder is always brown. It often shows plainly its vegetable origin, containing stems that look like undecomposed wood. The lustre may be resinous or dull; the specific gravity is .5 to 1.5, some kinds floating on water. Lignites burn easily with a smoky flame, generally contain a high percentage of water, crumble easily, and slack to mud on long exposure.

Bituminous or soft coal is black; the powder is black; the lustre may be resinous or dull; the specific gravity is 1.25 to 1.4. It contains less water than lignite and bears transportation better. Bituminous coals are subdivided according to their properties or uses, into coking, free-burning, smokeless, gas coals, etc. Coking coals partly fuse or cake in burning. If low in ash and very low in sulphur they are highly valued for forging and for making coke and gas. The famous coals of the Cumberland region in Mary-

land are classified as semi-bituminous. In coking coals the less volatile hydrocarbons present, the higher the yield of coke, but in gas coals the more hydrocarbons the better. A good gas coal will give 10,000 cubic feet of gas per ton. Smokeless coals burn with little smoke and are used for domestic purposes and for steam production.

Cannel coal (from *cannyl*, "a candle"), is black or brownish, has a dull lustre, does not soil the fingers, and shows few or no traces of vegetable structure. It grades into bituminous shale. It contains from 40 to 60 per cent of volatile matter, lights readily, burns with a steady flame, and is used as a fuel for open grates, but chiefly for enriching gas made from other coal. It is mined in the United States at Cannelburg, Ind., and in the Jellico district, Ky.

Anthracite, called also hard coal, is black with a black powder and does not soil the fingers. The specific gravity is 1.3 to 1.75. It kindles slowly, but, owing to the high percentage of fixed carbon, burns without smoke and gives an intense heat. It was formerly much used in this country for smelting iron and is still used as a steam fuel, but its chief use is for household purposes.

Generally speaking, the less water, ash, and sulphur in a coal the better. The water must be evaporated before the coal burns, ash represents inert matter, and sulphur is objectionable for several reasons. A first-class coal should not contain over 6 or 7 per cent of ash and a good gas coal should have less than .7 per cent sulphur.

The following table gives the composition of some representative American lignites and coals:

	Water	Volatile Hydrocarbons	Fixed Carbon	Fuel ratio	Ash	Sulphur
LIGNITE						
Cook Inlet, Alaska	11.59	49.03	31.64	.64	7.73	....
Coos Bay, Ore....	9.56	49.85	35.98	.74	4.61	.94
Rock Springs, Wyo.	6.98	34.42	52.60	1.53	2.00	....
Boulder, Colo.....	21.37	33.38	40.31	1.21	4.95	....
BITUMINOUS						
Roslyn, Wash.....	2.05	33.55	54.55	1.63	6.85	.11
Trinidad, Colo.....	4.88	36.25	53.57	1.48	5.30	....
McAlester, I. T...	2.08	37.52	56.02	1.49	4.38	.80
Saginaw, Mich....	5.82	39.79	45.15	1.13	9.24	3.83
Brazil, Ind.....	13.82	35.16	49.96	1.42	1.06	1.47
Pana, Ill.....	1.94	36.59	58.32	1.59	2.24	.90
Clearfield, Pa.....	.55	25.19	71.02	2.82	2.65	.58
Connellsville, Pa...	1.26	30.11	59.61	1.98	8.23	.78
Pratt Seam, Ala...	1.00	32.17	63.37	1.97	3.34	1.04
SEMI-BITUMINOUS						
Spadra, Ark.....	1.11	11.28	72.84	6.46	12.04	2.74
Pocahontas, W. Va.	1.68	17.45	75.90	4.35	4.20	....
Cumberland, Md...	.96	19.14	72.71	3.80	6.41	.79
SEMI-ANTHRACITE						
Crested Butte, Col.	.72	7.62	87.51	11.48	4.15	....
Bernice, Pa.....	1.29	8.10	83.34	10.28	6.23	1.03
ANTHRACITE						
Cerilios, N. M.....	2.90	3.18	88.91	27.96	5.21	....
Wilkesbarre, Pa...	2.49	4.34	83.97	19.33	8.55	.65
Lehigh, Pa.....	1.72	3.52	88.00	88.49	5.66	.61

Coal Fields of the World.— North America, Europe, and Asia contain the great coal fields of the world. In southern Africa, in Australia, and in New Zealand are deposits of importance. Only small and disconnected areas are known in South America and the only mines worked on a large scale are in Chile. As to Asia, the coal fields of China are vast and of great promise but are still practically undeveloped. Coal is abundant in India and Burma and the output is increasing fast, particularly from the mines in Bengal. The rather small coal field of Japan is being opened rapidly. The chief coal-producing States of Australia are New South Wales and Queensland. The South African mines are in Cape Colony, Natal, and the Transvaal.

Great Britain long led the world in coal-production, but was passed by the United States in 1899. The important coal fields of Great Britain lie in southern Scotland, stretching with interruptions, from the coast of Ayr to the mouth of the Firth of Forth; in the north of England, in Durham and Northumberland counties; in central England, where the several fields worked include parts of 10 counties, the most important being Yorkshire and Lancashire; in the west of England, near Bristol, and in the Forest of Dean; and the very important South Wales field in the counties of Monmouth (England), and Glamorgan and Carmarthen (Wales), this field producing the best coal mined in Great Britain.

On the continent of Europe, France, Belgium, Russia, Austria-Hungary, and Spain have coal fields of more or less importance. The French coal fields may be grouped in three divisions, those of the north, of the centre, and of the south. The northern field, in the departments du Nord and Pas de Calais, extends into Belgium. The fields of central France are generally small and irregular, the most important being in the department of the Loire. In the south of France the coal fields of Alais and of the Aveyron are of some importance. The coal field of Belgium is a narrow belt extending across the country, except for a short interruption, from the Pas de Calais in France to the Aix-la-Chapelle coal field in Prussia.

Of the German states, Prussia has the largest and best coal fields. These include the Aix-la-Chapelle and the Eschweiler; the very important coal fields of the Ruhr, or of Westphalia; and, extending into Bavaria, the Saarbrücken field, perhaps the most remarkable in Europe for the number of seams and total thickness of coal. In the extreme southeast of Prussia are the important and comparatively undeveloped coal fields of Silesia at the head waters of the river Oder. Of the other German states, Saxony is a considerable producer of coal, the most important mines being near Zwickau.

In Austria-Hungary, coal fields extend from Lower Silesia into Bohemia, and from Upper Silesia into Moravia, with mines near Schlan, Radnitz, and Pilsen. There are also great deposits of lignite, extensively developed near Einbogen and Bilin, and valuable mines of lignitic-bituminous coal near Fünfkirchen in southern Hungary and about Syria and Carinthia in the Austrian Alps.

The most important coal field of Russia is the Donetz basin, between the Don and the Dnieper rivers. It covers a large area and is being developed steadily. Spain has several coal fields, one of some importance in the Asturias, and two others but little developed. Lack of railroads has prevented their exploitation.

North America, as noted before, surpasses all the continents in the extent and variety of its fuel supplies. The United States leads the world in coal production, and there is little prospect of any country surpassing it before that far distant day when the great coal fields of China are well opened. Canada has coal fields of importance near Pictou and on Cape Breton Island in Nova Scotia, known as the Acadian coal field; also a vast and but partly developed field of lignite and true coal in Alberta and eastern British Columbia, and another field on Vancouver Island. Alaska has no true coal, but workable beds of lignite occur on the coast and in the Yukon valley at Rampart and Circle City.

The Mexican coal fields are of much local importance, but are not likely to produce any coal for export. The principal field is in the State of Coahuila, extending from Eagle Pass to Sabinas. Coal seams have been worked in Sonora, Hidalgo, and Michoacan.

The following table showing the production of coal and lignite of the chief coal-producing countries of the world is compiled from figures published in the 'Engineering and Mining Journal':

Country	Production	Country	Production
United States..	293,298,550	Belgium	25,090,490
Great Britain...	245,321,708	Russia	17,929,320
Germany	166,117,978	Japan	8,265,000
Austria-Hungary	43,363,700	India	7,840,000
France	32,590,691	Canada	7,630,255

The above figures are for the years 1902 or 1901, and are short tons (2,000 pounds).

The United States, Great Britain, and Germany together produce over 80 per cent of all the coal mined in the world.

The coal fields of the United States, not including Alaska, are of various ages from the Carboniferous to the Eocene, the two great horizons being the Pennsylvanian of the Carboniferous, and the Laramie of the Cretaceous. The total area covered by possibly productive seams of lignite, bituminous coal, and anthracite is fully 250,000 square miles.

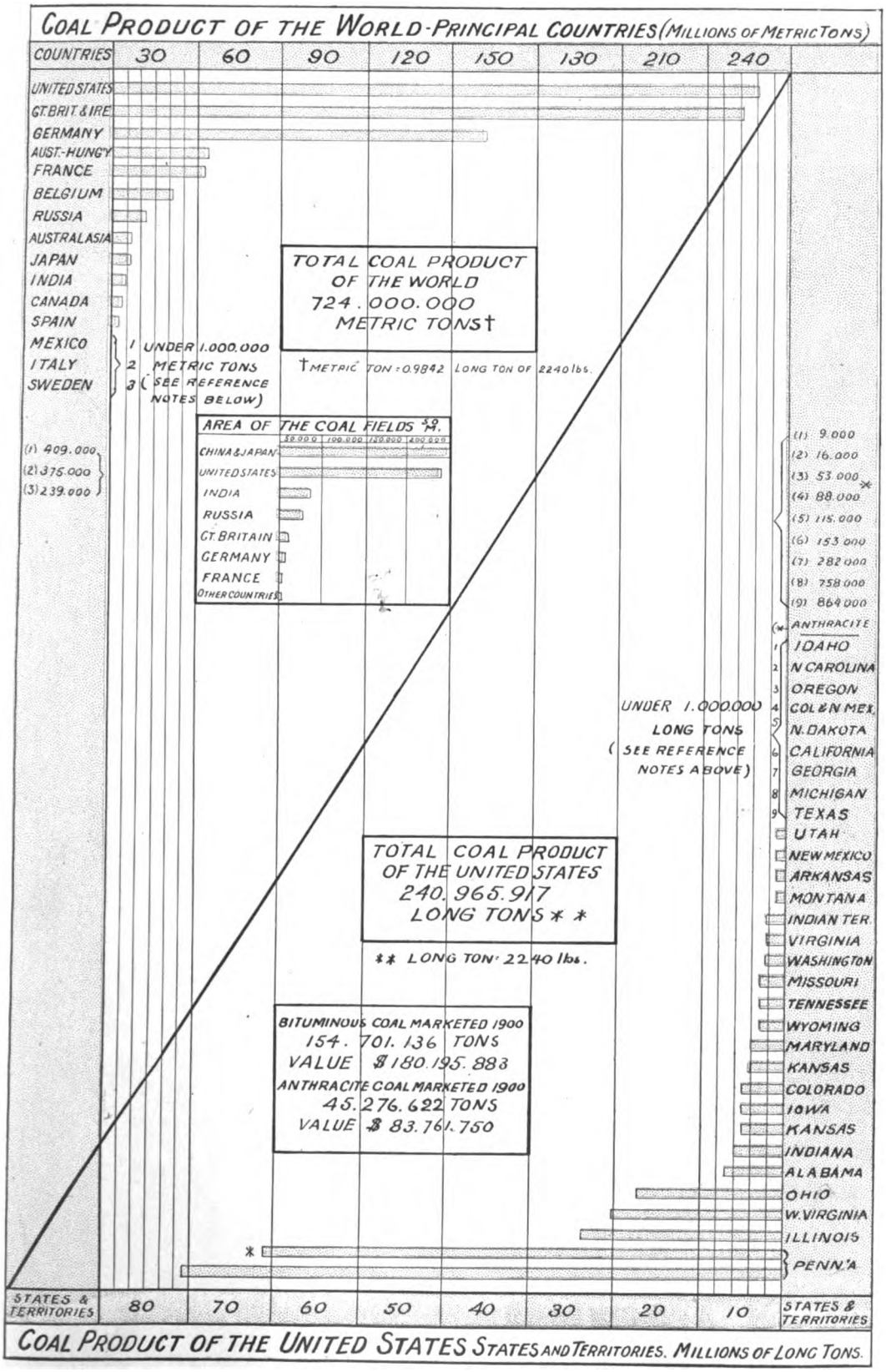
For convenience the coal fields may be grouped in these divisions: the Appalachian, covering 70,800 square miles; the eastern interior, 58,000 square miles; the northern interior, 11,300 square miles; the western interior, 94,000 square miles; the Rocky Mountain, 43,600 square miles; and the Pacific coast, 1,050 square miles.

The Appalachian field extends from near the New York and Pennsylvania state line southwesterly through the western half of Pennsylvania and eastern Ohio, the western end of Maryland, the extreme southwest of Virginia, nearly the whole State of West Virginia, eastern Kentucky, and Tennessee, into north-central Alabama. This field is of Upper Carboniferous Age, and with it are included the very important anthracite fields of eastern Pennsylvania, and a small area of graphitic anthracite in Rhode Island and southern Massachusetts. There are also coal beds of Tertiary Age (Newark) in the Richmond basin, near Richmond, Va., and on the Dan and Deep rivers in North Carolina. The Richmond field, though the first to be worked in the United States, having been opened in 1750, is now almost abandoned. The Chetham mines in Durham County, N. C., are of some importance.

The anthracite fields of Pennsylvania are divided for convenience into the northern, or Wyoming, lying in or near the valleys of the Lackawanna and Susquehanna rivers from Carbondale to Shickshinny; the Lehigh, comprising several basins about Hazleton and part of the Panther Creek valley; and the Schuylkill. The last really includes several fields extending from near Mahanoy on the north to Pottsville on the south, and from Tamaqua on the east to Lykens on the west. The total area of the various anthracite basins is about 480 square miles. The coal was mined first about 1765, and at the rate at which production is increasing the estimated life of the field is about 50 years. However, as mines go deeper, and mining costs increase, the resulting higher prices for coal will probably restrict consumption, and with a declining output it is possible that the anthracite mines may not be wholly exhausted in 200 years.

Owing to the competition of lower-priced bituminous coal in the form of coke, the use of anthracite for smelting iron has declined greatly of late years, and its consumption for industrial purposes is not increasing. For steam-production only the small sizes, pea, wheat, buckwheat, and rice, are much used, and these chiefly on railroads running through the fields or in cities having strict smoke ordinances. Anthracite, being clean, smokeless, having great heating power, and burning slowly, is chiefly used for household purposes and is sent to market broken into lumps of several sizes, known as broken or grate, egg, stove, and chestnut, these being called prepared sizes, in distinction from the small or steam sizes before mentioned. The market supplied by the Pennsylvania mines is along the Atlantic seaboard from Nova Scotia to Georgia, also a narrow strip of country extending from Montreal westward through southern Ontario and the States of the Union bordering on the Great Lakes. The chief markets are in New England and in New York, New Jersey, Pennsylvania, and Illinois. Out of a total shipment of 47,665,203 long tons in 1899 it is estimated that 7,144,131 tons went to the New England States, Massachusetts taking half the amount; 12,503,896 tons to New York; 4,693,500 tons to New Jersey; 13,803,253 tons to Pennsylvania; and 2,188,294 tons to Illinois. The total exports of 1,707,796 tons went almost wholly to Canada.

The bituminous coals of the Appalachian field include gas, coking, and steam coals of the highest grade. The largest and best seams or those most easily opened have been exploited so far, and the resources of the Appalachian field are still enormous. The State of West Virginia alone is estimated to contain more workable coal than the whole of Great Britain. The best-known of the various areas now opened are the Clearfield, in Pennsylvania, producing coking, gas,



and steam coals, shipped largely to seaboard points; the Broad Top, in Pennsylvania, producing coal of rather better grade, shipped to the same markets; the Cumberland, in Maryland, producing a famous steam and smithy coal, shipped to the seaboard and to interior cities from Canada to the Rocky Mountains; the Pittsburg, in Pennsylvania, whence come gas and steam coals largely used locally, but also shipped to points on the Great Lakes and on the Ohio River and lower Mississippi; the Connellsville, in Pennsylvania, yielding coal used chiefly for making a standard grade of coke; the Hocking Valley, in Ohio, whence are shipped steam coals to near-by cities and to distant ports on the Great Lakes; the Kanawha, in West Virginia, shipping gas and steam coal to various points on the Great Lakes or on the Ohio River and lower Mississippi; and the New River, Flat Top, and Pocahontas fields in West Virginia, producing steam, gas, and coking coals of varying excellence, the best grades having no superior, which are shipped mostly to seaboard points, though an increasing tonnage is made into coke to supply blast furnaces at Pittsburg, Chicago, and various Ohio cities. In eastern Kentucky is the Jellico field, whence gas and steam coal is shipped to a wide territory, including seaboard cities, and in eastern Tennessee are several basins yielding gas, steam, and coking coals, used locally and shipped to compete with the Jellico coal. The important district in Alabama is about Birmingham: the coal is shipped to Atlantic and Gulf ports for steam- and gas-making, and a large proportion of the output is made into coke for use in local furnaces and foundries.

The eastern interior field covers western Indiana, nearly the whole State of Illinois, and part of Kentucky. The coal is of Carboniferous (Pennsylvanian) Age, but in general lies in thinner veins and is of poorer quality than that of the Appalachian field. Most of the output is used as a steam fuel by railroads and in the many manufacturing cities that lie in or near the field. Certain grades are much used as a household fuel. The field contains no first-class coking coal.

The northern interior field covers a large area in the southern peninsula of Michigan and has been opened chiefly by the mines near Bay City and Saginaw. The seams are comparatively thin, and the coal is generally of poorer quality than that of Indiana and Illinois. The output is used locally. The beds are of Upper Carboniferous Age.

The west central field extends from western Iowa across western Missouri, northwestern Arkansas, and eastern Nebraska and Kansas, through Indian Territory into Texas. The coal beds vary widely. In parts of the field the coal is barely more than lignite, while in northwestern Arkansas it approaches semi-anthracite. The markets supplied cover a great area. Fully half of the output is used by railroads, and of the other half at least 40 per cent is used for household purposes. The measures are Carboniferous.

The Rocky Mountain field includes the numerous disconnected areas lying in narrow belts along either flank of the range from the Canadian frontier southward for 1,000 miles; Montana, Utah, Wyoming, Colorado and New Mexico having mines. Along the flanks of the mountains and in the parks or plateaus in the main range the coal is largely bituminous; but eastward from the range the coal measures, which are of upper Cretaceous (Laramie) Age, are lignitic, and vast beds of lignite underlie the plains of Montana, Wyoming, and North and South Dakota. The mines now opened supply the great transcontinental railroads, the chief users. In places the coals make good coke, used by local smelting plants. The resources of the field are vast and but little developed.

The Pacific coast coal field is of Tertiary Age and most of the output is lignite. It includes some unimportant basins in California, several fields in Oregon, of which the Coos Bay has been most developed, and the Roslyn and Puget Sound fields in Washington, the former producing a good bituminous coking coal. The California and Oregon fields are of little more than local importance, but the Washington mines supply railroads and steamships and are an important factor in the coal trade of San Francisco.

The rank of the principal coal-producing States of the Union is shown by the following table compiled from figures published in the 'Engineering and Mining Journal.' The figures are for 1902, except that for Pennsylvania the 1901 figures are taken, owing to the anthracite output in 1902 being curtailed by a long strike of the miners. The figures given include coal and lignite:

States	Short Tons	States	Short Tons
Pennsylvania	149,777,567	Kansas	5,379,500
Illinois	31,000,000	Wyoming	4,900,000
West Virginia	26,162,173	Tennessee	4,800,000
Ohio	24,700,000	Maryland	4,565,311
Alabama	10,327,713	Missouri	4,250,000
Indiana	8,357,417	Virginia	3,100,000
Colorado	7,522,923	Indian Territory	3,000,000
Kentucky	6,421,266	Washington	2,690,789
Iowa	5,800,000	Arkansas	2,200,000

It will be seen that Illinois already produces about as much coal as France, and West Virginia produces more than Belgium. The production of Pennsylvania in a few years bids fair to equal that of Germany.

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Coal Gas. See GAS ILLUMINATING.

Coal Gas Poisoning. See CARBON-MONOXIDE POISONING; COAL MINING; ILLUMINATING-GAS POISONING.

Coalition, The, in political history. (1) ENGLISH. In 1783, after the American War, there were three parties in Parliament, neither able to stand alone. The weakest (C. J. Fox «conscience» Whig) joined the second (Lord North, Tory), ousted the strongest (Lord Shelburne, opportunist Whig), and the coalition tried to pass an India bill with self-perpetuating offices. Fox had long denounced both North and George III. without stint personally as well as politically, and was a chief agent in debauching the Prince

of Wales (afterward George IV.); and the king was furious alike at his accession to power and North's ingratitude. As the two statesmen had professed utterly irreconcilable basic principles, the people were equally disgusted with what seemed a grossly corrupt bargain for the sake of office — though a different view is now taken. The king killed the India bill by threatening the Lords, dismissed the Coalition ministry, and made the younger Pitt premier; at the next election the Tories received an overwhelming majority, remained in power many years, and the name "Coalition" was long the most unsavory of bywords. (2) AMERICAN. In 1824, there being no electoral majority for President, the smallest (Henry Clay) party joining in electing the head of the second (J. Q. Adams); the largest (Andrew Jackson) considered this defeating the popular will, and when Adams later made Clay secretary of state, declared it to be in pursuance of a corrupt bargain, and gave it the name of the ill-savored Fox-North Coalition. The nickname was used for many years with damaging effect, though perfectly irrelevant, as the Clay and Adams parties were in close sympathy politically, and their heads not hostile personally. The Clay men much preferred a trained and gentlemanly statesman like Adams to one whom they regarded as an ignorant and violent demagogue, and Clay's position and ability entitled him to the place, which other great party leaders (Blaine, for example) have held later.

Coal Measures. See COAL; CARBONIFEROUS SYSTEM.

Coal Mining. Coal mining differs from metalliferous mining chiefly in the better ventilation required, the extent and regularity of mine workings, and the necessity of getting out the mine product with as little dust as possible. The principal gases found in coal mines are carbon dioxide, CO_2, heavier than air, suffocating, but not inflammable, called choke-damp by miners; carbon monoxide, CO, about as heavy as air, poisonous and inflammable, the dreaded white-damp of the miners; carburetted hydrogen, CH_4, light, not poisonous, but inflammable, the chief constituent of fire-damp; also, but less important, sulphuretted hydrogen, poisonous and inflammable, but easily detected by its odor. Of these gases, marsh gas, given off in large quantities in some mines, is the chief agent in coal-mine explosions. A mine is said to be fiery when the coal-seams give off much fire-damp. Many of the deeper coal-mines of Great Britain, France, and Germany are very fiery. The most fiery mines in the United States are in the anthracite region of Pennsylvania, the South Wilkes-Barre shaft at Wilkes-Barre being one of the most fiery mines in the world. A mixture of marsh-gas and air in certain proportions explodes violently on contact with flame. Coal-dust in the air makes a much smaller proportion of marsh-gas an explosive mixture.

To enable men to work in places where sufficient air to carry away the gas does not circulate, or to enable them to work in very fiery mines, safety-lamps are used. In a safety-lamp the flame is enclosed by wire gauze and cannot ignite gas in the air outside the gauze, unless the gauze is heated to the combustion point of the gas. The safety-lamp was invented by Sir Humphry Davy in 1815 and has been improved in various ways. Many patterns are in use; one of the latest types used in Pennsylvania and Germany is known as the Wolf lamp. The Hepplewhite-Gray lamp is much used in England. A safety-lamp indicates the presence of fire-damp by the lengthening of the flame.

Carbon dioxide and carbon monoxide given off by the coal in place are produced in the mined-out areas known as "gob." These gases are the chief constituents of after-damp, the gases resulting from an explosion of dust or fire-damp. They, rather than the shock, cause the terrible loss of life in mine explosions, since men may be killed by carbon monoxide without knowing they are in danger.

Good ventilation is thus a prime necessity in coal mining. It is sometimes secured by a furnace over a shaft, the fire producing a sufficiently strong up-current. But in all fiery mines, and generally in all large mines, large revolving fans, sometimes 35 feet in diameter, are used to circulate the air. The fans may exhaust or force in air (up-draft or down-draft); various types of mine fans are used, but the majority of those in service in Great Britain and at the larger mines in this country are modifications of the Guibal type.

As most coal-seams worked are a few feet thick, but of considerable extent, and as in this country at least, most coal-beds lie flat or dip at low angles, a coal-mine can be opened in a more regular way than a metalliferous mine. Two systems of mining are used — the pillar and room ("board and pillar"), and the long wall. The first, generally used in the United States, consists in taking out various portions of the coal as the work proceeds, from the mine-opening, and the remainder in working back toward the opening. The long wall system, used in certain bituminous districts in the United States, and extensively used in England, consists in taking out all the coal in a long face as the work advances from the mine-opening, the roadways and air-passages being protected by packs or walls. It is best suited for thin coal-seams with weak roofs, while the pillar-and-room system is best suited for thick seams with rock roofs. The two systems grade into each other.

Coal is broken from the face of the seam by the miner under-cutting it with his pick and then putting in a blast strong enough to bring down the coal. Black powder is generally used in this country. Abroad explosives making less flame are required by law in many districts, and in some of the very fiery German mines wedges operated by hydraulic power are used. To blast coal from the solid rock like an ore, though occasionally done in Illinois and elsewhere in this country is wasteful and dangerous. Fine coal is less valuable than lump, and dust greatly increases the danger of an explosion.

To under-cut the coal, machines are sometimes used. Those in general use in this country are of two types: the Harrison, or puncher type, with a reciprocating piston impelled by compressed air, carrying a cutting bit; and the chain machine, having an electrically driven chain carrying cutting teeth. The latter type, though not favored for fiery mines, is probably more used in newly opened mines, than the former. No machines are used in the Pennsylvania anthracite mines. Of the total bituminous coal (225,826,849 tons) mined in the United

States in 1901, 57,843,335 tons were under-cut by machines.

The coal, when broken down, is roughly sorted by the miner or his helper and loaded into mine cars which are hauled to the main haulage roads by mules. Here the cars from the various gangways are usually made up into trains (or "trips") and hauled to the shaft bottom or the entrance of the mine by a wire rope (tail-rope haulage), by a compressed air locomotive, or by an electric locomotive. Sometimes the cars are attached singly to an endless wire rope like cars on an ordinary surface cable road (endless-rope haulage). Mines of the shaft type are to be found in largest numbers in the hard-coal districts. The hard-coal mines are likewise the deepest. Occasionally an extreme depth of 1,500 feet is attained. Two other styles of mines are found in both anthracite and bituminous fields,—"drifts" and "slopes." The drift mine is dug straight into the mountain from one side. The passageway or heading may have an upward trend. The slope mine slants downward to the extent of perhaps 35 or 40 degrees, the main heading often measuring a mile or more in length.

Occasionally coal is found in quantities near the surface of the ground. This is true to-day in parts of Missouri. At both Hazelton and Summit Hill, in Pennsylvania, coal has been extracted by an uncovering operation known as "stripping," which is regarded as apart from mining proper. An interesting process also is "pocket mining," but this is practised comparatively little to-day. An outcrop of coal at various points on the side of the mountain suggests the possibility of a rich mineral vein. Digging is begun directly into the bed of coal projecting at the surface. This form of mining is seldom highly profitable, for when the digging has progressed at considerable expense to a point where the mine should be expected to pay, all operations are suddenly cut short by the encountering of solid rock, which, owing to some upheaval of the past, has "faulted" the vein of coal from its natural course. These pockets at intervals in the mountains where pocket mining is done present an interesting sight. About Shickshinny, Pa., they are numerous.

In shaft mines, and especially those of anthracite, mules are used very extensively. Where mechanical power is employed to haul trains in the main haulage-ways, these beasts bring the cars only from the side headings or the rooms. The mules do not see daylight for months at a time. In bituminous drift mines evolution has included the introduction of miniature trolley trains of 40 or 50 cars, each train being in charge of a motorman and brakeman. In anthracite drifts steam locomotives of a small and peculiar type, know as "hogs," haul the trains. In a slope mine cable trains transport the coal. One end of the cable is attached to the train, and the other winds upon a drum at the power-house. When the cable turns a corner it passes around what is known as a "bull wheel." Twenty-five one-ton cars may comprise a cable train of soft coal. Anthracite cars often hold four and a half tons. In soft-coal mines the man in charge of the cable train is called a "rope rider." In bringing his cars out of the mine he sits upon the ring which connects the cable with the train. In the anthracite slopes a man stands upon the side of a car ready to "sprag" the wheels when a stop is made. Spragging consists in throwing short but stout lengths of wood into the openings between the four spokes of the car wheel. The height of the bituminous vein is often not more than four or five feet, thus making the quarters of the miners rather cramped. In the mining of anthracite only two thirds loosened from the vein is of value. The miner must use good judgment in loading only the paying coal. To handle and transport chunks in which slate predominates is unprofitable. Even the better coal has more or less slate in it, while in bituminous coal the slate is principally at the top and bottom of the vein and not mixed with the product as mined.

Off from the main or side headings of a hard-coal mine "breasts" or "chambers" are opened. In bituminous fields these are known as "rooms." A tunnel or neck 40 to 60 feet long may connect the room proper with the main passageway. Beyond the neck the chamber may broaden out to a width of 30 or more feet, continuing indefinitely. The coal between the rooms forms what is known as a "rib" or "pillar." As the rooms begin to broaden to their maximum widths, timber props are placed between the floors and ceilings to support the loose rock and earth. Apart from supporting the great mass of solid rock, they are of little service.

When all the coal that it is practical to mine in the chambers has been extracted, the work of drawing the ribs between the rooms is begun, eventually allowing the rock above to cave in. In addition to securing the coal in the ribs, this process is necessary, that the weight of the mountain bearing upon the entrance to the mine may be lightened. As mining progresses, the weight is thrown upon the main heading, until, were it not for the drawing of the ribs, this main passageway would close.

When drawing a rib, the soft-coal miner keeps but one car beside him. He cannot tell how much of the rib he will be able to remove before the rock above his head will fall. The first warning of approaching danger is a drumming noise from the layer of stone overhead. Sometimes this noise may be heard hours before the final crash; in anthracite mines it may be perhaps weeks before. Again, it may come with marked suddenness.

The coal, when brought to the surface, is screened, and at many bituminous mines is then shipped as lump and slack. Sometimes it is broken and washed, and in the anthracite region of Pennsylvania, where coal is shipped in seven or more sizes, the coal, as it comes from the mine, is passed through the breaker.

A modern coal breaker built on the side of a hill at Mocanaqua, Pa., will serve to illustrate the construction and operations connected with this important branch of coal-production. This breaker is 300 feet in length and 180 feet in height. It is capable of turning out 1,000 tons of clean coal per day. Some breakers have a much larger capacity. The Mocanaqua breaker was originally built at a cost of $50,000, but with recent improvements and the installation of the latest machinery its total cost reaches $100,000. It is heated by steam.

The anthracite is brought to the head of the breaker over a little railway leading from the

mine in the side of the mountain. The coal, when dumped from the cars, passes over a screen 30 feet in length, through which the fine coal sifts. The big chunks next pass to the breaker proper, where rolls with sharp teeth crush it. It next runs into a screen which is cylindrical in shape, and not unlike a locomotive boiler in appearance. As the coal is handled in this device, it falls through perforations of different sizes, each size dropping into a separate chute. On benches at intervals on these chutes, sit the breaker boys, presided over by a foreman. As the coal passes slowly down the chute at their feet, these lads pick the slate from it and throw the refuse into a parallel chute. The inexperienced boys are always at the upper end of the chutes. They succeed in picking a part of the slate from the coal, and then it passes to the next workmen in line, who continue the operation until, by the time the product has reached the boys at the bottom of the chutes, it is pretty well cleaned. The coal is also washed to free it from dust. From the chutes the various-sized coal finds it ways into bins, from which it is discharged into cars.

Mechanical contrivances for sorting have recently been installed at great cost in modern breakers. These inventions are spiral in shape, and provide for ridding the coal of much of its slate by centrifugal force. But even with these machines the final operation must be performed by boys or men.

A large amount of the soft coal of Ohio and Pennsylvania is brought to the lower harbors of the Great Lakes, bound for the Northwest and Canada. The cars which carry this coal have a capacity of 100,000 pounds, whereas, in the early days of the coal industry in this country, coal cars scarcely carried 1,800 pounds. On reaching the lake ports, coal for Canada may be taken 60 miles across Lake Erie in car ferries. But the bulk of the coal that comes to the lake ports is unloaded directly into the holds of lake vessels by means of most wonderful and massive machines, which pick up a 50-ton car and dump its contents as quickly as a pail of coal could be emptied into the magazine of a stove. Some of these machines can be operated by three men, and yet have a capacity of 500 tons per hour. A large and modern coal vessel will carry a coal cargo of 6,000 tons. The cargo record is 7,800 tons. More than 2,500,000 tons of coal have gone to the head of the Great Lakes in a single season.

Historically considered, coal mining perhaps dates back to about the end of the 12th century. Coal, as an inflammable substance, appears to have been known to the ancients, and to the Britons before the Romans visited their island, it being found frequently in ravines and beds of rivers of a color and texture so decidedly different from the strata which in general accompany it; but as at that period, and for centuries afterward, the country was covered with immense forests, which supplied abundance of fuel for every purpose of life, there was no necessity for using coal as fuel. The working of coal, therefore, only became an object of attention as population and civilization advanced, when agriculture began to be studied, the woods cleared away, and the arts of civil life cultivated; accordingly we find that the working of coal in Great Britain, as an article of commerce, is comparatively of modern date. The first charter giving liberty to the town of Newcastle-upon-Tyne to dig coal was granted by Henry III. in 1239; it was then denominated "sea-coal," on account of its being shipped for places at a distance. In the year 1281 the Newcastle coal-trade had become so extensive and important that laws were enacted for its regulation. In Scotland coals began to be wrought much about the same time; and a charter was granted in the year 1291 in favor of the abbot and convent of Dunfermline, in the county of Fife, giving the right of digging coals in the lands of Pittencrieff, adjoining the convent. Coal began to be used for iron-smelting about the beginning of the 17th century. The working of coal gradually increased, though on a very limited scale, until the beginning of the 18th century, when the steam-engine was brought forward by Newcomen in the year 1705, and was applied to collieries in the vicinity of Newcastle about the year 1715. This machine produced a new era in the mining concerns of Great Britain, and, as it were in an instant, put every coal-field within the grasp of its owner. Collieries were opened in every quarter; and the coal-trade rapidly increased to an astonishing extent. This extension of the trade was greatly aided by James Watt, who so very much improved the construction and power of the steam-engine as to render it one of the most complete and most useful pieces of mechanism.

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Coal Oil. See PETROLEUM.

Coal-tar, or **Gas-tar,** the black, opaque liquid obtained by condensation from the products of the distillation of coal. As it comes from the condensers it contains more or less water, which rises to the surface when the liquor is allowed to stand for a time, bringing with it the ammonia and ammoniacal salts that are present. The tar as thus freed from water is used in the crude form for a variety of purposes, notably as fuel, for the preservation of building-materials, and the manufacture of sheathing-paper. It is exceedingly complex in chemical constitution, something like 100 different substances having been recognized in it up to the present time, many of which are of great industrial importance. In the utilization of coal-tar for the manufacture of these, it is first roughly separated into parts by fractional distillation,— an operation that is rendered possible by the fact that the various constitutents have widely different boiling-points. The distillation is carried out in wrought-iron retorts, and the details of the operation vary somewhat among the different manufacturers. The scheme here given probably represents average practice.

The temperature of the retorts containing the tar being gradually raised, the first products to be expelled are certain gaseous or very volatile substances, such as sulphuretted hydrogen and carbon disulphide, which must be carefully

treated to avoid danger from fire, since their vapors form explosive mixtures with air. As the temperature gradually rises, other bodies are driven off, and the total product that is obtained at temperatures below 350° F. is kept separate, and designated «light oil.» This is treated with soda lye, sulphuric acid, and water, and is then redistilled, fractionally, in special apparatus and in a much more careful manner. By accurate regulation of the temperature, benzene, toluene, and the xylenes are successively obtained, followed by other products that are of less commercial importance.

That portion of the original tar which comes off at temperatures between 350° and 445° F. is known as «carbolic oil,» or as «heavy oil» (because it sinks in water), and serves as a source of two exceedingly important substances known as naphthalene and carbolic acid. The former separates out from the heavy oil upon cooling. It is then pressed, treated successively with caustic soda and with sulphuric acid, and redistilled. When purified, it is used in the manufacture of dyes. The liquor from which the naphthalene has crystallized out is shaken with caustic soda solution to extract the carbolic acid and cressol. Upon standing, the aqueous solution containing those substances rises to the top and is removed. Sulphuric acid is then added to it, when the carbolic acid and cressol separate in an oily form. Carbolic acid is greatly used as a disinfectant, and as a raw material for the manufacture of numerous other important substances.

That part of the original tar which distils between 445° and 520° F. is known as «creosote oil,» and is used for the preservation of timber. This portion consists mainly of carbolic acid, cressol, anthracene, and naphthalene. That part of the tar which passes over at temperatures above 520° F. is known as «anthracene oil,» or «green grease,» and is used for the manufacture of anthracene (q.v.), and hence alizarin (q.v.) and the alizarin colors. The final product that is left in the retorts after the extraction of the anthracene oil is called «pitch,» and is used in the manufacture of artificial asphalt.

It need hardly be said that when a manufacturer is concerned with only a limited number of the coal-tar derivatives, he modifies the process of distillation in accordance with his immediate needs, so as to obtain the greatest yield that is economically possible of the particular substances in which he is interested. Hence the temperature-limits that are given above, for the various portions of the distillate, are subject to certain modifications according to the special end in view. See COAL-TAR COLORS.

Coal-tar Colors, the coloring matters that are artificially prepared from substances occurring in coal tar. They are exceedingly numerous, and are mostly of complex chemical constitution, belonging to the group known as aromatic compounds (q.v.). The coal-tar colors are exceedingly important in the arts, and are used in enormous quantities in dyeing and calico-printing. In popular language they are often called aniline colors. This designation is incorrect, however, for although they include the colors of the aniline class they also include derivatives of phenol, anthracene, and other bodies. Some prejudice exists against the coal-tar colors in the public mind, because they are believed to be less permanent than the natural animal and vegetable colors, for which they are substituted. This criticism was quite justifiable some years ago, but a considerable number of coal-tar colors are now known which are fully as «fast» as the natural ones, and in some cases the coal-tar color has a decided advantage in this respect. England may be regarded as the original home of the coal-tar color industry, but in recent years it has passed largely to Germany and France, the change being due in large measure to the attention that is paid in the educational institutions of the latter countries to the subject of synthetic chemistry. Following are a few of the more notable events in the history of the development of the coal-tar color industry, as given by Benedikt: Naphthalene was first discovered in tar in 1820 by Garden; anthracene in 1832 by Dumas; and phenol in 1834 by Mitscherlich. Faraday discovered benzene in 1825, but its presence in coal-tar was not recognized until 1845, by A. W. Hofmann. In 1826 Unverdorben discovered aniline among the products obtained in the dry distillation of indigo, and in 1834 Runge proved its existence in coal-tar, and observed that it gives brilliant colors when brought in contact with chlorid of lime. In 1834 Mitscherlich discovered nitrobenzene, and in 1842 Zinin showed that aniline can be manufactured by the reduction of nitrobenzene. The last-mentioned discovery was of exceeding importance, for although aniline occurs in coal-tar it is in such small quantities that it could not be profitably extracted on a commercial scale. In 1854 Bechamp greatly improved the process of manufacturing aniline from nitrobenzene, and in 1856 Perkin prepared mauveïne (the first aniline dye) on a large scale. In 1858 A. W. Hofmann published a paper in which he showed that magenta (aniline red) can be prepared by the action of carbon tetra-chlorid upon aniline, and in 1859 Verguin first manufactured magenta in quantity. During the next few years various other colors were discovered and placed on the market, and aniline black was discovered by Lightfoot in 1863. Pelletier and Walter discovered toluene in 1837, and in 1848 Mansfield showed that this substance occurs in coal-tar. The coal-tar color industry was greatly stimulated when Graebe and Liebermann effected the synthesis of alizarin in 1868, thereby opening up a new and important field of chemical activity. Previous to this date alizarin was obtained from madder-root, but it is now almost exclusively manufactured from anthracene. Baeyer produced the first eosin dye in 1874. The synthesis of indigo was the result of a long series of investigations, the final step in which was taken by Baeyer in 1878; and in 1880 a German company placed a substance known as nitrophenyl-propiolic acid on the market, for depositing artificial indigo upon fibres by Baeyer's method. Other methods for the artificial manufacture of indigo have since been discovered, but the natural dye is still largely used in spite of all efforts to displace it.

The marks that are used in commerce for designating the shade of a color consist usually of certain letters affixed to the name of the color to be described. Thus R is used for red, O for orange, J or G for yellow (Fr. *jaune;* Ger. *Gelb*), B for blue, and V for violet. Thus «Scarlet RR» or «Scarlet 2R» signifies a scarlet whose tint inclines toward red, and the doubled

R signifies that an intermediate color is recognized, whose tint lies between that here specified and the pure scarlet. Aniline blue occurs in a reddish shade which is designated as "Aniline blue R"; while the finest quality of aniline blue is designated as "Aniline blue 6B."

Much attention has been paid to the connection between the color of a substance and its chemical constitution, but no absolute rule can be given for predicting the color of a compound whose formula is known. In the case of the aromatic series, however (which is of special interest to the student of coal-tar colors), the following may be said: All of the aromatic hydrocarbons are colorless (or white), and the same is true of such of their mono-substitution compounds as are obtained by replacing one atom of hydrogen OH, NO_2, or NH_2. If two hydrogen atoms are replaced, the resulting compound is also colorless if the radicals introduced are alike. If they are unlike, and one of them is NO_2, then the resulting compound is colored. For example, benzene, C_6H_6, is colorless, and so also are its derivatives, aniline ($C_6H_5.NH_2$) and nitrobenzene ($C_6H_5.NO_2$), which are obtained by replacing one atom of hydrogen by NH_2 and NO_2, respectively. But if a second atom of hydrogen in the benzene nucleus of aniline be replaced by NO_2, we have the compound $NO_2.C_6H_4.NH_2$, which is known as nitroaniline and is yellow. The presence of certain atomic groups in the molecule of a substance appears to have a strong influence, also, upon the color of the compound. This is particularly noticeable in the quinones, which contain the group .O.O., and in the azo compounds, which contain the group .N:H. . The difference between a colored substance and a coloring matter, or dye, must be borne in mind, however. A dye is a substance which unites directly with the animal or vegetable fibres of the fabric to which it is applied, or with a mordant with which those fibres are impregnated. According to Witt, a true dye must contain two species of molecular groups, one of which is called the chromophor ("color-bearer"), while the other serves to make the compound acid or basic, so that it can form salts. The groups NO_2, .N:N., and .O.O. are examples of chromophors, Compounds that contain chromophors, but are neither acid nor basic, are called chromogenes ("color-generators"). They are not dyes, but may be transformed into dyes by the introduction of a salt-forming group such as OH or NH_2. Azobenzene, $C_6H_5.N:N.C_6H_5$, is a colored substance, but it is not a dye. It is a chromogene, however, because it contains the chromophor-group .N:N.; and if one of its hydrogen atoms is replaced by the group OH, the compound $C_6H_5.N:N.C_6H_4.OH$, known as oxyazobenzene, is obtained, which is a true dye. Again if one of the atoms of hydrogen in azobenzene is replaced by NH_2, the compound $C_6H_5.N:N.C_6H_4.NH_2$ is obtained; this is also a true dye, and is known to chemists as amidoazobenzene. (Consult: Hjelt, 'Principles of General Organic Chemistry,' from which these examples are taken.) Coloring matters that are basic in nature are always used, in dyeing, in the form of salts; that is, it is the compounds of these substances with acids that are used, and not the free bases themselves. "Substantive" coloring matters are those that are directly absorbed from solution by the fibre to be dyed. "Adjective" coloring matters are those that are not directly absorbed in this manner, but which require the fibre to be first "mordanted," or charged with certain metallic salts, or "animalized" with albumen, or treated in some other manner, before the dyeing can be done.

Classification.— It is impossible to give an entirely satisfactory classification of the coal-tar colors. The following scheme is due to Benedikt, and appears to be as good as any. (See Benedikt, 'The Chemistry of the Coal-Tar Colors,' for a full account of these colors and of their chemical relations.)

1.—Aniline Dyes.
- (a) *Rosaniline Group.*
- (b) *Indulines and Safranines.*
- (c) *Oxazines.*
- (d) *Aniline Black.*
- (e) *Thionines* (coloring matters containing sulphur).

2.—Phenol Dyes.
- (a) *Nitro Bodies.*
- (b) *Nitrous Derivatives* (coloring matters formed by the action of nitrous acid on phenols).
- (c) *Rosolic Acid.*
- (d) *Phthaleins and Indophenols.*

3.—Azo Dyes.
- (a) *Amidoazo Dyes.*
- (b) *Amidoazo Sulphonic Acids.*
- (c) *Oxyazo Dyes.*

4.—Artificial Indigo.

5.—Anthracene Dyes.

Aniline Dyes.— *Rosaniline Group.*— The coloring matters belonging in this group may be regarded, for the most part, as derived from two fundamental "mother substances," known respectively as triphenylmethane and tolyldiphenylmethane. Triphenylmethane, $C_{19}H_{16}$, is (in theory) obtained from methane, CH_4, by replacing three of the hydrogen atoms by three phenyl radicals. It therefore has the constitutional formula

$$C\begin{cases} C_6H_5 \\ C_6H_5 \\ C_6H_5 \\ H \end{cases}$$

The carbon atom which serves to unite the three phenyl radicals to the single hydrogen atom is known as the methane carbon. Tolyldiphenylmethane is derived from triphenylmethane by replacing an atom of hydrogen, in one of the phenyl radicals, by methyl, CH_3. Numerous basic substances are obtainable from these by replacing one hydrogen atom in two or three of the phenyl groups by NH_2, and by subsequently replacing the hydrogen of the NH_2 by methyl, phenyl, etc. The bases so obtained are colorless, from which circumstance they are known as the "leuco-bases." By oxidation they are converted into the color bases, which are also colorless for the most part. Prominent among the color bases are the two substances known as rosaniline and pararosaniline. Rosaniline (q.v.) is most conveniently obtained by oxidizing a mixture of aniline and liquid orthotoluidine. (See Toluidine.) Pararosaniline is is formed in the same way from aniline and solid paratoluidine. Pararosaniline may be prepared, however, from triphenylmethane, and rosaniline from tolyldiphenylmethane. The dyes that are classed under the rosaniline group are the salts of the color bases referred to above. Thus magenta (or fuchsin) is a mixture of the hydrochlorids of rosaniline and pararosaniline, and methyl violet is the hydrochlorid of pentamethylated pararosaniline. Auramine is the

hydrochlorid of the more complicated base imidotetramethyldiamidodiphenylmethane.

Indulines and Safranines.— The indulines and safranines are distinct from each other in all respects, save that they are derived from the same mother substances. The induline bases are formed when aniline acts upon an amidoazo compound, such as amidoazobenzene (or aniline yellow), with liberation of ammonia. The best-known base of this sort is violaniline. When the same mother substances are caused to interact so that oxidation occurs and hydrogen is liberated (instead of ammonia), safranine is formed. Blackley blue is one of the best known induline colors, and magdala red is one of the best known of the safranine series.

Oxazines.—This group contains coloring matters that may be regarded as derived from phenoxazine,

$$C_6H_4 <^{NH}_{O}> C_6H_4$$

It includes muscarin, gallocyanin (or solid violet), nile blue, resorcin blue, and prune.

Aniline Black.— This substance is formed by the cautious oxidation of aniline hydrochlorid. If the oxidation is not sufficient, violet or green colors are obtained; while if it is excessive quinone is formed. Aniline black may also be produced by the electrolysis of a concentrated solution of an aniline salt.

Thionines.— Thionine coloring matters are obtained when the hydrochlorids of certain of the aromatic diamines are dissolved in a solution of sulphuretted hydrogen gas, and subsequently oxidized by ferric chlorid. Methylene blue is the only color of this group that is in extensive use. It is prepared from dimethylaniline, $C_6H_5N(CH_3)_2$, by treatment with hydrochloric acid and sodium nitrite, and subsequent sulphurization with sulphuretted hydrogen, and oxidation with ferric chlorid.

Phenol Dyes.— *Nitro Bodies.*— This group contains substances that are derived from phenol, and are mostly yellow in color. Picric acid, which is one of the best-known examples, is formed by treating carbolic acid (phenol) with nitric acid according to the following equation:

$$C_6H_5.OH + 3HNO_3 = C_6H_2(NO_2)_3.OH + 3H_2O.$$
Phenol. Picric acid.

Phenyl brown, Victoria yellow, and naphthol yellow are further examples of dyes of this class. Aurantia, which has the formula $N(C_6H_2(NO_2)_3)_3.NH_4$, may be placed in this group. The acid of which it is the ammonia salt is obtained by the action of nitric acid upon methyldiphenylamine, $N(C_6H_5)_2CH_3$.

Nitrous Derivatives.— This group consists of those dyes that are obtained by the action of nitrous acid upon such bodies as resorcin, naphthol, thymol, and carbolic acid. Fluorescent resorcin blue is the only example of the group that is in extensive use in the arts. If resorcin is dissolved in sulphuric acid and treated with nitrous acid (obtained by adding nitrite of sodium to strong sulphuric acid), a red substance known as diazoresorufin is obtained, having the formula $C_{18}H_{10}N_2O_5$. When this body is treated with bromine, a hexabrominated substitution product is obtained, whose ammonium salt is the commercial resorcin blue.

Rosolic Acid.— The rosolic acids may be regarded as rosanilines in which the amido groups have been replaced by hydroxyl, OH. They may be prepared from the rosanilines or from triphenylmethane. They are classed as phenol coloring matters, however, because they (or at least their more common representatives, the corallins) are more conveniently prepared from phenol. Yellow corallin is obtained by the action of strong sulphuric acid upon phenol, followed by the prolonged action of oxalic acid. It consists chiefly of pararosolic acid (aurin) and of derivatives of rosolic acid. If yellow corallin is heated with ammonia to about 270° F., red corallin, $C_{19}H_{13}O_2NH_2$, is formed.

Phthaleïns and Indophenols.— The indophenols are formed by the simultaneous oxidation of a phenol and a paradiamine. Commercial indophenol is a blue powder or paste prepared from nitrosodimethylaniline and alpha-naphthol, and is used for obtaining indigo blue shades upon cotton and wool. The phthaleïns are manufactured from phenols and phthalic acid, or phthalic anhydrid; but they may also be regarded (like rosaniline and rosolic acid) as derivatives of triphenylmethane. When a phenol is heated with phthalic anhydrid at moderate temperatures, water is eliminated, and two molecules of the phenol combine with one of the anhydrid, the compound so obtained being known as the phthaleïn of the corresponding phenol. The phthaleïns of resorcin and of pyrogallol are by far the most important ones in the arts. The anhydrid of resorcin phthaleïn (known as "fluoresceïn") is obtained by heating resorcin with the correct molecular proportion of phthaleïn anhydrid to about 390° F., until the mass becomes solid and no more steam is given off. The product so obtained is cooled and pulverized, and sold in this form for the manufacture of the eosins, for which it serves as practically the sole commercial source. Pure fluoresceïn is a yellowish-red crystalline substance, with feebly acid properties. Fluoresceïn is seldom used as a dye, but its sodium salt (uranin) is employed to some extent in printing upon woolens. The empiric formula for pure fluoresceïn is $C_{20}H_{12}O_5$; and its nitro and halogen substitution products are known as eosins. Thus bromine forms, with fluoresceïn, the substitution product $C_{20}H_8Br_4O_5$, which is known to the chemist as tetrabromfluoresceïn, and to the dyer by various names such as "Eosin yellowish," "Eosin J," and "Soluble eosin." A somewhat similar compound, in which chlorine is the substituted halogen, is known as "Aureosin J."

Azo Dyes.— These coloring-matters all contain the binary molecular group .N:N., and may be prepared by the action of phenols or aromatic amines upon diazo compounds, which contain the group in question. See *Azobenzene*, under Benzene.

Amidoazo Dyes.— This group contains only three representatives that are of commercial importance,— aniline yellow, chrysoidine, and Bismarck brown. They are all derived from azobenzene. Thus aniline yellow is the hydrochlorid of amidoazobenzene, chrysoidine is the hydrochlorid of diamidoazobenzene, and Bismarck brown is the hydrochlorid of triamidoazobenzene.

Amidoazo Sulphonic Acids.— Helianthin will serve as an illustration of this group of coloring matters. It is prepared by the action of dimethylaniline upon diazobenzene sulphonic

acid, and occurs in commerce in the form of the sodium salt,

$$C_6H_4 \begin{matrix} N:N.C_6H_4.N(CH_3)_2 \\ SO_3Na \end{matrix}$$

On silk and wool it yields a fiery orange color. Acid yellow, which consists chiefly of the sodium salt of the disulphonic acid of amidoazobenzene, also belongs in this group, and while it is not used alone to any great extent, it is employed in various combinations, and large quantities of it are also manufactured for use in the preparation of the other diazo coloring matters.

Oxyazo Dyes.— These may be regarded as derived from oxyazobenzene, $C_6H_5.N:N.C_6H_4.OH$, which was first prepared in 1866 by Peter Griess. They are far too numerous and varied to be considered in any general encyclopædia, and they are not treated in any considerable detail even by Benedikt, who says:

> The immense number of coloring matters belonging to this group is easily accounted for if we consider that every primary amine belonging to the aromatic series, after having been converted into a diazo compound, will combine with almost any phenol or derivative of a phenol (in which the hydrogen atom standing opposite the hydroxyl group is not substituted) to form an azo dye.

The first patent for a dye of this group was taken out by Griess in 1878, and since that date many others have been taken each year.

Artificial Indigo.— Numerous methods for the artificial preparation of indigo are known, but all are too expensive in execution to displace the natural product to any great extent. For calico printing, extensive use is made of an artificial product known as "propiolic acid," which can be converted into indigo, upon the fibre, by the use of suitable reducing agents. The blue that it gives is not entirely pure, but the printing process is far simpler than when the natural indigo is used, and for this practical reason propiolic acid is preferred. In its manufacture cinnamic acid is first prepared by heating benzal chlorid, $C_6H_5CHCl_2$, with sodium acetate. The cinnamic acid so obtained is treated with fuming nitric acid, and the ortho-nitro-cinnamic acid that is formed is isolated. This is brominated with free bromine, and afterward boiled with potash and alcohol. Ortho-nitrophenyl-propiolate of potassium is formed, from which ortho-nitrophenyl-propiolic acid (which is the substance commercially known as propiolic acid), $C_6H_5(NO_2)O_2$, is liberated upon the addition of hydrochloric acid. This is transformed into indigo blue, $C_{16}H_{10}N_2O_2$, upon boiling with reducing agents, according to the equation, $2C_6H_5(NO_2)O_2 + 2H_2 = C_{16}H_{10}N_2O_2 + 2CO_2 + 2H_2O$.

Anthracene Dyes.— The coloring matters derived from anthracene (q.v.) contain hydroxyl (OH), and are slightly acid in nature, forming colored "lakes" with metallic oxides and with the alkaline earths. They require mordants, but they are faster than most of the other coal-tar colors, and are also faster than most of the natural dyes. Alizarin, purpurin, anthrapurpurin, and flavopurpurin are among the better-known coloring matters obtained from anthracene. (See Alizarin and Purpurin.) Alizarin is used in dyeing for red, black, blue, orange, and violet, and has replaced the madder-root dyes almost absolutely.

Many of the more important substances connected with the manufacture and use of the coal-tar colors will be found under separate headings. The principles that underlie the application of the coal-tar colors in the dyer's art are outlined in the article on Dyeing (q.v.). In addition to Benedikt's excellent work, consult: Hurst, 'Dictionary of the Coal-Tar Colors'; Nietzki, 'Chemistry of the Organic Dye-Stuffs'; and Schultz and Julius, 'Systematic Survey of the Organic Coloring Matters.'

A. D. Risteen, Ph.D.

Coaling Stations, depots established by maritime governments at various important points throughout the world, where the ships of the navy may obtain supplies of coal. The utility of such stations, when properly fortified, as points of refuge, defense, and repair for warships in the event of war can hardly be over-estimated. The more important of British stations are Aden, at Trincomalee (Ceylon), Singapore, Hong Kong, Sierra Leone, St. Helena, Mauritius, Jamaica, and Simon's Town (Cape Colony). During 1898–1900 the United States established coaling stations for its navy at San Juan, Porto Rico; Pearl Harbor, Hawaii, Pago Pago, Samoa; Cavite, near Manila; at the chief port of Guam, Ladrone Islands; and at convenient points in Cuba; and coal "piles" at La Paz, Mexico, and at several points in Alaska. Some of the British coaling stations supply both naval and mercantile vessels.

Coamings, in naval architecture, a framework surrounding the opening of a hatchway, designed to stiffen the parts weakened by the opening, and, by being raised above the deck, to keep water from entering the hold. A rabbet or groove in its inside upper edge receives the hatches.

Coan, kō'ăn, **Titus,** American missionary: b. Killingworth, Conn., 1 Feb. 1801; d. Hilo, Hawaii, 1 Dec. 1882. After spending several months (1833–4) on a dangerous exploring expedition in Patagonia, he went to the Sandwich Islands (1835), occupying the Hilo station 47 years, and in that time converting 14,000 natives. He wrote: 'Adventures in Patagonia' (1880); 'Life in Hawaii' (1881).

Coan, Titus Munson, American physician and critic, son of Titus Coan (q.v.): b. Hilo, Hawaii, 27 Sept. 1836. He now resides in New York, where he founded in 1880 the New York Bureau of Literary Revision. He has written: 'An Ounce of Prevention'; 'Topics of the Time' (edited).

Coanza. See Kwanza.

Coast and Geodetic Survey, United States. To all nations whose territory touches the sea or other water navigable to any extent, or who have any interests in the commerce of the sea, a full and complete knowledge of the coast — its nature and form, the character of the sea bottom near it, the location of reefs, shoals, and other dangers to navigation, the direction and strength of currents, and the character and amount of magnetic disturbance — is of the greatest moment.

To supply this knowledge the governments of all maritime nations have in modern times executed surveys of their coasts by the most exact methods.

Some idea of the importance to this country of like operations and their extent may be

formed when it is remembered that the coast line of the United States and Alaska, measured along its general trend, exceeds 10,000 miles in length. To represent the actual shore line as surveyed, which includes all the islands, bays, sounds, and rivers in the littoral or tidal belt, these figures would have to be multiplied many times. To this must be added the shore line of Porto Rico, the Hawaiian Islands, and the Philippine Islands. The length of the general shore line of only 14 of the principal islands of the latter group exceeds 11,000 miles.

On the recommendation of President Thomas Jefferson, Congress in 1807 authorized the establishment, as a bureau under the secretary of the treasury, of a national coast survey. For the purpose of furnishing geographic positions and other data to State surveys, the scope of the bureau was in 1878 enlarged, and its designation became the United States Coast and Geodetic Survey.

The plan upon which it is organized is the outgrowth of trial and experience during the first 50 years of its existence, and from its inception almost every year has seen some new feature added or some old one discarded.

Under the direction of a superintendent there are two great divisions of its work. They are the field and the office.

The field work includes all of the practical operations of the survey on land and sea.

Except in time of war, in accordance with the plan of reorganization of 1843, the work upon the land was divided between civilian assistants and officers of the army, the hydrographic parties being in charge of naval officers. Since 1861 no officers of the army have been connected with the survey, and the conduct of the hydrographic work was about equally divided between the civilian assistants and naval officers until 1898, when the naval officers were relieved, and since which time none have been assigned to the survey.

The civilian assistants consist of a body of trained experts permanently attached to the survey, and numbering between 50 and 60.

The service owns a fleet of 11 steamers and 6 schooners, besides steam and motor launches.

The office is that part of the establishment which receives the records, original sheets, etc., representing the results of field work. They are registered and deposited in the archives until in turn they are taken up for examination, computation, and adjustment, prepared for publication, and finally published. Original charts are reduced or enlarged, engraved, electrotyped, and printed.

For the convenience of administration the operations of the main office at Washington are carried on by eight divisions, each having some specified portion of the general work to perform. In these divisions are employed the required force of clerks, draftsmen, computers, engravers, instrument makers, printers, etc., numbering in all about 145.

There are sub-offices at San Francisco, Seattle, Honolulu, and Manila.

Many of the field operations of the survey being geodetic in their nature, a system of primary triangulation, together with the determination of geographic positions by means of astronomic methods, must furnish the foundation upon which the whole rests. On the Atlantic coast a chain of triangles, beginning at the eastern boundary of Maine, stretches to the Gulf, constituting an oblique arc, which, besides serving as a basis for the coast triangulation, adds much to our knowledge of the figure of the earth.

An extensive system of triangles extends across the continent along the 39th parallel of latitude, connecting the surveys of the two coasts and furnishing a basis for the surveys of the 13 States through which it passes. It is also one of the longest arcs now available for the determination of the figure of the earth. Another triangulation system is being executed along the 98th meridian. Its extension southward through Mexico has already begun, and there is a prospect of its extension northward through the British possessions.

In connection with these principal systems, the triangulation has been considerably expanded in the New England States, New York, and several western States, including California, where some exceptionally large figures were introduced. The longest line so far observed is that from Mount Helena to Mount Shasta, over 190 miles in length.

A tertiary triangulation for topographic and hydrographic purposes has been completed along the entire Atlantic and Gulf coasts, and over more than half of the Pacific coast, except Alaska. Much progress has been made in the latter territory by methods which possess a sufficient degree of accuracy for immediate use and are capable of rapid execution.

In the determination of astronomic positions the exact methods originally developed in the survey have been adhered to and perfected. The methods of using the zenith telescope for latitude and the telegraph for longitude have been constantly improved.

The topographical operations have been mostly restricted to a narrow margin, not often over three to five miles wide, along the coast and surrounding harbors, bays, and rivers up to the head of tide water. In some cases it has been somewhat more extensive, notably in the survey of the District of Columbia, where the scale was 1-4800 and the contour interval only five feet.

The hydrographic operations have extended as far out from the coast as was necessary for the interests of navigation, and have included, all harbors, channels, bays, etc., as far as the work has gone.

Deep-sea soundings have been made extensively, especially in and about the Gulf Stream.

Much attention has been given to tides, and continuous series of tidal records have been obtained at several important points.

The results of the operations of the survey in connection with the study of terrestrial magnetism can be found on its charts and in its other numerous publications on the subject. In addition to the determination of the magnetic elements at many widely distributed points and their frequent redetermination for secular variation, special observations are also made at certain base stations, with the aid of self-registering instruments, for the purpose of obtaining the record of the numerous variations of the earth's magnetism continually taking place.

The study of the force of gravity as a part of the great geodetic problem has received attention for 30 years, and the survey has of late years developed methods and instruments which will lead to a great extension of the work at a less cost

than by older processes, but without lowering the standard of accuracy.

A network of precise levels covering in a general way the eastern half of the United States, connecting the Atlantic Ocean, the Gulf of Mexico, and the Great Lakes, has been executed, and in the future will be extended to the Pacific Ocean.

Throughout its history the survey has constantly been called upon to determine boundary lines, both State and national, which have been in dispute.

At the present time, with its assistance, three State boundaries are in the process of settlement.

The Office of Standard Weights and Measures, charged with the maintenance of the standards of length, weight, and capacity, which was under the direction of the superintendent of the Coast and Geodetic Survey until 30 June 1901, is now an independent organization under the title of the «National Bureau of Standards.»

The principal publications of the survey consist of about 500 different charts; tide tables for all the principal and many minor ports; a monthly edition of 4,700 copies of a circular known as 'Notice to Mariners,' containing notes of all changes along the coast; 'Coast Pilots,' containing minute sailing directions for all navigable waters along our coast; and the 'Report of the Coast and Geodetic Survey', which contains, besides the reports of the superintendent and his assistants on the conduct of the work, a series of special reports upon various technical and scientific operations of the service. For details of the work of the bureau see CHARTS; COAST PILOTS; GEODESY; GRAVITY; HYDROGRAPHY; LEVELING; TRIANGULATION; TOPOGRAPHY; TIDES; etc.

O. H. TITTMAN,
Superintendent.

Coast Defense, systematic protection of a country against hostile attack along its coastlines. In providing such defense a nation will consider not only the safety of its territory, but also the security of its commercial interests. In any system of coast defense a good navy is the most important feature; and so essential is it considered, that all other means are regarded as adjuncts or auxiliaries of the navy. (Along a well-defended coast, in suitable places, are stations or points of support where is stored the requisite material for building, equipping, repairing, and supplying naval vessels, and where provision is made for furnishing men when additional force is needed. Forts are built in places where the coast artillery may co-operate with the navy in obstructing the advance of an enemy intending to capture a city or to invade the country; where their guns may command the entrance to a harbor or other approach by water; wherever they may cripple the enemy's attack on the defensive fleet, leaving it free to attack the enemy in turn; where forts may assist each other, and co-operate in repelling an invasion or preventing a blockade or a bombardment; where minor channels of approach may be closed or guarded, thus enabling the navy to give entire attention to the main channel, etc. Torpedo-boats, harbor-mines, the searchlight, which illuminates the harbor and permits detection of the enemy's manœuvres, are all valuable aids for the forts. The unfortified coast, as well as the land approaches to cities, must be defended in time of war by whatever means are at command.

The guns for coast defense change with the places and purposes for which they are to be used. To pierce the side armor of battleships, the flat trajectory, high-power guns are used; for projectiles intended to fall on the decks of an enemy's ships, the high-angle guns (mortars or howitzers) are employed. The number and size of guns vary with the estimated number and calibres of those which may be brought to bear by an enemy. From the depth and length of the channel may be determined how many and what classes of ships the enemy can operate in it, their armament, etc., and from these data the number and calibres of guns needed may be calculated.

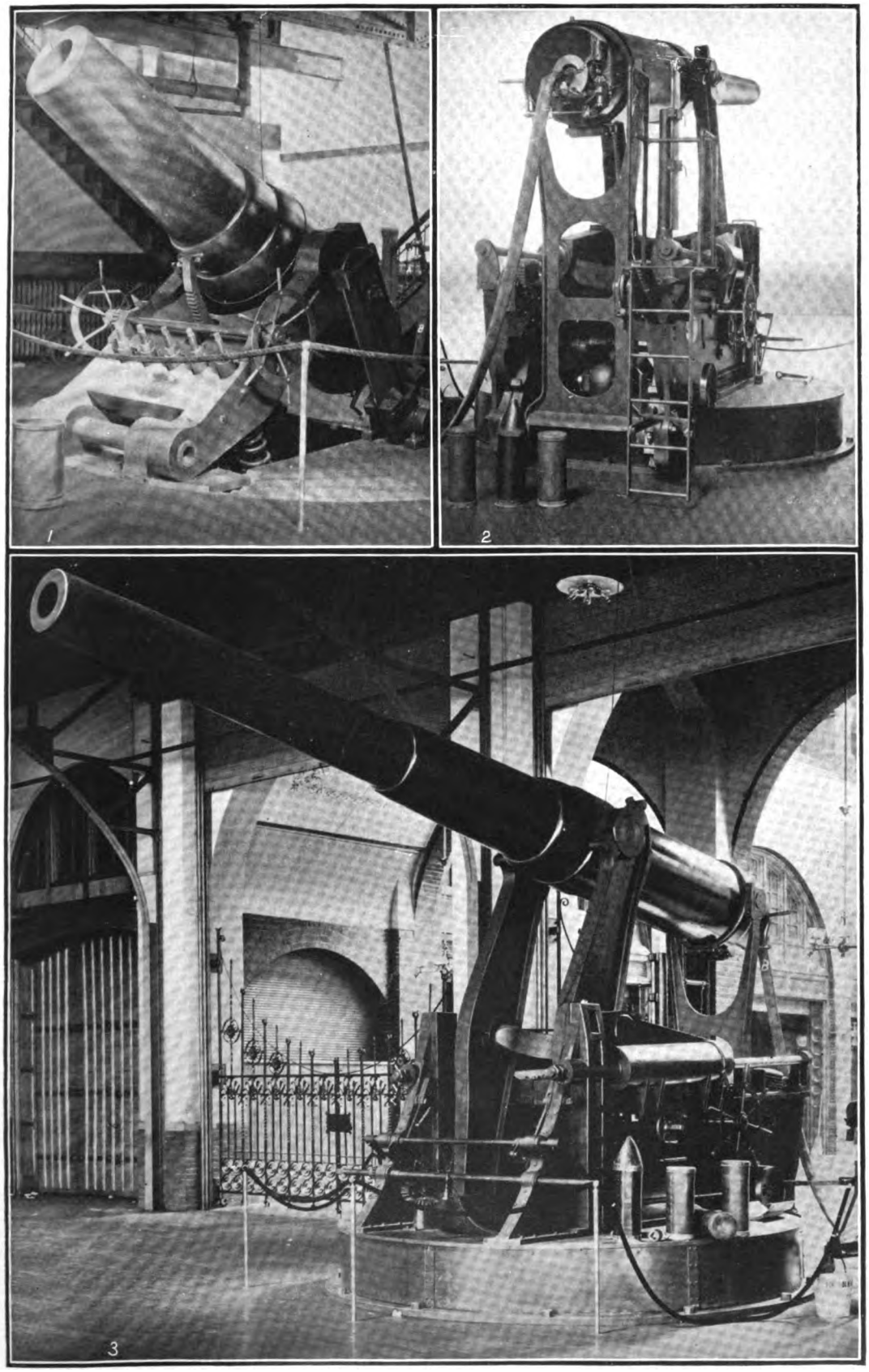
The difficulty of obtaining naval supplies after war has been declared makes it necessary to store them during times of peace. Besides quantities of supplies at points of support for the navy, important harbors are generally equipped with torpedo storehouses, cable-tanks, mining casements, etc., for use in emergencies.

The tactics of coast defense have changed greatly since the beginning of the last decade of the 19th century. Besides defense against attack upon fortified places preparation is also necessary for resisting assaults upon unfortified coasts. The length of the United States coast-line makes its secure fortification a matter of great difficulty and expense.

Methods of reconnaisance are important for defense as well as for attack. The defense seeks to veil all batteries, and even in times of peace a journey along a fortified coast might not discover many forts or other means of defense. The enemy, in preparation for attack, or in action, seeks to discover the nature and strength of the defenses; and the defense in turn uses all possible methods of ascertaining the number and classes of the enemy's ships, the probable line of attack, and whatever else may be discoverable in regard to his strength and purposes. Pictures of every important warship in the world are studied by certain officers of every navy, and so close are some of these studies that a war vessel may be recognized by such an officer in any position in which he sees it. For the important work of reconnaisance observation stations are fully equipped for the coast artillery, photographs, drawings, descriptions of warships, telescopes, etc., for use in procuring information of the enemy, being fully provided.

In times of peace a country may, to its peril, neglect its coast defense, as was shown by the condition of the defenses of the United States at the beginning of the war with Spain. European nations have for years divided their tide-water regions into naval zones, and have assigned to each zone reserves, torpedo divisions, lighthouse establishments, coast-guard services, and signal stations.

In France the naval authority is made paramount, and all naval affairs are in charge of the minister of marine, assisted by a chief of staff. Not only the mobile defenses, but the coast fortresses, submarine mines, and the fort batteries are under control of the minister or his aid. In June, 1903, the general board of the United States navy made public the details of a plan for its reorganization with a general staff



[1] A 12-Inch Mortar. [2] Rear View of 8-Inch Gun Showing Compressed-Air Attachment and Dummy Shell.
[3] Working Model of 8-Inch Gun.

SHELL PRACTICE WITH MODERN COAST-DEFENSE GUNS IN A CITY ARMORY.

in several grand divisions, under a chief of staff, with the secretary of the navy, as now, at the head of the department.

In recent times the navies of all leading countries have been enlarged, forts multiplied and strengthened, and more attention given to training young men in the tactics and strategy of defense, involving immense increase of national expenditure. In this general advance of naval preparation our own country is now maintaining a steady and quickened pace, and questions of coast defense must here be solved with equal energy and intelligence. The work of providing a proper armament for the exposed harbors of the United States has been progressing as rapidly as the congressional appropriations would permit. Since the outbreak of the war with Spain, Congress has been more liberal with its provisions for pushing this work. According to the annual report of the United States board of ordnance and fortification for 1895, at the rate of progress then being made it would require 50 years of work to place the great stretch of seacoast in proper condition for defense. The board recommended an appropriation of $2,000,000 for engineer work in the construction of implements, fortifications, etc., and one of $5,000,000 for the construction of guns, mortars, gun-carriages, seacoast armament, and ammunition. Concerning future advancement, the board recommended that it be along the following lines: the development of smokeless powders; the development of a high explosive that can be safely discharged in a shell at a high velocity with certainty of detonation; the selection of armorplate for sea forts; the development of rapid-fire field and seacoast guns, and of an efficient system of fire control for harbor defenses. Recent reports show that satisfactory progress has been made in all these lines except that the use of armor-plates in forts has been abandoned for the more satisfactory earth and concrete emplacements. The bill making appropriations for the construction of fortifications and coast defenses in the year ending 30 June 1900, carried a total of $4,744,798. The department submitted estimates for works to cost $12,151,898. In the 11 years from 1889 to 1899 inclusive Congress appropriated for these purposes $48,761,747. The bill for the year 1898–9 carried $9,377,494, and the further sum of $8,674,898 was provided in deficiency acts. In addition $12,865,841 was allotted for the same object out of the $50,000,000 appropriation for the national defense, making a total of $30,988,233 made available for fortifications and the armament thereof at that critical period.

The total appropriations made for fortifications and other works of defense since 1888 amounted in 1900 to $77,000,000. In April, 1900, the secretary of war issued a general order to the army announcing the names of 56 new batteries that had been recently constructed and the sites for works yet to be constructed along the seacoast.

The reorganization of the control of the coast defenses of the United States has embraced more thorough and systematic information regarding this branch of service. In one of its recent orders the navy department gives the following instructions: "As a part of the scheme of naval defense each district will provide means of obtaining and forwarding information to and from the coast, and of communicating with vessels of our own navy, and this system, as a whole, shall be designated as the naval patrol."

The sea and lake coasts of the United States have been divided into 13 naval districts. Torpedo boats are to be part of the defense of each district, and torpedo-boat bases will be established in them. Each district is to be in charge of an officer known as commandant. The districts follow:

1. Eastport, Me., to include Chatham, Mass.; torpedo-boat base, Rockland; commandant of the Portsmouth navy yard in charge.

2. Chatham to include New London, Conn.; torpedo-boat base, Narragansett Bay; officer specially detailed from Narragansett Bay headquarters in charge.

3. New London to include Barnegat, N. J.; officer detailed from headquarters in New York in charge.

4. Barnegat to include Assateague, Va.; torpedo-boat base, Delaware River; commandant of League Island navy yard in charge.

5. Assateague to include New River Inlet, N. C.; torpedo-boat base, Norfolk; commandant of the Norfolk navy yard in charge.

6. New River Inlet to include Jupiter Inlet, Fla.; torpedo-boat base, Charleston; commandant of Charleston navy yard in charge.

7. Jupiter Inlet, to include Tampa, Fla.; torpedo-boat bases, Tampa and Pensacola; commandant of Key West naval station in charge.

8. Tampa, to include Rio Grande; torpedo-boat base, lower Mississippi and West Gulf coast; commandant of Pensacola navy yard in charge.

9. Lake Michigan. 10. Lakes Erie and Ontario. 11. Lakes Huron and Superior. All these in charge of the commandant of the Lake training station near Sheboygan, Wis.

12. Southern boundary of United States on Pacific coast to lat 42° N.; torpedo-boat base, Mare Island; commandant of Yerba Buena training station in charge.

13. Pacific coast from lat. 42° N. to northern boundary; torpedo-boat base, Puget Sound; commandant of Puget Sound navy yard in charge.

Information collected in these districts is to be sent to the office of naval intelligence. In time of peace the aide to the commandant, or some other line officer, is to be second in command in each district; in time of war lighthouse inspectors are to be second in command. See BLOCKADE; BOMBARDMENT; FORTIFICATION.

Coast Guard, a British force formerly under the customs department, and intended only to prevent smuggling, but now organized also for purposes of defense and governed by the admiralty. The men, who are generally old men-of-war's men of good character, have high pay and are furnished with free cottages. The force numbers, with officers and men, about 4,000.

Coast Pilots are compiled to assist mariners in the navigation of their vessels, and, when from any cause they are without charts, to enable them to safely carry their vessels from port to port along the coast. The governments of all large maritime nations publish works for these purposes.

As early as 1796 a volume known as 'The American Coast Pilot', by Capt. Lawrence Furlong, was published in Newburyport, Mass., by Edmund M. Blunt, and the first edition met

with so ready a sale that a second edition of the same work was published in 1798. Since the latter date numerous compilers have published coast pilots of the coast of the United States and its harbors. These works were compiled from charts, from reports by shipmasters published in the newspapers, and from surveys and the personal knowledge of the compilers, some of whom were experienced shipmasters.

The vessels of the Coast and Geodetic Survey, while engaged in surveying the coast and harbors of the United States, collected much information of importance to mariners which could not be shown on the charts or completely given in 'Notices to Mariners.' 'Coast Pilots' are published and distributed by the Coast and Geodetic Survey at the cost of the printing and binding. Similar information can not be collected by private enterprise except at great cost and with imperfect means, and at the present time all the private publications containing such information relating to the coast of the United States are compilations from government publications and based generally on the work of the Coast and Geodetic Survey.

The compilation of the 'Coast Pilots' necessitates work in the office and in the field. The office work consists of the collection of the latest data from the reports and surveys of hydrographic and topographic parties, from the reports and surveys of the United States engineers engaged in the improvement of harbors and waterways, and from correspondence with local authorities and engineers. This information, in manuscript, is then put in the form of a volume which experience has shown to be convenient for the use of the mariner.

For the field work a vessel of the survey, with the compilers of the 'Coast Pilot' on board, visits every part of the coast which is treated in the volume; the information collected in the office is verified and, if necessary, corrected on the spot; the sailing lines and directions are tested by running over them; such artificial aids and natural landmarks as are of use to the mariner are noted, and hydrographic examinations of reported dangers and changes are made; pilots, shipmasters, and local authorities are interviewed and the latest information is incorporated, together with such notes as can only be obtained by observation and experience in the locality.

On returning to the office from the field work this manuscript, correct to date, is prepared for the printer, and when printed the volumes are issued with a supplement or insertion sheet containing the changes which have occurred since the date of the preparation of the volume and while the matter was going through the press.

The 'Coast Pilots' published by the coast and geodetic survey contain:

1. A tabular description of lighthouses, light vessels, and fog signals; lists of life-saving stations, storm-warning display stations, and seacoast telegraph stations, and information regarding tides, tidal currents, variation of the compass, etc.

2. Nautical descriptions of the coast and harbors and general information concerning the several bodies of water and harbors, including notes relative to pilots, depth of water, draft of vessels entering the harbor, supplies; facilities for making repairs, usual or best anchorage, and other matters of practical value. In each case the information of this nature precedes the sailing directions and is printed in smaller type.

3. Sailing directions, with subordinate paragraphs treating of prominent objects, dangers, aids to navigation, etc. The arrangement conforms to the order in which these matters would be considered in practice, and be available when wanted promptly. For this purpose, and to afford a ready means of reference from one part to another, the sailing directions, where long, are divided into numbered or lettered paragraphs, printed in large type, each followed by its own subordinate remarks in smaller type.

4. Appendices, containing rules of the road at sea and in inland waters; laws and regulations relative to pilotage, harbor control, national and local quarantine, and Marine Hospital service; and information regarding storm-warning displays.

5. Views of important points. These are only inserted in volumes which treat of localities which have not yet been surveyed or where the lighthouses and other aids to navigation are not sufficiently numerous to readily locate and navigate a vessel.

6. Sections of charts covering the coast treated in the volume to aid in finding the geographic positions of different localities. Index maps showing the limits of the charts covering the localities treated in the volume.

The 'Coast Pilot' publications of the United States Coast and Geodetic Survey include:

Seven volumes of the 'United States Coast Pilot, Atlantic Coast', in eight parts as follows:

Parts I-II. From St. Croix River to Cape Ann.

Part III. From Cape Ann to Point Judith.

Part IV. From Point Judith to New York.

Part V. From New York to Chesapeake Bay Entrance.

Part VI. Chesapeake Bay and Tributaries.

Part VII. From Chesapeake Bay Entrance to Key West.

Part VIII. Gulf of Mexico, from Key West to the Rio Grande.

One volume of the 'Pacific Coast Pilot'; California, Oregon, and Washington.

One volume of the 'Pacific Coast Pilot; Alaska, Part I, Dixon Entrance to Yakutat Bay, with Inland Passage from Strait of Fuca to Dixon Entrance'.

In addition to the above 'Coast Pilots', bulletins containing the latest information obtainable from all sources about the little known waters of northwest Alaska and Bering Sea are published for the use of mariners navigating those waters.

It is manifest that publications of this character must be subject to numerous corrections in the details after the lapse of a few years. To maintain the volume in a useful form corrections are issued in 'Notices to Mariners,' insertion sheets, and supplements; and each volume is revised and passed to a new edition when the corrections have assumed proportions that impair its usefulness, or more recent surveys show changes or furnish additions that render the old volume untrustworthy.

Coastal Plain. Where the foothills of a range of mountains descend to a lowland that slopes gently to the sea, this lowland is called

a coastal plain. It represents what was once the sea floor, being composed of material eroded from the mountains and deposited in the sea. With further elevation the original surface of the plain may be removed by streams cutting their valleys and by the weathering of the valley slopes. The coastal plain of the Atlantic Seaboard extends from New York to Georgia. In the Carolinas and Georgia it is divisible into belts parallel to the shore. The outer is a smooth plain, often swampy, perhaps 50 miles wide with a gently rolling surface. Further inland, where the streams have cut valleys, the surface is more hilly, and 100 miles inland is a belt of hilly country some 600 or 700 feet high covered with pine forests where the original surface of the plain has been nearly destroyed. Back of this come the higher hills, formerly mountains, of the old land, forming what is known as the Piedmont belt. Other instances of coastal plains are the east coast of Mexico, north and south of Vera Cruz, and the east coast of India, skirting the Bay of Bengal.

Coast Range. The Pacific shore of the United States rises abruptly from the ocean along nearly its whole length, with practically no coastal plain of any size from southern California to the Strait of San Juan de Fuca. The hills and low mountains which border the ocean are given the general name of the Coast Range. They do not form, however, a continuous ridge, but are rather parts of more or less disconnected uplifts, lower and possibly younger than the Sierra Nevada and Cascade ranges. North of the Strait of San Juan de Fuca the mountains of Vancouver Island and the Island range of British Columbia mark the continuation of these uplifts, although in British Columbia the name of Coast Range is given to the mountains which border the continental shore and are spurs of the Cascades.

In California the coast range comprises two parallel ridges, 400 miles long, 30 to 60 miles apart, and parallel to the coast from Point Concepcion in lat. 35° to Cape Mendocino, the ridge on the coast being the coast range proper, and the inner the Monte Diablo range, the two separate the Sacramento and San Joaquin valleys from the Pacific. In the south the coast ranges and the Sierra Nevada coalesce and the topography is complicated by east and west ranges; thus opposite the Santa Barbara channel is the Santa Inez range, having a height of about 4,000 feet, and farther south is another east-and-west range, the Santa Monica. Still further south the uplift is much broken and irregular without strongly marked ridges but with portions rising into central dominating points like the San Bernardino and San Jacinto mountains, about 11,000 feet high.

North of lat. 35°, toward San Francisco Bay, there are no very high peaks. The highest peaks near the bay are Monte Diablo, 3,856 feet, an isolated peak that is a conspicuous landmark for miles; Mount Helena, 4,343 feet; and Mount Hamilton, 4,400 feet, the latter famous as the site of the great Lick observatory. North of San Francisco Bay the heights of the summits gradually increase, and 150 miles north is Mount Bailey, 6,357 feet. Farther north the coast range becomes gradually a series of disconnected mountain groups, and near the Oregon line east-and-west ridges develop which unite with the Cascades, the most important of these being the Calapooia Mountains in Oregon.

Along the Oregon coast the uplift is low, being generally less than 3,000 feet. In Washington also the uplift is not great except in the Olympic Mountains between Puget Sound and the Pacific Ocean, which culminate in the fine peak of Mount Olympus, 8,150 feet.

Extending along such a length of coast, the coast ranges have a wide variety of climate and differ much in vegetation and attractiveness. In California, north of lat. 38° to San Francisco Bay, much of the outer range is covered with brush and has some timber. South the mountains are covered with a thorny undergrowth known as chapparal. Near the coast, from Santa Barbara to San Francisco, there is a fair rainfall in the interior. The climate is very dry, and the mountains are generally bare. North of San Francisco Bay the rainfall increases, and the mountain valleys are fertile and picturesque. In Oregon the rainfall is heavy, and in Washington very heavy; the mountains being covered with thick forests of fir, pine, and spruce.

Geologically the mountains of the coast uplifts, besides being newer than the Sierra Nevada and Cascades, are also less broken through by granite than the Sierra Nevada, and less covered by lava than the Cascades. The upheaval began in late Tertiary time, and perhaps continued into the Quatenary, Pliocene rocks being upturned at a high angle near San Francisco Bay. South of San Francisco Bay the rocks are mostly of the Miocene series, though there are large areas of Cretaceous in the east side of the Monte Diablo belt. North of San Francisco Bay and in Oregon the proportion of Cretaceous increases, and the Tertiary is much less. On Vancouver Island an uplift took place in Jurassic time.

Generally speaking, the rocks of the coast range in California are much metamorphosed, and large masses of serpentine and similar rocks are not uncommon. In places these serpentines sometimes contain workable deposits of chrome iron ore, though, owing to the limited demand, the production is small. The chief mineral wealth of the coast range is in quicksilver and petroleum, though some gold has been washed from placers in southern California. The quicksilver occurs at a number of places in the range where the altered rocks are silicified, and the total production, though the ore is generally of low grade, has been large.

South of San Francisco Bay, in the Miocene, in places is a great thickness of bituminous shale, there being several thousand feet of it near Santa Barbara and Los Angeles. This shale has been used extensively as a material for paving streets. Within the past eight years a valuable oil-field has been developed near Los Angeles. But little coal has been found in the range in California, and that is of poor quality. In Oregon is the Coos Bay field.

In Oregon and Washington the coast range contains very few mineral deposits of importance. On Vancouver Island, however, promising copper deposits are being developed on the west coast, and on the east coast are large and important coal mines.

The coast range naturally has no river systems, nor, except in California, is it a barrier to rivers of the interior. It is crossed by the

Columbia, Coquille, Rogue, Klamath, and other rivers.

For mineral resources of the range see COAL; PETROLEUM. See also BRITISH COLUMBIA; CALIFORNIA; OREGON; WASHINGTON.

Coasting Trade, trade carried on by sea between the ports of the same country. In some countries the coasting trade is retained as a home monopoly, and this used to be the case in the United Kingdom, but by recent laws the coasting-trade of Great Britain has been opened to foreign vessels, subject to the same rules, dues, and regulations as British sailing ships and steamers; but power was given to impose by an order in council retaliatory prohibitions and restrictions on the ships of such countries as should impose restrictions and prohibitions on British ships. The dues and regulations to which vessels engaged in the coasting trade are subject are different from those which relate to vessels engaged in the oversea trade, and masters are required to keep books showing that their cargoes are strictly such as are allowable by the rules of the coasting trade. In the United States the coasting trade is restricted to vessels belonging to the country. The commerce of the Great Lakes is included in the coasting trade. The great length of the sea and lake coasts, the number of good harbors, and the fact that much of the coast region of the United States has been settled makes the coasting trade of this country the most extensive in the world. Many hundreds of sailing craft and steamers are used in this trade, carrying the products and people of one part of the country to other parts. This trade is increasing rapidly, the licensed tonnage of fisheries and trade in 1900 was 4,338,145 tons, an increase of nearly 1,250,000 tons in the preceding 50 years. The annual amount of tonnage passing through St. Mary's Falls Canal is much larger than that of the annual tonnage of the Suez Canal, and the amount passing through St. Clair River is about four times that recorded at St. Mary's Falls Canal.

Coat of Arms, heraldic insignia, originally embroidered on the tabard, a short coat worn by knights over the armor. They originated in the age of chivalry, when they were assumed as emblematic of the adventures, and hopes of the knight and were useful for distinguishing individuals whom it was difficult to recognize when in full armor. The favorite emblem of the knight later became the adopted badge of the family, the figures or characters employed in the coat of arms began to receive names, and so the language and science of heraldry came into existence. Modern nations have adopted coats of arms, in monarchical countries, sometimes an adaptation of the heraldic insignia of a dynasty. The coats of arms of the United States and of the individual States are arbitrarily adopted emblems without true heraldic significance. The emblem of a State sometimes represents its leading industry; some cities have also adopted similar coats of arms. See HERALDRY.

Coat of Mail, a piece of armor in the form of a shirt, consisting of a close net-work of iron or steel rings, or of a strong linen or leather jacket covered with small laminæ or plates, usually of tempered iron, overlapping each other like the scales of a fish. See ARMS AND ARMOR.

Coatbridge, kōt'brĭj, Scotland, a municipal burgh in Lanarkshire, nine and a half miles east of Glasgow. It owes its rise to the working of the coal and iron-stone found in the surrounding district, and has grown rapidly from a village to a thriving town. The chief manufacturing interests are the numerous iron works in the town and neighborhood, about half of the blast-furnaces of Scotland being situated in this locality. There are also important engineering establishments and other industries. Pop. (1901) 36,981.

Coates, Florence Earle, American poet: b. Philadelphia, Pa., 1 July 1850. In 1879 she was married to Edward Hornor Coates. She has made many contributions to various magazines and published her collected 'Poems' in 1899.

Coates'ville, Pa., a borough of Chester County, situated on the Pennsylvania and the Wilmington & No. R.R.'s. It has a number of important industrial interests, including large boiler works, iron and steel works, foundries, and woolen and paper mills. Pop. (1900) 5,721.

Coati, an American animal somewhat related to the raccoons, of which two species are known, constituting the genus *Nasua*. One inhabits Mexico and roves as far north as southern Arizona; the other lives in Brazil. The Mexican coati, or "coati-mundi" (*N. nasica*) is about the size of a house-cat, has a long cartilaginous snout which may be reflexed or stiffened at will, according to its owner's needs. Its fur is long, thick, and a warm brown in color; and its tail is ringed like that of a raccoon. The Brazilian coati (*N. rufa*) is somewhat smaller than the Mexican, and its fur is not so fine. Both species feed on fruits, eggs, insects, and sometimes on small birds. They are readily tamed, and make as good pets as the domestic cat.

Coaticook, kō-ăt'i-kuk, Canada, a town of Stanstead County, Quebec, situated on the Coaticook River, and the Grand Trunk R.R. It has a number of factories and is a manufacturing centre. Pop. 3,000.

Coatzacoalcos, kō-ät-sa-kō-äl'kōs, a river of the isthmus of Tehuantepec in Mexico, rises in the Sierre Madre, and empties into the Gulf of Mexico, 130 miles southeast of Vera Cruz. It is navigable for large vessels for 30 miles, and is interesting as part of a route which has been surveyed for an inter-oceanic canal, a city of the same name, with a population of about 3,000, is situated at the mouth of the river.

Cobalt, a metal which occurs combined with arsenic, nickel, and other metals; also as a sulphide and as an arsenate. After the ore has been calcined, oxide of cobalt remains, but impure from the presence of other metallic oxides. When this oxide has been purified and reduced to the metallic state the cobalt is obtained of a white color inclining to gray, and, if tarnished, to red, with a moderate lustre. Its fracture is compact; it is hard, brittle, and of a specific gravity of 8.5 to 8.9. Like nickel, it is strongly magnetic. It undergoes little change in the air, but absorbs oxygen when heated in open vessels. It is attacked, though slowly, by sulphuric or hydrochloric acid, and is readily oxidized by means of nitric acid. Two basic oxides of cobalt are known, and some inter-

mediate oxides. The protoxide is of an ash-gray color, and is the basis of the salts of cobalt, most of which are of a pink hue. When heated to redness in an open vessel it absorbs oxygen and is converted into a higher oxide. It may be prepared by decomposing the carbonate of cobalt by heat in a vessel from which atmospheric air is excluded. It is easily known by its giving a blue tint to borax when melted with it. It is employed in the arts, in the form of smalt, for communicating a similar color to glass, earthenware, and procelain. *Smalt*, or powder blue, is made by melting three parts of fine white sand, or of calcined flints, with two of purified pearl-ash and one of cobalt ore previously calcined, and ladling it out of the pots into a vessel of cold water; after which the dark-blue glass, or zaffer, is ground, washed, and distributed into different shades of color, which shades are occasioned by the different qualities of the ore and the coarser or finer grinding of the powder. Smalt, besides being used to stain glass and pottery, is often substituted, in painting, for ultramarine blue, and is likewise employed to give to paper and linen a bluish tinge. The chloride of cobalt is well known as a *sympathetic ink*. When diluted with water so as to form a pale pink solution, and then employed as ink, the letters, which are invisible in the cold, become blue if gently heated. It is prepared by dissolving precipitated oxide of cobalt in hydrochloric acid with the aid of heat, and diluting with water. The nitrate of cobalt is readily got by dissolving cobalt or its oxide in nitric acid and crystallizing the solution. It is a deliquescent red salt, which dissolves in water with a pink color. The peroxide of cobalt is black, and is formed by adding a solution of bleaching-powder to a cobaltous salt, or by passing a current of chlorine gas through water holding cobaltous hydrate in suspension. It does not unite with acids; and when digested in hydrochloric acid the cobaltous chloride is generated with the disengagement of chlorine. When heated it is converted into one of the intermediate oxides.

Ores of Cobalt.— "Bright white cobalt ore" is the popular name for the mineral cobaltite (q.v.), a sulph-arsenide of cobalt. "Gray cobalt ore," also sometimes called "tin-white cobalt," is the mineral smaltite (q.v.). It is the chief ore of cobalt and is essentially cobalt diarsenide, though it always contains nickel and iron. "Red cobalt," also known as "cobalt-bloom," is the mineral erythrite (q.v.), a hydrous cobalt arsenate. "Earthy cobalt," or "black cobalt," is the mineral asbolite, a variety of wad containing up to 32 per cent. oxide of cobalt. "Cobalt pyrites" is the mineral linnæite, a sulphide of cobalt, often containing much nickel. The principal supply of cobalt is derived from the smaltite of Germany and the cobaltite of Norway and Sweden.

Cobaltite, "bright-white cobalt," an important ore of cobalt, is its sulph-arsenide, CoAsS, and contains 35.5 per cent. of cobalt. It occurs granular massive, but also in isometric-pyritohedral crystals. These usually have a brilliant metallic lustre and a white color slightly tinged with copper-red. Their hardness is 5.5 and specific gravity 6 to 6.3. The most important localities are in Norway and Sweden.

Cobalt'-blue, or **Thenard's Blue,** a compound of alumina and oxide of cobalt, forming a beautiful pigment often used in the arts. Sometimes it contains also the phosphate or arsenate of cobalt, according to the mode of manufacture employed. It is non-poisonous, and unacted on by acids and alkalies.

Coban, kō-bän', or **Vera Paz,** Guatemala, a city 90 miles northeast of the city of Guatemala. It is the capital of the department of Vera Paz, on the left bank, and near the source of the Dulce or Dolce. It was formerly a mission station of the Dominicans, whose memory is still revered. The Dominican monastery is now deserted. The valley is exceedingly fertile, and covered with plantations of sugar-cane, bananas, and pimento trees, and various kinds of fruit-trees. Pop. about 30,000.

Cobb, Henry Ives, American architect: b. Brookline, Mass., 19 Aug. 1859. He studied at the Massachusetts Institute of Technology, and graduated at Harvard 1880. In 1881 he established himself in Chicago, and has built up a large and lucrative general practice in that city and other parts of the country. In 1893 he was one of the national board of architects of the World's Columbian Exposition, and at present is retained as a special architect for the United States government. Among the prominent public buildings erected from his designs are, the Newberry Library, Chicago, opera house, University of Chicago, and Church of the Atonement, in Chicago; the Pennsylvania State Capitol, American University at Washington, D. C., and government buildings at Chicago, League Island, Annapolis, etc.

Cobb, Howell, American statesman: b. Cherry Hill, Ga., 7 Sept. 1815; d. New York City, 9 Oct. 1868. He was graduated at Franklin College in 1834, became a lawyer in 1836, and in 1843 was elected to Congress as a Democrat. He served eight years and was speaker of the House one term. Elected governor of Georgia in 1851, he returned to Congress in 1855, and was made secretary of the treasury by President Buchanan in 1857, resigning in 1860 to urge secession. He held a Confederate military commission in the Civil War, but saw little service.

Cobb, Sylvanus, American novelist: b. Waterville, Maine, 1823; d. Hyde Park, Mass., 2 July 1887. He was editor and publisher of a periodical called the 'Rechabite', and besides contributing to other publications, was a most prolific story-writer. His most popular novels are: 'The King's Talisman' (1851); 'The Patriot Cruiser' (1859); and 'Ben Hamed' (1864); 'The Gunmaker of Moscow'.

Cobb, Thomas Reed Root, American lawyer and soldier: b. Cherry Hill, Jefferson County, Georgia, 10 April 1823; d. Fredericksburg, Va., 13 Dec. 1862. He graduated at the head of his class at the University of Georgia, 1841, was admitted to the bar, and was reporter of the Georgia supreme court 1849–57. As a lawyer he enjoyed a wide reputation and large practice. In the Confederate Congress he was chairman of the Committee on Military Affairs, but later became a general in the army and was killed at the battle of Fredericksburg. He wrote: 'Digest of the Statute Laws of Georgia' (1851); 'Inquiry Into the Law of Negro Slavery in the United States' (1858); 'Historical Sketch of Slavery from the Earliest Periods' (1859).

Cob'ban, James Maclaren, Scottish novelist: b. Aberdeen, Scotland, 24 April 1849. He is the author of 'The Cure of Souls' (1879); 'Tinted Vapors' (1885); 'Master of His Fate' (1890); 'A Reverend Gentleman' (1891); 'Sir Ralph's Secret' reprinted in America as 'The Horned Cat' (1892); 'The Red Sultan' (1893); 'The Burden of Isabel' (1893); 'The White Kaid of the Atlas: a Boy's Story' (1895); 'The King of Andaman' (1895); 'Wilt Thou Have This Woman?' (1896); 'Her Royal Highness' Love Affair' (1897); 'The Angel of the Covenant' (1898); 'Pursued by the Law' (1899); 'An African Treasure' (1899); 'Cease Fire!' (1900); 'I'd Crowns Resign' (1900); 'The Golden Tooth' (1901); 'The Green Turbans' (1901); 'Life and Deeds of Earl Roberts' (1901); 'The Last Alive' (1902); 'Julius Courtney'; 'Royal Exchange'.

Cobbe, kŏb, **Frances Power,** Irish rationalistic writer: b. Dublin 4 Dec. 1822. She has taken a deep interest in many humanitarian movements, especially in the anti-vivisection crusade, and for 18 years acted as honorary secretary of the Victoria Street Society for the Protection of Animals from Vivisection. Some of her works are descriptions of her travels in Italy, Greece, Egypt, and Palestine, the others treating mainly of theological, religious, and humanitarian questions. The most important are: 'Essay on Intuitive Morals' (1855); 'Religious Duty' (1857); 'Pursuits of Women' (1863); 'Broken Lights: an Inquiry into the Present Condition and Future Prospects of Religious Faith' (1864); 'Hours of Work and Play' (1867); 'Dawning Lights' (1868); 'Darwinism in Morals' (1872); 'The Hopes of the Human Race Hereafter and Here' (1874); 'Duties of Women' (1880); 'The Peak in Darien' (1882); 'The Scientific Spirit of the Age' (1888); and 'The Modern Rack' (1889). She has also written an enormous number of pamphlets and edited an edition of the works of Theodore Parker.

Cobbett, kŏb'ĕt, **William,** English writer and politician; was the son of a farmer and publican: b. Farnham, Surrey, 9 March 1762; d. near Guildford 18 June 1835. In 1783 he set out to try his fortune in London, and arrived there with only a half a crown in his pocket. He succeeded in obtaining a situation as copying-clerk to an attorney of Gray's Inn, where he remained for nine months. Determined to find some other sphere of employment he quitted London for Chatham, enlisted in the 54th Regiment, and after continuing there for a year proceeded with it to New Brunswick. During his stay at Chatham he set himself assiduously to study and the improvement of his mind. He remained four years in America, during which time his regular habits and ability and attention in the discharge of his military duties effected his promotion to the rank of sergeant-major. In 1791 he returned to England with the regiment, and shortly after arriving there obtained his discharge. After a short stay in England, and a stay of six months in France in 1792, he embarked at Havre for America. He landed in New York in October, 1792, and continued in America for eight years, where he occupied himself with literary labors, chiefly of a political kind, commencing his career by an attack on Dr. Priestley, then recently landed in America, in a pamphlet entitled 'Observations on the Emigration of a Martyr to the Cause of Liberty', and signed "Peter Porcupine". Under this famous *nom-de-plume* a succession of papers appeared, all of a strongly anti-Republican tendency, which were afterward republished in England. Before leaving America he published a life of 'Thomas Paine'. In June, 1800, he sailed for England, and on his arrival started the 'Porcupine', which zealously supported the measures of Pitt, but met with little success. In a subsequent paper, the 'Weekly Register', he was more fortunate; and it continued to appear regularly every week up to the period of his death. Not long after its commencement symptoms of a gradual change began to appear in Cobbett's political opinions, and from high conservative he passed over to extreme radical principles. In 1803 a prosecution for libel on the lord-lieutenant and other officers of state in Ireland was instituted against him, and resulted in his being sentenced the following year to a fine of $2,500; while a second action, brought almost immediately afterward, subjected him to a second fine of the same amount. In 1810, owing to some remarks of his in the 'Register' of 10 July 1809, on the flogging of some militiamen, he was again prosecuted for libel, and sentenced to imprisonment for two years and a fine of $5,000. This last was paid by a subscription among his friends. Nowise daunted, he continued his attacks on government as soon as he was liberated, and commenced his celebrated 'Twopenny Trash', which reached a sale of 100,000, and from its supposed influence on the working-classes brought about the passing of the noted Six Acts. Partly to escape their operation, he retreated to the United States, and remained here for two years, residing principally in Long Island. He returned to England in 1819, and in 1820 endeavored, unsuccessfully, to be returned member for the city of Coventry. About the same period he commenced in the 'Register' a series of papers entitled 'Rural Rides', afterward reprinted, which present most charming pictures of English country scenery, and are among the best of his productions. In 1824–27 he published a 'History of the Protestant Reformation in England and Ireland', in which he vilified Queen Elizabeth and the leading reformers, but added in no way to his literary reputation. The work was eagerly adopted by the Roman Catholics, who caused translations to be made of it into various European languages. In 1831 he was again prosecuted for libel, on the ground of an article in the 'Register' alleged to be published with the view of exciting the agricultural laborers to acts of violence. He conducted his own defense in a speech of six hours, and the jury not being able to come to a verdict the trial ended in their discharge. On the passing of the reform bill in 1832 Cobbett was returned member to Parliament for Oldham; but his success in this capacity was indifferent. Nevertheless, at the general election in December, 1834, he was again returned to Parliament for Oldham. In addition to the writings already referred to Cobbett is the author of an English and a French Grammar; 'Advice to Young Men and Women', containing many useful hints; 'Cottage Economy'; 'Village Sermons'; 'A Year's Residence in America'; and other works. Cobbett wrote in a pure and vigorous English style, and his

writings contain a great amount of information and sound practical advice. See E. Smith, 'Life of Cobbett' (1878).

Cob'den, Richard, English economist, the great "apostle of free trade": b. Dunford, Sussex, 3 June 1804; d. London 2 April 1865. After receiving a very meagre education at the grammar-school of Midhurst, he was taken as an apprentice into a Manchester warehouse in London belonging to his uncle, where he rapidly made up for the defects of his education by his own diligence, and soon acquired a thorough acquaintance with the business. In 1830, being left to his own resources, he obtained some advances of money, and, with some relatives, started a cotton manufactory in Manchester, which in a few years succeeded in producing fabrics equal in point of quality to the best manufactured in London. By several journeys that he now made to France, Belgium, Switzerland, and the United States, chiefly in the interest of the firm, he not only increased his business connections, but matured and enlarged his views. His first political writing was a pamphlet on England, Ireland, and America, which was followed by another on Russia. In both of these he gave clear utterance to the political views to which he continued through his life rigidly to adhere, rejecting the course of policy based upon the theory of the balance of power, advocating non-intervention in the disputes of other nations, and maintaining it to be the only proper object of the foreign policy of England to increase and strengthen her connections with foreign countries in the way of trade and peaceful intercourse. These views, although disregarded or considered as visionary in Parliament were warmly received in industrial and commercial circles, and secured Cobden a considerable number of followers, especially in Manchester. After returning from extensive travels in the East and in Germany, he entered actively on a course of agitation with the view of carrying into effect his political views. Soon after the Anti-Corn Law League was formed in 1838, it was joined by Cobden, who expended all his energies on behalf of the cause to support which the league had been founded; and it was chiefly the extraordinary activity and perseverance of Cobden, joined to the zeal of his supporter Bright, that brought about the final victory of free-trade principles. In 1841 Cobden was returned to Parliament by Stockport. In his very first speech in Parliament he took occasion to point out the unjust way in which the corn-laws operated, and, undeterred by the failure of his first attempts, returned again and again to this subject. After five years of unwearied contest he at last succeeded in convincing Sir Robert Peel himself, at that time prime minister, of the pernicious action of the corn-laws, and in inducing him to bring in a bill for their repeal. The bill passed both houses of Parliament before the end of June 1846, and Sir Robert Peel was the first to congratulate Cobden on his victory in a speech delivered in the House of Commons. During this long struggle Cobden had been obliged to neglect his business, which before agitation commenced had been a highly prosperous one. As a compensation for the loss he had thus sustained a national subscription was made, and a sum of about $350,000 presented to him. After again visiting several countries on the Continent, where he was generally received with enthusiasm, he returned to his parliamentary duties in 1847, having been returned without opposition as one of the members for the West Riding of Yorkshire. He now appeared chiefly as the advocate of parliamentary reform, economy, and retrenchment in the management of the finances of the country, and a policy of non-intervention; in all of which he found a firm and ready ally in Bright. His advocacy of a peace policy did not in every case add to his popularity. His opposition to the policy of Lord Aberdeen in 1853, which ultimately led to the Russian war, met with no success; and although in 1857 he carried a vote of censure on Lord Palmerston's Chinese policy, his action in this case was displeasing to the country generally. In 1860 he negotiated a treaty of commerce with France, and in reward for his services on this occasion was offered a baronetcy, a seat in the privy-council, and several other offices and dignities, all of which he persistently refused. A collection of his political writings appeared in 1867, and a collection of his speeches 'Speeches on Questions of Public Policy' (1870). Consult Garnier, 'R. Cobden, les Liguers et la Ligue' (1846); McGilchrist, 'Life of Richard Cobden' (1865); Morley, 'Life of Richard Cobden' (1881–3).

Cobden Club, The, an organization named after Richard Cobden, formed about a year after his death, through the influence of John Bright and others, for encouraging the diffusion of free trade and the other economical and political principles with which Cobden's name is associated. The Cobden Club has distributed a vast number of books and pamphlets.

Cobego, kō-bā'gō. See Colugo.

Co'bern, Camden M., American Methodist clergyman: b. Uniontown, Pa., 19 April 1855. He was educated at Allegheny College, and the Theological School of Boston University and entered the ministry in 1876. He has published 'Ancient Egypt in the Light of Modern Discovery' (1892); 'Ezekiel and Daniel: a Critical Commentary' (1901).

Cob'ham, Lord. See Oldcastle, Sir John.

Cobija, kō-bē'hä, or **Puerto La Mar,** Chile, a seaport in the territory of Antofagasta (formerly belonging to Bolivia), on the shore of the Pacific. It stands in a desert region, and is entirely dependent on the mines in the neighborhood. The roadstead is tolerably safe, but the landing-place is far from good. All the water used for drinking must be obtained by distillation, and the means of subsistence come from a considerable distance. The population is about 4,000, including those who are going to and from the mines.

Co'ble, or **Cobble,** a flat-floored boat with a square stern, furnished with a lug-sail and also propelled with oars. It has a sharp high bow, is admirably constructed for encountering a heavy swell, and is used in fishing, especially on the east coast of Great Britain. The rudder extends for some distance below the stern. There is also a small rowing-boat with the same name used by salmon-fishers and others.

Coblentz, kō'blĕnts, Germany, a fortified city, anciently called *Confluentes,* from its situation at the confluence of the Rhine and Moselle. It is the capital of Rhenish Prussia, and is finely situated on the left bank of the Rhine,

in the angle between that river and the Moselle, and connected by a pontoon bridge over the Rhine with the fortress of Ehrenbreitstein. This with its other fortifications renders it one of the strongest places in Germany, and capable of accommodating 100,000 men. The new part of the town is well built, with broad streets and fine squares. The palace of the Elector of Treves is now a Prussian royal residence. Its industries embrace cigars, machinery, champagne wines, and pianos. Its trade in Rhine and Moselle wines is extensive. Pop. 46,000.

Cobourg, kō'bėrg, Canada, a town and port of entry, the county-seat of Northumberland County, Ontario, on Lake Ontario, and the Grand T. R.R., 69 miles northeast of Toronto. It is the seat of a Wesleyan university, and has several woolen mills, a car factory, foundries, newspapers, banks, and schools. Pop. (1901) 4,239.

Cobra di Capello, that is, "serpent with a hood"; the Portuguese name of an East Indian serpent, the *Naja tripudians,* and sometimes applied to an African serpent of the same genus, the *Naja haje,* or asp, both reptiles of the most venomous nature. The former inhabits India and southeastern Asia, Java, etc. The species of the viper kind are all remarkable for the manner in which they spread out or distend the sides of the neck and head when disturbed or irritated. In the cobra di capello the conformation necessary to this action is found in the most perfect condition, as some of the ribs are loosely articulated and moved by appropriate muscles on the sides of the neck, which, when expanded, give the anterior part of the body the appearance of an overhanging arch or hood, on the middle of which, posterior to the eyes, is a greenish-yellow mark, resembling the rim of a pair of spectacles. From this mark we have the name "spectacled snake." When disturbed by the approach of an individual or otherwise, the cobra raises the anterior part of its body, so as to appear to stand erect, expands its hood, and is prepared to inflict a deadly wound. The poison fangs are attached to the anterior end of the maxillary bone, and are permanently erect, not movable, as in the rattlesnakes. So exceedingly poisonous is its bite that in numerous instances which are well authenticated death has followed within a few minutes; under ordinary circumstances a few hours is the longest term that intervenes from the infliction of the bite till the death of the sufferer, where prompt measures for his relief have not been resorted to. So numerous are these snakes in India, and so bold in frequenting human habitations, that the census returns attribute not less than 10,000 deaths annually to their bites.

To minister to the curiosity of the multitude, the jugglers of India select these venomous reptiles for their exhibitions, and having extracted their fangs keep them in cages or baskets to exhibit as dancing snakes. When the cage is opened, the juggler begins playing upon a pipe or other instrument; whereupon the cobra assumes the erect attitude, distends its hood, and remains balancing itself in this position until the music is suspended. It is most probable that this snake in common with lizards and other animals, is peculiarly affected by musical sounds. With the exception of the spectacle mark on the back of the neck and its distensible hood, the cobra is not especially distinguished as regards coloration or form. Consult Gunther, 'Reptiles of British India'; Boulenger, 'Snakes of the British Museum'; Gadow, 'Amphibia and Reptiles.' See HAMADRYAD.

Coburg, kō'boorg, a noted family of Germany, dating from the 5th century, distinguished for intermarriages with royal houses, especially during the 19th century. A sister of Duke Ernest I. became Duchess of Kent and mother of Queen Victoria; the Duke's brother Leopold became king of the Belgians, and married in succession daughters of George IV. of England and of Louis Philippe; one of his nephews, Ferdinand, married the queen of Portugal, and was regent of that kingdom, 1853; another, August, married a daughter of Louis Philippe; one of his sons, Duke Ernest II., declined the crown of Greece, 1863, and another, Prince Albert, was the husband of his cousin, Queen Victoria of England.

Coburg, or **Koburg,** Germany, capital of the duchy of Saxe-Coburg-Gotha, situated on the left bank of the Itz, 106 miles east by north of Frankfort-on-the-Main. Among the principal buildings is the Ehrenburg Palace, one of the town residences of the Duke of Saxe-Coburg-Gotha, formerly a monastery of the Recollets, but converted into a ducal residence in 1549. It contains some interesting pictures, tapestry, etc. Some of the old doors exhibit beautiful specimens of marquetry or inlaid work. There are one or two other palaces, and various monuments, including a statue of Prince Albert, consort of Queen Victoria. The chief church is the Moritzkirche, a spacious building in the late Gothic style, with a tower 334 feet high. The government house is a handsome structure in the Italian style. The educational institutions comprise a gymnasium (founded in 1605), real school, normal school, etc. On an eminence overhanging the town is the ancient castle or fortress, now a museum, from which extensive views are obtained. In the museum are relics and writings of Luther, who resided here for three months in 1530, and here wrote some of his works. This castle was occupied by the Swedes in 1632, and was unsuccessfully besieged by Wallenstein during the Thirty Years' war. Coburg has manufactories of porcelain and ceramic wares, carriages, furniture, etc., and has also malt-works, breweries, and other establishments. Pop. (1900) 20,460.

Coburg, a thin fabric of worsted and cotton, or worsted and silk, twilled on one side, for ladies' dresses, intended as a substitute for merino.

Coburn, Foster Dwight, agricultural writer: b. Jefferson County, Wis., 7 May 1846. After serving in Wisconsin regiments during the Civil War he went to Kansas in 1867. He became secretary of the Kansas Board of Agriculture in 1894 and still holds that position. He is the author of 'Swine Husbandry'; and 'Alfalfa'; and also of the following books on agricultural topics prepared for and issued by the Kansas State Board of Agriculture: 'Feeding Wheat to Farm Animals'; 'Alfalfa-Growing'; 'Alfalfa, Irrigation, Well Water Supply and Subsoiling'; 'Corn and the Sorghums'; 'The Helpful Hen'; 'Cow-Culture'; 'The Beef Steer (and His Sister)'; 'The Plow, Cow and Steer'; 'Pork Production'; 'The Modern

Sheep'; 'The Horse Useful'; 'Forage and Fodders'; 'Dairying in Kansas'; 'Short-Horn Cattle'; 'Hereford Cattle'; 'Polled Cattle'; 'Kansas Wheat-Growing'; 'Railroads and Agriculture.'

Coca (*Erythroxylon coca*), a shrubby plant belonging to the natural order *Erythroxylaceæ*, found wild in the mountainous regions of Peru and Bolivia, and cultivated in districts 2,000 to 5,000 feet above sea-level. The leaves are gathered and dried in the sun, and chewed with a little powdered chalk. When taken in some quantity they produce an intoxication like that of opium. As the indulgence is repeated the appetite for it increases, while that for wholesome nourishment diminishes; the miserable victim loses all power of resisting his craving, and becomes reduced to a condition of physical and mental prostration. When used in moderation coca lessens the appetite for food and enables those who have partaken of it to sustain greater fatigue than they otherwise could. It has been found the best preventive of asthmatic symptoms caused by the rapid ascent of lofty mountains. An infusion of the leaves is also used with the same effect.

Cocaine, kō'kạ-īn, or -ēn, a vegetable alkaloid, with the chemical formula $C_{17}H_{21}NO_4$, obtained from the leaves of the coca shrub (*Erythroxylon coca*) of South America. The leaves are digested with ether, and the solution is evaporated to dryness and extracted with boiling water. Magnesia is then added, and the solution again evaporated, after which the cocaine is removed by solution in amyl alcohol. Cocaine crystallizes in small, monoclinic prisms, which melt at 208° F., and are but slightly soluble in water, though they dissolve freely in hot alcohol and hot ether. Salts of cocaine are precipitated from solution by numerous reagents, among which are ammonia, caustic potash, sodium carbonate, picric acid, tannic acid, gold trichloride, and platinum tetrachloride. The substance popularly known as cocaine is the hydrochloride of the true alkaloid, this being the form in which the base is usually administered in medicine. The leaves of the coca plant are chewed by the natives of Peru and Bolivia for the relief of hunger and fatigue, and of the disagreeable sensations connected with breathing the rarefied air at great elevations.

Cocco, Cocoa-root, Eddoes, Taro, various plants of the genera *Caladium* and *Colocasia* of the natural order *Araceæ*. They are widely cultivated for food in the tropical and subtropical islands of the Pacific, the West Indies, and adjoining continental regions, and to a less extent in other warm countries. The edible part most desired is the starchy acrid tuber which is eaten like potatoes or made into *poi*, a substance obtained by roasting the tubers, pounding them with water to a paste and allowing the mass to ferment before being eaten either in that form or again prepared for the table. In this form the roots are a staple food of the Hawaiians. During the process of roasting or boiling the tubers lose their acridity, which quality is, in some varieties almost wanting. The young leaves of some species are used as pot-herbs. The principal species is *Colocasia antiquorum* var. *esculentum*, a perennial herb with heart-shaped peltate green leaves often three feet long and nearly as wide; and an inconspicuous spadix. It is very popular as a bedding plant in the United States, since it gives a subtropical effect, especially when grouped with cannas and crotons. Popularly it is known as elephant's ear. It is easily grown, being started in the greenhouse, transplanted to the open ground after danger of frost, freely supplied with water, and at the approach of frost in the autumn, stored in a cool, dry cellar.

Cocceius, Heinrich von, hīn rĭH fŏn kŏk-tsā'yoos, German jurist: b. Bremen 1644; d. 1719. He studied at Leyden, and Oxford; was in 1672 professor of law at Heidelberg, and in 1688 at Utrecht; in 1690 regular professor of laws at Frankfort-on-the-Oder. He went to The Hague in 1702, without giving up his office, on occasion of the disputes as to the hereditary succession of the house of Orange; and received for his services, in 1713, the rank of baron of the empire. As a lawyer he was the oracle of many courts, and his system of German public law ('Juris Publici Prudentia') was almost a universal academical text-book of this science.

Cocceius, Johannes, yō hän'nĕs (originally Koch or Koken), Dutch theologian: b. Bremen 9 Aug. 1603; d. Leyden 5 Nov. 1669. He was appointed professor of biblical philology at the Academy of Bremen in 1629, was professor at the University of Franeker, 1636–50, and of dogmatics at Leyden for the rest of his life. He published 'Summa Doctrinoe de Foedere et Testaments Dei' (1648); 'Hebrew and Chaldaic Lexicon' (1669); as well as commentaries covering nearly all of the Old Testament.

Cocceius, Samuel Freiherr von, German jurist: b. Heidelberg 1679; d. 1755. He was a son of Heinrich von Cocceius (q.v.). He was, in 1702, professor at Frankfort-on-the-Oder, and rose through many degrees to the dignity of grand chancellor of all the Prussian dominions, and was also a distinguished jurist.

Coc'colith, the name given in 1858, by Huxley, to one of certain minute oval or globular calcareous bodies found in countless numbers in the ooze of the Atlantic, either detached or adherent to small pieces of protoplasm. They have since been dredged up from other places, and found in chalk, and, according to Guembel, in limestone of all ages. Carter thinks they belong to *Melobesia*, a genus of algæ.

Coccosteus, kŏk-kŏs'tē-ŭs, a genus of fossil placoganoid fishes, pertaining chiefly to the Devonian and Old Red Sandstone systems, but met with also in Silurian strata. The head was protected by a great shield covered with tubercles. Besides this bony cuirass there was also a ventral shield, but the rest of the body was naked. The mouth was furnished with small teeth.

Coc'culus In'dicus, or fish-berry, as it is commonly known in the United States, is the seed of a herbaceous climbing vine (*Anamirta paniculata*), a species of *Menispermaceæ*. The dried berries are imported from the East Indies. The drupe resembles a round berry, the size of a pea or larger, wrinkled externally, and with a brittle husk. The kernel is intensely bitter. It contains about one fiftieth of its weight of a powerful bitter narcotic poison called picrotoxin, also bases called menispemine, a crystalline base, paramenispermine, and several organic acids. Picrotoxin is used as an adulterant in enriching

and imparting a bitter taste to malt beverages, and is thrown into rivers in which fish abound to stupefy them, so that they may be readily caught. It has been used in the form of an ointment in certain skin diseases, and in decoctions for killing vermin in the hair of children and animals, although death is sometimes caused through this latter use. The symptoms of poisoning are twitching and incoördination of the muscles, increased reflex excitability, convulsions, coma, and death from asphyxia.

Coccus, in zoology, a genus of insects of the order *Hemiptera,* family *Coccidæ.* Generic character: antennæ filiform, of 10 articulations in the male, nine in the female, shorter than the body; rostrum pectorale, conspicuous only in the females; males with two large incumbent wings; females apterous, subtomentose, fixed, and becoming gall-shaped or shield-shaped after impregnation. These little insects are remarkable for many peculiarities in their habits and conformation. The males are elongated in their form, have long, large wings, and are destitute of any obvious means of suction; the females, on the contrary, are of a rounded or oval form, have no wings, but possess a beak or sucker formed of the extremely modified appendages of the mouth, by which they fix themselves to the plants on which they live, and through which they draw their nourishment, At a certain period of their life the females attach themselves to the plant or tree which they inhabit, and remain thereon immovable during the rest of their existence. In this situation they are impregnated by the male; after which their body increases considerably, in many species losing its original form and assuming that of a gall (whence Réaumur's name, *Gallinsecta,* for the family), and, after depositing the eggs, drying up and forming a habitation for the young. This change of form is not, however, constant to all the species, which has given rise to a division of the genus into two sections: those which assume a gall shape, in which the rings of the abdomen are totally obliterated, are called "kermes" by some authors; and those which retain the distinct sections of the abdomen, notwithstanding the great enlargement of the body, are called "true cocci," or "cochineal" (q.v.). They are impregnated in the spring, after having passed the winter fixed to plants, particularly in the bifurcations and under the small branches. Toward the commencement of summer they have acquired their greatest size, and resemble a little convex mass without the least appearance of head, feet, or other organs. Many species are covered with a sort of cottony down. Each female produces thousands of eggs, which are expelled by a small aperture at the extremity of the body. As soon as they are produced they pass immediately under the parent insect, which becomes their covering and guard; by degrees her body dries up, and the two membranes flatten and form a sort of shell, under which the eggs, and subsequently the young ones, are found. Soon after the death of the mother the young insects leave their hiding-place and seek their nourishment on the leaves, the juices of which they suck through the inflected rostrum placed beneath their breast.

But it is with a view to their importance as an article of commerce, arising from their use in the arts, that the insects of this genus are particularly interesting. When it is considered that the most brilliant dyes and the most beautiful pigments, as well as the basis of the most useful kinds of cement, are their product, it will be acknowledged that to none of the insect tribe, except, perhaps, to the bee and the gall-insect, are we more indebted than to these singular and apparently insignificant little beings. Kermes, the scarlet grain of Poland, cochineal, lac-lake, lac-dye, and all the modifications of gum-lac, are either the perfect insects dried, or the secretions which they form. The first-mentioned substance is the *Coccus ilicis.* It is found in great abundance upon a species of evergreen oak (*Quercus coccifera*), which grows in many parts of Europe, and has been the basis of a crimson dye from the earliest ages of the arts. It was known to the Phœnicans before the time of Moses; the Greeks used it under the name of *kokkos,* and the Arabians under that of *kermes.* From the Greek and Arabian terms, and from the Latin name *vermiculatum,* given to it when it was known to be the product of a worm, have been derived the Latin *coccineus,* the French *cramoisi* and *vermeil,* and the English "crimson" and "vermilion." The early Jews, the Greeks, the Romans, and until lately the tapestry-makers of Europe, have used it as the most brilliant red dye known. The scarlet grain of Poland (*Coccus polonicus*) is found on the roots of the *Scleranthus perennis,* which grows in large quantities in the northeast of Europe and in some parts of England. This, as well as several other species, which afford a similar red dye, have, however, fallen into disuse since the introduction of cochineal. The introduction of aniline dyes has greatly injured the cochineal industry.

Lac is a secretion from a species of *Coccus* inhabiting India, where it is found in astonishing abundance on the *Ficus religiosa.* In its native state, not yet separated from the twig on which it has been deposited, it is called "stick-lac"; when separated, powdered, and the coloring matter washed from it, it is denominated "seed-lac"; "lump-lac" when melted into cakes; and "shell-lac" when purified and formed into thin laminæ. Lac-lake is the coloring matter of stick-lac precipitated from an alkaline lixivium by means of alum.

Coccus is also the name of a family of bacteria characterized by their spherical form and consisting of a number of genera, all named for certain growth characters. Thus cocci that grow in chains are termed *Streptococci* in which group the virulent bacteria that cause blood-poisoning, septicæmia, and the organism of erysipelas are found; Cocci that grow in pairs are termed *diplococci.* The *diplococcus* of pneumonia, and the *diplococcus* of gonorrhœa are in this group. Others grow in bunches,—*Staphylococci.* The common organism of pus is *Staphylococcus pyogenes aureus,* by bacteriologists usually called *S.p.a.* Other spherical forms are known as *Micrococci,* one of which group, the *Micrococcus urea,* is found in the urine as causative agent in excessive urinary fermentation. Some forms of this family group grow in packets. These are termed *Sarcinæ.* They are very abundant in the air, and are frequently associated with chronic gastric fermentations. A large number of different forms of this family are known, the greater majority of which are

not pathogenic but very useful in agriculture and the arts, particularly in agricultural processes. As many as a hundred different species have been found in the air, and Chester has described 36 species of *Streptococcus*, 91 species of *Micrococcus* (*Staphylococcus* here included), 14 species of *Sarcinæ*, 3 species of *Planococci*, or movable cocci, and 3 species of *Planosarcinæ*. See BACTERIA.

Consult: Chester, 'Manual of Determinative Bacteriology.'

Coccygodynia, kŏk"sĭ-gō-dĭn'ĭ-a, a painful affection usually situated at the end of the spinal column, in and about the region of the coccyx. It is probably many affections rather than one, as neuralgias, arthralgias, and sympathetic pains may be felt in this region. It is an affection more common in women than in men, being more prevalent in those women who have had children. Pain is felt, usually of a decided sharp character, and definitely localized and in the region, on rising after sitting down, walking up and down stairs, and on defecation. The diagnosis may be extremely difficult and the treatment purely medical or surgical.

Coccygomorphæ, an order or suborder of birds, proposed by Huxley, and nearly equivalent to the *Cuculiformes* of some authors. All have the palate desmognathous or provided with a more or less well developed band of bone binding the two maxillary bones together across the palate; but, owing to the great diversity of characters exhibited by the families, a brief definition is impossible. The following families are included by Stejneger, and indicate the limits of the group: *Cuculidæ*, cuckoos (q.v.); *Coraciidæ*, rollers, of Madagascar; *Alcedinidæ*, kingfishers (q.v.); *Upupidæ*, hoopies (q.v.), of the Old World; *Musophagidæ*, plantain eaters (q.v.) of Africa; *Todidæ*, todies (q.v.), of Mexico and the West Indies; *Momotidæ*, sawbills (q.v.); *Bucerotidæ*, hornbills (q.v.), of the Old World; *Rhamphastidæ*, toucans (q.v.), of tropical and sub-tropical America; *Caprimulgidæ* (q.v.), goatsuckers, cosmopolitan; *Bucconidæ*, barbets and puffbirds (qq.v.); and *Indicatoridæ*, guide-birds (q.v.), of Africa.

Coccyx, kŏk'sĭks. See OSTEOLOGY.

Cochabamba, kō-chä-bäm'bạ, Bolivia, a central department of the republic, bounded on the north by the department of Beni, on the east by Santa Cruz, on the south by Chuquisaca and Potosi, and on the west by Oruro and La Paz. Its area is about 22,000 square miles. The following list shows its provinces and the varieties of climate: Tarata, Mizque, Punata, and Ayopaya are tropical; Chaparé, Tapacari, Totora, Arque, and Furacares are semi-tropical; the capital district is temperate. The goldmines at Choquecamata in Ayopaya have been worked for a long time, and were famous during the period of Spanish supremacy. Silver and marble are found at Palca; gold and silver at Sayari; silver in Mizque, Colcha de Arque, and Quioma. Cochabamba has been called "the granary of Bolivia." It is the great wheat and maize growing section of the country, and is also noted for its fine horses bred from imported Peruvian and Chilean stock. All classes of agricultural products can be grown on the extensive and rich plains of Sacaba, province of Chaparé, where useful medicinal plants are also found, and alfalfa grows luxuriantly. In the province of Ayopaya there are great tracts of pasture land, and wool, barley, etc., are produced. In Tapacari all the European fruits and cereals thrive, and herds of llamas, cattle, and horses abound. All cereals thrive in Mizque, a province which also contains extensive vineyards, and produces the excellent and nutritive Cochabamba corn. The agricultural products are manufactured on a limited scale. According to the census taken by the national committee and approved by President Pando, 5 Dec. 1902, the department has 328,163 inhabitants.

Cochabamba, Bolivia, the capital of the department of the same name. It is one of the principal centres of trade in the republic, and its elevation (8,400 feet above the level of the sea) gives it a cool and healthful climate. The city has manufactures of leather goods, woolen cloths, and other products. Pop. over 40,000.

Cochin, Charles Nicolas, French engraver: b. Paris 1688; d. 1754. He practised painting till his 23d year, and this was of considerable advantage to him in the art of engraving, to which he afterward devoted himself. In 1731 he became a member of the Academy of Painting.

Cochin, Charles Nicolas, French engraver: b. Paris 22 Feb. 1715; d. Versailles 29 April 1790. He was a son of the preceding, and his productions are superior to those of his father. The collection of his works contains more than 1,500 pieces, among which there are 112 likenesses, in the form of medals, of the most renowned French scholars and artists of his time, who were almost all his friends. Besides his essays in the memoirs of the Academy, he published 'Voyage d' Italie' (1758), and several other works. His frontispieces and vignettes are remarkable for neatness and taste. His views of 16 French seaports are of great value. His composition in general is rich, delicate, and pleasing. He was a member of the Academy, and occupied several places of importance.

Cochin, kō'chĭn, India, a seaport of Hindustan, in the Malabar district of the Madras presidency, situated on a small island. It is a picturesque place with many quaint old Dutch buildings. Its harbor, though sometimes inaccessible during the southwestern monsoon, is the best on this coast. Cochin was one of the first places in India visited by Europeans. In 1502 Vasco da Gama established a factory and soon after Albuquerque built a fort; he also died here in 1524. In 1663 the Dutch took the place, in 1795 the British. Pop. about 18,000.

Coch'in, a variety of the domestic fowl, imported from Cochin-China. It is a large, ungainly bird, valuable chiefly owing to its fecundity, eggs being laid even during the winter.

Cochin-China, a country forming part of the peninsula of southeastern Asia, and generally regarded as comprising the whole of Anam and Lower or French Cochin-China. Three of the six provinces into which the latter was divided were acquired at one period, and the remaining three at another period. A persecution of the French Roman Catholic missionaries in Anam furnished the French with an occasion of regaining a footing in the East. An expedition against Cochin-China was decided on in 1857, and Saïgon was occupied. The Austro-

Italian war deferred further operations till 1861, when the conquest of Metho gave the French possession of the most fertile district of Lower Cochin-China. The war continued till 5 June 1862, when a peace was concluded at Saïgon with the king of Anam, which was ratified at Hué 15 April 1863. By this treaty the king agreed to cede to the French the three provinces of Bienhoa, Saïgon, and Metho, along with the island of Poulo Condore, to permit the Roman Catholic religion in his kingdom, to open three of the ports in Tonquin to French ships, and to pay an indemnity of 24,000,000 francs (about $4,800,000). Although the inhabitants were found to be on the whole sufficiently tractable, yet a few revolts took place, whereupon Admiral De la Grandière, on the pretext that all these disturbances had their origin in the provinces of Lower Cochin-China which had remained to Anam, namely, Vinhlong, Chaudoc, and Hatien, took possession of these provinces, and declared them French territory, 25 June 1867. The territory thus acquired by France in this peninsula covers 21,710 square miles, and in 1894 had a population of 2,226,935. It is now organized in departments, prefectures, sub-prefectures, and cantons. In 1882–3 France asserted a claim to the protection of Tonquin, and indeed the entire Anam territory, and after some fighting this claim was conceded by the king. Tonquin was accordingly taken possession of by France in 1884, and is now under French administration, native resistance having now entirely ceased. Anam (q.v.) forms a protectorate.

The northern and eastern parts of French Cochin-China are hilly, but the rest of the territory consists almost entirely of well-watered low alluvial land. The lowlands, where the waters stagnate, are covered with a rank vegetation from three to ten feet high; contiguous to the flowing streams are extensive rice-grounds. Where the soil is somewhat raised above the water-level it is very fertile, and in some places ranges of low hills follow the line of the rivers. In the more elevated districts are grown tobacco, sugar-cane, maize, indigo, and betel. Among the other products are tea, gums, cocoanut oil, silk, spices, and various farinaceous and aromatic articles. The Anamites raise also great numbers of buffaloes, cattle, hogs, and birds; the first being employed in agriculture, and, as well as oxen, for draft purposes; but since the French conquest oxen are reserved more strictly for food. Industrial arts are as yet limited among the natives. They are skilful in all kinds of basket-work, in which they use the reeds and other similar materials which abound in the low lands; silk and cotton are also wrought. But they excel in the use of wood, of which their temples, pagodas, and tombs are built, and ornamented with elaborate carving. They live in villages — numbering nearly 1,000 — adjacent to the rivers, which, in the unsuitableness of the country for land traffic, form almost the only means of communication. Their houses are either tiled or thatched with straw, the roofs being supported with wooden pillars; the better class are in two sections, the inner apartments and the outer veranda, which serves for use in the daytime; they are often well furnished, and not devoid of comfort. The only roads at present are those connecting Saïgon, the capital, with the principal towns. Telegraphic communication between many of the principal places has been opened, and is being extended. The principal export is rice, of which there is annually exported about 7,000,000 hundredweight, mainly to China; cotton and silk are also exported.

Cochin-China, Upper, or **Dong-trong,** a narrow strip of land, consisting of four provinces, on the east coast of Anam, to which empire it belongs, extending from Tonquin on the north to Champa on the south. The most important river is that on which the chief town P'hu-thua-thien or Hué stands. In the most fruitful parts of this region aloes wood (of the Aquilaria ovata), corn, sugar-cane, and cinnamon flourish. From October to January the weather is often very stormy, and typhoons rage frequently. The climate is healthy and pleasant. Camphor is produced in the district in the utmost perfection.

Cochineal, an insect (*Coccus cacti*), used as a dye. It is a native of Mexico, but has been introduced into Europe and Algiers. Even the live insects were imported, and plantations of cactus were cultivated for their nourishment. The French and Spanish kermes, which at one time was in high repute, disappeared and was soon entirely forgotten. It is a small insect with the body wrinkled transversely; its abdomen of a deep mulberry color, and bristly in the posterior part; the legs are short and black, the antennæ subulate and about one third the length of the body. The male has two erect wings, the female none. The principal district in which they are reared is in the province of Oaxaca, those of the district of Mestique being considered the best insects. There are plantations of the nopal (*Opuntia coccinellifera*), upon which they feed, the insects being tended with care equal to that ordinarily bestowed upon silkworms. Before the rainy season sets in, branches of the nopal covered with insects are cut off and brought under shelter to protect them from the weather. At the close of the wet season, about the middle of October, the plantations are stocked from these supplies by suspending little nests made of some soft woody fibre, each containing 8 or 10 females, upon the spines of the nopal. The insects, warmed by the sun, soon emerge and lay their eggs, each female producing more than 1,000 young. These spread rapidly over the plants, and as the young females become impregnated they attach themselves to the leaves and swell to great size, presenting the appearance more of vegetable excrescences than of animated creatures. In this condition they are gathered for the cochineal. The males, which are few in number, not more than one to 100 or 200 females, are of no value for this purpose. The females are picked off with a blunt knife, the first crop about the middle of December, and subsequently several more of as many successive generations, the last being in May. A laborer can pick off only about enough to make two ounces of cochineal in a day. Those taken off full of young lose about two thirds of their weight in the process of drying, to which they are subjected as soon as they are killed, which is done either by dipping them in a basket into boiling water, or placing them in a hot oven, or on plates of hot iron. By the first method, usually considered the best, the insects turn to a brownish red color, losing a portion of the white powder with which they

were previously loaded between the wrinkles of the body. In the oven they retain this, and their color is then gray. Those killed on hot iron turn black. Such is the origin of the different varieties known in our market as "silver grains and black grains," and the "foxy" of the London market, the last being those killed by boiling water, though others ascribe it to the former being the female before laying her eggs, and the latter after she has parted from them. The quality of the cochineal is the same in both cases. When dried, the cochineal presents the form of grains, convex on one side and concave on the other, about one eighth of an inch in diameter, with the transverse wrinkles still visible. It is stated that it takes about 70,000 insects to weigh a pound.

Cochineal-fig, a name given to *Opuntia coccinellifera* and two other species of cacti, natives of Mexico and the West Indies, the plants on which the cochineal insect lives. See CACTUS; COCHINEAL.

Cochituate (kō-chĭt'ū-āt) **Lake,** Mass., a narrow body of water, about four miles long, in Middlesex County, 17 miles west of Boston. From this lake for many years Boston has derived its principal water-supply.

Cochlea, kŏk-lē'a, an important part of the internal ear, so called from its shape, which resembles that of a snail-shell. See EAR.

Cochlearia, kŏk-le-ā'rĭ-a, a genus of annual maritime herbs of the mustard family (*Cruciferæ*). It numbers upward of 25 species, all natives of the colder parts of the north temperate zone, and not familiar generally. About four species are found on the Arctic and northern Pacific coasts of North America. Two very distinct species quite well known are the horse-radish (*C. armoracia*), escaped from cultivation, and now found wild in the moist ground along streams, and scurvy-grass (*C. officinalis*), considered of great value as an antiscorbutic. If eaten fresh, it is a stimulant and diuretic, but is feeble if allowed to dry before being taken.

Cochran, John, American soldier and lawyer: b. Palatine, Montgomery County, N. Y., 27 Aug. 1813; d. New York 7 Feb. 1898. He was graduated at Hamilton College 1831, practised law in Oswego from 1834 to 1845, when he removed to New York, where his talents as lawyer and orator at once brought him into prominence. He was surveyor of the port of New York 1853–7, and a Democratic member of Congress 1857–61, serving as chairman of the Committee on Commerce. During the Civil War he commanded the 1st United States Chasseurs in the Peninsula campaign; was commissioned a brigadier-general 17 July 1862, and commanded a brigade in Gen. Couch's division of the Army of the Potomac; was with the reserve at the battle of Antietam and took an active part in the pursuit of the enemy. He was attorney-general of New York State 1863–5. He was active in securing Greeley's nomination for President in 1872; was president of the New York Common Council 1872, and acting mayor when Mayor Hall retired during the Tweed ring disclosures; again a member of the council in 1883, and a police justice 1889.

Cochrane, Thomas, 10th Earl of Dundonald, British naval officer: b. Annsfield, Scotland, 14 Dec. 1775; d. Kensington, England, 31 Oct. 1860. He entered Parliament in 1806. In 1814 he was accused of conspiring to circulate a false report of Napoleon's death for speculative ends, and though he protested his innocence he was imprisoned for a year, fined, and was expelled from the navy and the House of Commons. In 1818 he accepted an invitation to organize the navy of Chile and performed many brave exploits during the contest with Spain. He left the service of the Chileans and was commander of the Brazilian navy from 1823 to 1825, when he resigned, because accused of insubordination. In 1827 and 1828 he commanded the Greek army. In 1832 he was cleared of the charges brought against him in 1814, and restored to the Order of the Bath and to the English navy. He was appointed vice-admiral in 1841; admiral in 1851, and rear-admiral of the United Kingdom in 1854.

Cock, the male of the domestic fowl. At what time this valuable species of pheasant was brought under the immediate control of man it is now impossible to determine; but, as the forests of many parts of India still abound with several varieties of the cock in the wild or natural condition, it is reasonable to conclude that the race was first domesticated in Eastern countries, and gradually extended thence to the rest of the world. It is stated that the cock was first introduced into Europe from Persia; and Aristophanes speaks of it as "the Persian bird." Nevertheless it has been so long established throughout western regions as to render it impossible to trace its progress from its native wilds.

The cock has his head surmounted by a notched, crimson, fleshy substance called "comb": two pendulous fleshy bodies of the same color, termed "wattles," hang under his throat. The hen has also a similar, but not so large nor so vividly colored excrescence on her head. The cock is provided with a sharp horn or spur on the outside of his tarsus, with which he inflicts severe wounds; the hen, instead of a spur, has a mere knot or tubercle. There is, in both sexes, below the ear, an oblong spot, the anterior edge of which is reddish, and the remainder white. The feathers arise in pairs from each sheath, touching by their points within the skin, but diverging in their course outward. On the neck they are long, narrow, and floating; on the rump they are of the same form, but drooping laterally over the extremity of the wings, which are quite short, and terminate at the origin of the tail, the plumes of which are vertical. In the centre of the cock's tail are two long feathers, which fall backward in a graceful arch and add great beauty to the whole aspect of the fowl. The plumage is infinitely varied in both colors and markings, being in some breeds of the greatest richness and elegance, and in others of the simplest and plainest hue. Except in the pure white breeds, the plumage of the cock is always more splendid than that of the hen. The cock, when in good health and full plumage is apparently conscious of his personal beauty and courage. The cock is strongly attached to what may be called his harem, and is often seen strutting at the head of 10 or 15 hens. His sexual powers are matured when he is about six months old, and his full vigor lasts for about three years, varying

in earliness of maturity and duration with his size and the climate. See also HEN.

Cock-fighting, an ancient sport of unknown origin, but practised among both the Greeks and the Romans. An annual cock-fight was instituted at Athens, and Æschines reproaches Timarchus, and Plato the Athenians in general, with their fondness for the cock-pit. The breeds of Rhodes and of Tanagra in Bœotia were in great esteem in Greece. The Romans seem to have used quails and partridges also for this purpose. This sport has long been a favorite with both Americans and English, although repeatedly denounced and prohibited by the laws. The size proper for game-cocks may be said to be not less than four pounds eight ounces, nor above four pounds ten ounces. The strain from which the cock is chosen ought to be distinguished for victory. For the combat they are armed with steel or silver spurs, or "gaffles." The place appropriated to fighting is called a "pit," and consists generally of a mound of earth covered with sod, and surrounded by seats in circular tiers. The battle is conducted by two "setters-to," who place the cocks beak to beak. When they are once "pitted" (this verb owes its origin to the sport of cock-fighting), neither of the setters-to can touch his cock so long as they continue to fight, unless their weapons get entangled. In the Philippine Islands cock-fighting is pushed almost to the verge of a craze. Nearly every village has its pit, and every peasant his cock. The peasant, too, is said to rescue his fighting-cock rather than his wife or child in the event of fire, and wherever he goes he takes it with him. The sport is there practised in a very cruel form, and many are ruined by excessive betting. Throughout all Spanish-America cock-fighting is more or less in favor. It was formerly a regular sport in the public schools of England, and schoolmasters received dues in connection with it. Cock-fighting is still prevalent in China, Persia, and Malacca.

Cock-Lane Ghost, a famous hoax by which many people of London were deceived in 1762, arising from certain knockings heard in the house of a Mr. Parsons, in Cock Lane. Dr. Johnson was among those who believed in the supernatural character of the manifestations; but it was found out that the knockings were produced by a girl employed by Parsons.

Cock of the Plains. See CAPERCAILZIE.

Cock of the Rock (*Rupicŏla crocea*), a South American bird of a rich orange color, with a beautiful crest, belonging to the family *Cotingidæ*. The name, or its French equivalent, is also applied to several related species.

Cock of the Woods. See CAPERCAILZIE.

Cockade (Fr. *cocarde*), a plume of cock's feathers, with which the Croats in the service of the French in the 17th century adorned their caps. A bow of colored ribbons was adopted for the cockade in France, which soon became a national emblem and party signal. During the French Revolution the tricolored cockade — red, white, and blue — became the national distinction. National cockades are now to be found over all Europe. In Germany cockades of black, red, and gold, after being forbidden in 1832, were again allowed in 1848, and even introduced into the army. Since 1850, however, they have again ceased to be publicly worn. In Italy the former emblem of the party of progress, the green, red, and white cockade, was recognized by the government of Piedmont in 1848, and since the formation of the kingdom of Italy it has formed the national cockade.

Cockaigne, kŏk-ān', **Land of,** an imaginary land of idleness and plenty, in which the houses were roofed with cake, the rivers ran wine, and roasted fowl offered themselves to be eaten. The term was applied in derision to both London and Paris. The corresponding term in English is "lubberland," and in German "*Schlaraffenland.*" 'The Land of Cockaigne' was the title of a satirical poem written not later than 1300.

Cockatoo, an English rendering of a Malayan name for certain species of birds of the parrot family (*Psittacidæ*). They are comprised in *Cacatua,* and five other genera forming a sub-family, which, besides having some peculiarities of internal anatomy, is distinguished from true parrots by the greater height of the bill, and its being curved from the base, and by the lengthened, broad, and rounded tail. The head is also large, and in the true cockatoos is surmounted by a crest of long and pointed pink or yellow feathers, with their tips directed forward, which can be erected and expanded like a fan, or depressed, at the pleasure of the bird. The true cockatoos are also all of generally whitish plumage, but often finely tinged with red, orange, and other colors, or mixed with these colors in more brilliant displays. The cockatoos are confined to the Australian region and the neighboring Malayan islands, with the exception of a single Philippine species. The sulphur-crested cockatoos (*Cacatua sulphurea* and *galerita*) are well-known cage-birds which may be taught a few words, but their vocal efforts are chiefly limited to the harsh cry "cockatoo."

Cock'atrice, a fabulous serpent or serpent-like monster anciently believed to be hatched from a cock's-egg. It is often simply another name for the basilisk (q.v.).

Cockburn, kō'bėrn, SIR **Alexander James Edmund,** English jurist: b. 24 Dec. 1802; d. 20 Nov. 1880. He studied at Cambridge; was called to the bar in 1829, and soon became distinguished as a pleader before parliamentary committees. In 1847 he became member of Parliament for Southampton in the Liberal interest; became solicitor-general and was knighted in 1850. He was made chief justice of the common pleas in 1856; and lord chief justice in 1859. Among the many famous trials over which he presided were the Wainwright case and Tichborne case. He represented Great Britain at the Geneva arbitration tribunal for the adjustment of the "Alabama Claims," 1871–2.

Cockburn, Alicia or **Alison Rutherford,** Scottish lyrist: b. Fairnilee, Selkirkshire, 8 Oct. 1713; d. Edinburgh 22 Nov. 1794. In 1731 she married Patrick Cockburn, advocate, and in 1753 was left a widow. She died having for 60 years and more been a queen of Edinburgh society. In person she was not unlike Queen Elizabeth. Of her lyrics the best known is the exquisite version of 'The Flowers of the Forest' ("I've seen the smiling of Fortune beguiling"), commemorating a wave of calamity that swept over Ettrick Forest, and first printed in 1765. Mrs.

1. The Slender-billed Cockatoo (Licmetis nasicus). 2. The Black or Crow Cockatoo (Calyptorhynchus galeatus).

Cockburn in 1777 discerned in Walter Scott "the most extraordinary genius of a boy"; in 1786 she made Burns' acquaintance.

Cockburn, Sir George, English naval officer: b. London 22 April 1772; d. Leamington 19 Aug. 1853. He entered the navy in early youth, and about 1812 obtained the rank of rear-admiral. He took part in the capture of Washington City in 1814 and conveyed Napoleon to Saint Helena in 1815. He was a lord of the admiralty from 1818 to 1828, and sat in Parliament for many years.

Cockburn, George Ralph Richardson, Canadian educator: b. Edinburgh, Scotland, 15 Feb. 1834. He graduated at Edinburgh University, 1857, and studied in France and Germany. He went to Canada in 1858, became rector of the Upper Canada Grammar School; was commissioned to inspect the higher educational institutions of the province, and study the subject in all its phases. The investigation lasted two years, and he presented its results in two able reports. In 1861 he was made principal of Upper Canada College, and a member of Toronto University senate. Under his administration of 20 years the college attained a high reputation for the excellence of its teaching and discipline.

Cockburn, Henry Thomas, Lord, Scottish judge: b. Edinburgh, Scotland, 26 Oct. 1779; d. Bonaly, near Edinburgh, 26 April 1854. It was chiefly in connection with political cases that he rose to eminence in his profession, one leading transaction being his gratuitous defense of several persons tried for treason in the year 1818. He became solicitor-general for Scotland in 1830, and in 1834 one of the lords of session. 'Memorials of His Time' (1856) is an invaluable record of the social history of Scotland, narrated in the raciest and most genial manner. Not less interesting is his life of his friend Lord Jeffrey (1852).

Cockburn, Sir John Alexander, Australian statesman: b. Crosbie, near Duns, Scotland, 23 Aug. 1850. He was educated at Kings' College, London, and settled in South Australia in 1875. He sat in the House of Assembly as member for Burra in 1884, and for Mount Barker in 1887. He was minister of education 1885–7; premier and chief secretary 1889–90; chief secretary 1892; minister of education and agriculture 1893–8. He represented South Australia at the International Commercial Congress in Philadelphia in 1899, and at the Colonial Congress in Paris in 1900, as well as at other important conferences. He was knighted in 1900.

Cockchafer. See Chafer.

Cock'er, Edward, English engraver and teacher of writing and arithmetic: b. 1631; d. 1675. He is said to have published 23 books of exercises in penmanship, one of which is preserved in the British Museum. The great work with which his name is so intimately associated that the phrase, "according to Cocker," has become proverbial, was first published in 1678 under the title of 'Cocker's Arithmetic, Being a Plain and Familiar Method, Suitable to the Meanest Capacity, for the full Understanding of that Incomparable Art, as It is now Taught by the Ablest Schoolmasters in City and Country, Composed by Edward Cocker, late Practitioner in the Arts of Writing, Arithmetic, and Engraving.' The book reached a 37th edition by 1720, and upon it most of the succeeding treatises on arithmetic were based. Two other works bear Cocker's name—a treatise on 'Decimal Arithmetic' and an 'English Dictionary,' but it has been surmised that they are not of his authorship, but of that of his publisher, Hawkins.

Cocker, a variety of spaniel (q.v.).

Cockerell, kŏk'ĕr ĕl, **Charles Robert,** English architect: b. London 28 April 1788; d. London 17 Sept. 1863. He wrote monographs on the mausoleum of Halicarnassus and other archæological subjects. Advancing to the front rank of his profession, he became an associate of the Royal Academy in 1829, a member in 1836, and professor of architecture in 1839, delivering lectures which were highly esteemed and largely attended. He was happier in following classic models than in the Gothic style. He built the Bank of England and many other public and private buildings. He wrote on the 'Iconography of Wells Cathedral'; 'Sculptures of Lincoln and Exeter Cathedrals'; 'Tribute to the Memory of Sir Christopher Wren'; etc.

Cock'ermouth, England, a town in the county of Cumberland. It is situated at the confluence of the Cocker with the Derwent, 24 miles southwest of Carlisle, and 260 miles northwest of London. The old castle, supposed to have been built soon after the Conquest, stands on a bold eminence. Mary Queen of Scots was imprisoned in it in 1568, and in 1648 it was dismantled by the parliamentary forces. Cockermouth is the birthplace of the poet Wordsworth, in memory of whom a fine stained-glass window has been inserted in the church of All Saints. Pop. (1901) 5,355.

Cockle (*Cardium*), a genus of bivalve shellfish forming the type of the family *Cardiidæ*. The general characteristics are—shells nearly equilateral and equivalvular; hinge with two teeth, one on each side near the beak, and two larger remote lateral teeth, one on each side; prominent ribs running from the hinge to the edge of the valve. The animal has a powerful foot, with which it burrows in the sand. For this purpose it first distends it with water, to give firmness to it. This foot may also be used to enable the animal to move from place to place, for by first bending it and then suddenly straightening it the animal may project itself to a considerable distance. The common cockle (*Cardium edule*) is common all round the coasts of the British islands wherever it finds suitable sand-beds to live in, and is also found in the Baltic, and elsewhere. It is much used as an article of food. A prickly species, the *Cardium aculeatum*, found on the coast of Devon, is also eaten. Among American species, which, however, are not eaten, are *C. islandicum*, found to the north of Cape Cod, and *C. pinnulatum*, found about Long Island Sound. On the coast of Labrador *Serripes groenlandicus* reaches a large size, being nearly four inches long, and two inches thick. This genus is represented by fossils from the Devonian Period onward, but it attains its maximum in recent seas.

Cockle, kŏk'l. See Corn-cockle.

Cockle, Order of the, that of St. Michael, the knights of which wore the scallop as their badge. This order was instituted by Louis XI.

of France, who began to reign 1461 A.D. The dress is thus described from a MS. inventory of the robes at Windsor Castle in the reign of Henry VIII.: "A mantell of cloth of silver, lyned withe white satten, with scallope shelles. Item, a hoode of crymsin velvet, embraudeard with scallope shelles, lyned with crymsin satten."

Cock'lebur, a coarse annual plant, a species of *Xanthium,* belonging to the rag-weed family (*Ambrosiaceæ*). There are five or more species widely distributed throughout the temperate regions. Three of these species occur very commonly in waste grounds in nearly every part of the United States, excepting the interior region east of the Mississippi River, where the plant is rare. A distinct native of this country is the American cocklebur (*X. canadense*), while two other species (*X. strumarium* and *X. spinosum*), had their advent from Europe or Asia. Wool-growers are seriously troubled by the hook-spined burs of this plant, which catch in the sheep's wool, depreciating its value. In South Africa the injury to the wool industry is so great that strict laws are enforced to keep the plant from multiplying.

Cock'ney, a nickname for a native of London, especially for a person both born and bred there, the term being often used with a certain sense of disparagement, and as implying ignorance of other than city affairs, or as suggesting effeminacy. As to the origin of the word there has been much dispute, and many explanations, some of them sufficiently absurd, have been propounded. In the 14th and 15th centuries it was used to mean a petted or cockered child; and, according to the most recent etymology, its original meaning was "cock's egg," a small or misshapen egg.

Cockpit, in old-time men-of-war, a place situated under the lower gun-deck, where the ship's surgeons tended the wounded. The term is also applied to the open space in a yacht or canoe in which the crew or passengers sit.

Cockran, kŏk'ran, **William Bourke,** American lawyer: b. County Sligo, Ireland, 28 Feb. 1854. He came to America in 1871, and taught school for several years, while studying privately for the bar. He soon attained prominence as a lawyer, and entered actively into New York politics, his eloquence causing him to be much in demand as a Democratic public speaker. He was a member of Congress 1891–5, made noteworthy speeches at the Democratic national conventions of 1884 and 1892, at the latter of which he opposed Cleveland's nomination; and in 1896 refused to follow his party on the silver question, campaigning for McKinley, and advocating the gold-standard in effective addresses.

Cock'rell, Francis Marion, American senator: b. Johnson County, Mo., 1 Oct. 1834. He graduated at Chapel Hill College, Mo., 1853, studied law, and practised that profession until his election to Congress. During the Civil War he was a brigadier-general in the Confederate army, was severely wounded during Hood's invasion of Tennessee, and commanded a division in the operations around Mobile, Ala. He was chosen United States senator to succeed Carl Schurz, took his seat 4 March 1875, and has been re-elected four times, his present term expiring 3 March 1905.

Cockroach, any of the species of *Blatta* or allied genera, belonging to the family *Blattidæ,* order *Orthoptera.* The body of the cockroach is much flattened, being adapted to life under the bark of trees, under stones, in cracks, etc. The four wings are much alike in size and net-veined; the antennæ are long and slender, and to the end of the body are appended many-jointed antenniform limbs which contain olfactory organs like those in the joints of the antennæ. Cockroaches are hatched in nearly the same form as the parent, differing mainly in not having wings. The eggs are deposited in a bean-like case (*oötheca*), which is divided into two compartments, each containing about 30 eggs; these egg-sacs are carried about for some time by the female, projecting from the end of her hind-body. One small native species (*Platymodes pensylvanicus*) lives under stones, but the species so abounding in our homes have been introduced from the Old World. The peculiar odor given out by cockroaches is expelled from glands in the hind-body, and either present in both sexes, or only in the males. In the croton bug, or common small cockroach of our cities, these glands are very large, giving out a fœtid odor, and occur only in the males.

While nearly a thousand species of blattids are known to be now living and 200 fossil species are described, mostly from Palæozoic strata, chiefly the carboniferous states, several forms are household pests. They swarm in our kitchens, spreading through those parts of the house warmed by hot water or steam pipes, and are troublesome from eating clothing, cereals, devouring the paste in bindings of books; they also abound in ships, where they devour ship biscuit, etc., impregnating the pantry with their disagreeable odor. On the other hand, the cockroach is an enemy of the bed bug, doing great service in reducing their numbers. The development of the cockroach is slow and the number of eggs deposited not great. *Phyllodromia germanica,* the German roach or croton bug, reaches maturity in from four and a half to six months.

Of the many species known the most annoying is the German roach, whose native country is, however, not known, though supposed to have had an eastern origin. The Oriental cockroach (*Periplaneta orientalis*) is derived from tropical Asia, and is supposed to have been introduced into Europe two or three centuries since. The female is nearly wingless, it is a large dark brown species, living in colonies. The best remedies are insect powder, and phosphorus paste; a certain proprietary substance, called German snow-flake powder, is very efficacious. Consult the text books on entomology; also Howard and Marlatt, 'The Principal Household Insects of the United States.' (Bulletin No. 4 U. S. Department of Agriculture, Division of Entomology. Washington, 1896.)

Cock's-foot Grass. See ORCHARD GRASS.

Cocks'comb, a name sometimes given the genus *Celosia cristata* of the amaranth family *Amaranthaceæ.* It is an annual plant, native in the tropical regions of America, Asia, and the East Indies. The naturalized plant from tropical America is found during the months of August, September, and October as a weed or herb in waste places, also in cultivated ground, throughout the United States. The cultivated plant grows with an upright stem bearing a

brilliantly colored and wavy crest, formed by the minute flowers on the surface of the pointed bracts.

Cockswain, colloq. kŏk's'n, the officer who manages and steers a boat, and has the command of the boat's crew.

Cock'ton, Henry, English humorous novelist: b. London 1807; d. 26 June 1853. His stories were very popular in their day, the most noted among them being 'Valentine Vox, the Ventriloquist' (1840).

Cocles, kō'klēz, Horatius. See HORATIUS COCLES.

Cocoa. See CACAO.

Cocoa Butter. See CACAO, BUTTER OF.

Cocoanut, or **Coconut,** a palm tree (*Cocos nucifera*) native of islands in the Indian Ocean, but widely distributed in warm countries throughout the world. Geology shows that it had a wider distribution than at present, since specimens have been discovered in Central and South America. The tree grows naturally upon sandy soil bordering the sea or not far inland except where planted by man. It is remarkable as one of the first tree species to gain a foothold upon newly formed tropical islands. Its stem, which often attains a height of 100 feet is crowned by a rosette of long pinnatisect leaves from 10 to 20 feet long, gracefully curving upward at their bases and downward at their tips. From among the bases of the leaf-stems appear large pointed spathes from which proceed yellow or white flowers followed by large hard-shelled nuts. Several of the spathes in various stages of development are usually found upon the trees, which often commence to bear when less than 10 years old and continue productive for more than half a century, yielding about 100 nuts as an annual crop.

Since the tree does not produce well when remote from the coast, it is planted along the shores upon sandy or shelly land where little else of value will grow. The seeds are the sole means of propagation. They are planted in rows in the nursery and when the seedlings are large enough they are transplanted about 20 feet apart, where they are to remain, given clean cultivation for three or four years, and then allowed to shift for themselves, occasional mulches of seaweed, etc., but no manure, being given. The only part of the United States in which the cocoanut palm bears fruit with reasonable certainty is the extreme south of Florida, but even there it has not become commercially important. It may be taken as an index of the dividing line between the tropical and sub-tropical regions, since it thrives best in regions where frost never comes.

This palm is one of the most important economic trees of the world. Its fruit is a staple food either ripe or unripe, raw, or prepared in various ways, in many tropical countries. It is also exported to temperate climates, where the nuts are used in confectionery and for cake and dessert-making. The oil, of which there is about 70 per cent in the nuts, from which it is obtained by expression or heating in water, is largely used for making soap and candles and for food. (See COCOANUT OIL.) The central part of the stems of young plants is used for food, as is also the terminal bud or "cabbage." A drink and a kind of sugar are made from the sap of the young spathes. The dried leaves are used for thatching, baskets, mats, etc., and the petioles for oars. The wood in the lower portions of the trunks of old trees is commercially important under the name of "porcupine wood," which is used in cabinet-making, etc. The fibrous centres of old stems are used for cordage-making, as is also the fibrous husk of the nuts (see COIR). This latter is widely used for making cocoanut-matting, which is put down in corridors where there is a great deal of tramping. It is exceedingly durable. The cocoanut shell is used for drinking cups, bottles, etc., and for ornament when carved and polished. The fibre of the husks is used by florists as a moisture-retaining medium in which to plunge potted plants and in which to propagate various seedlings and cuttings.

Cocoanut Crab. See ROBBER CRAB.

Cocoanut Oil, a solid vegetable fat, largely used in candle-making and in the manufacture of soaps and pomatum. This fat is expressed from the albumen of the cocoanut kernel, and is as white as lard, and somewhat firmer. From Manila and Ceylon large quantities of the oil are exported.

Cocoa-plum, the fruit of *Chrysobalanus icaco,* belonging to the family *Rosaceæ,* which is eaten in the West Indies. It is about the size of a plum, with a sweet and pleasant though somewhat austere pulp. The root, bark, and leaves of the plant are employed as remedies in diarrhœa and other troubles. It has simple, alternate leaves and cymose flowers.

Cocoa (kō'ko) **Root.** See COCCO.

Coco de Mer, or **Sea** or **Maldive Double Cocoanut,** the fruit of the *Lodoicea seychellarum* palm. Its double kernel has long had an extraordinary value over a large area in the East. As a sovereign antidote to poison, and long known only from specimens thrown up on the Maldive coasts, it was supposed to grow on a submarine tree, and had other fables attached to it. The tree on which it grows is peculiar to some of the Seychelles Islands, reaches a height of 100 feet, and has very large fernlike leaves.

Cocoon, kŏ-koon', the web or ball spun by caterpillars before passing into the chrysalis state. The valuable product thus obtained from the silk-worm is well known.

Coco River. See CAJE RIVER.

Cocos, a genus of palms. There are about 30 species, natives, with one exception (*C. nucifera*), of South America, but cultivated for their fruits or for ornament in many warm countries. They vary considerably in height, but are all characterized by absence of spines, ridged trunks, pinnatisect leaves in a terminal crown or rosette, spadices erect at first, but later drooping, spathes two, flowers white or yellow, fruit of various forms. Some species are cultivated under glass on account of their graceful foliage. The most important species of the genus is unquestionably *C. nucifera,* the coco palm or cocoanut tree (see COCOANUT). Of the other species the following are perhaps best known in the United States. *C. flexuosa,* a medium-sized Brazilian species often planted in southern Florida and southern California as a street tree and to some extent cultivated in northern greenhouses. *Ceriospatha,* a stouter, somewhat taller

species from southern Brazil, by some considered the hardiest of the genus and often planted along avenues in the regions mentioned and in the West Indies. It is little cultivated under glass because of its rather coarse leaves. *C. datil,* an Argentine species, found to be hardy in southern California as a street tree. Its fruits which are edible, resembling those of the date palm. *C. plumosa* is the most generally cultivated street tree of the genus; it is of quick growth, soon reaching a height of 30 feet, and, with age, 50 feet. It is indigenous to central Brazil. *C. medalliana,* a dwarf species from central Brazil, is unquestionably the most popular greenhouse palm, not only of the genus, but of all genera. Its foliage is small, delicate, and graceful, and on this account it is frequently used as a table decoration. It is probably the most easily cultivated of the palms used in house decoration, and since it is of slow growth it retains its beauty for a considerable time, never becoming coarse or unattractive.

Cocos-keeling (kō'kōs-kē'lĭng) **Islands,** British India, a group in the Straits Archipelago, being a little horseshoe-shaped cluster of isles lying south of Java at about the distance of a three days' sail by steamer. The group is little known, but is said to be among the most picturesque in the British empire. The inhabitants, numbering about 600, are divided between the Cocos natives and coolie laborers from Java. The islands have a romantic history. A Scotch sailor named Ross landed here in 1825 and established himself as ruler; in 1851 he hoisted the British flag; but in 1857 the islands were formally annexed to Great Britain; and authority over them still remains in the hands of the Scotch sailor's descendants. An enlightened civil government is maintained; schools have been established; and industries connected with cocoanut and other products are carried on.

Co'cum-butter, or **Cocum-oil,** a pale, greenish-yellow solid oil obtained from the weeds of Garcinia purpurea, a tree of the same genus with mangosteen, used in India to adulterate ghee or fluid butter.

Cocy'tus (from Gr. *kōkucin,* to lament), a river of ancient Epirus which falls into the Acheron. Also, among the ancient Greeks, one of the rivers of the lower world. Pausanias advances the following conjecture respecting this river: "At Cichyrus is Lake Acheron, with the rivers Acheron and Cocytus, whose waters are very ungrateful to the taste. Homer, I imagine, had seen these rivers, and in his bold description of hell gave to the streams in it the names of those in Thesprotia."

Cod, the typical representative (*Gadus callarias* or *Gadus morrhua*) of a family (*Gadidæ,* q.v.) of marine fishes of pre-eminent economic importance. Although most widely and generally known as the codfish, or simply cod, perhaps not less than 50 other names are applied to it more or less colloquially, many of them derived from the same root as cod. The cod is moderately elongated, heavy in front, with a large head, and tapering gradually into a slender tail terminated by a slightly notched fin. There are three dorsal fins, none of which is elevated, and two anals, and the ventral fins are normal in structure and placed far forward on the throat. The mouth and eyes are large, and the chin bears a long barbel. Very small scales cover the entire body and most of the head. Although varying much in shade, the color is usually reddish-brown with small rounded spots of darker brown and a conspicuous pale lateral line. Unlike the haddock, all of the bones of the shoulder girdle are thin and lamellar; much variation in size has been observed, certain localities and schools always yielding large fish, others small or mixed ones. An average length is from three to four feet; and the weight from 7 to 40 pounds, but very much larger ones, several exceeding 100 pounds, and one of 160 pounds, have been recorded.

The cod is a fish of cold waters, apparently preferring a temperature of from 35° to 45°. Whether there is more than a single species is doubtful, though it is well known to fishermen and ichthyologists that the Alaskan cod have much larger swimming-bladders than those of the Atlantic. Waiving this question, the cod may be said to have a circumpolar distribution, ranging south in the Atlantic as far as the Bay of Biscay on the European side, and to Cape Hatteras on the American shore. In the Pacific it is abundant in the waters of Alaska and Bering Sea, and occurs on banks off the mouth of the Columbia River, though there are no cod fisheries at the latter point. Northward they are found to at least 80°, and probably beyond. Sometimes it will even enter fresh water, ascending rivers, as was formerly frequently recorded in the Delaware, perhaps in pursuit of food. That any north-and-south migration takes place is doubtful, but seasonal migrations between deep and shallow waters, and irregular ones in search of food, are well known both on our coasts and on those of Europe. Thus Prof. Sars has described the so-called "mountains of fish" which annually approach the coast of Norway. North of Cape Cod the fish approach the shores during the summer and retire, upon the approach of cold weather, to the deeper waters of the off-shore banks, where they are followed by the Gloucester fishermen. On the shores of New Jersey and Virginia no cod are found except during the winter, the shallow waters becoming so warmed in summer that they are driven seaward to the cold Labrador current. Rocky and stony banks, where a rich fauna has congregated at moderate depths to about 120 fathoms, are the favorite resorts of the cod, but considerable numbers are taken down to 250 fathoms on the edges of the outer banks, and the trawl has brought up cod from a depth of 300 fathoms.

Little need be said concerning the food of the cod. It devours everything of an animal nature that it comes across, and a mere list of the species which have been taken from its stomach would fill a volume and be little short of a catalogue of marine animals. Great clams are swallowed in their shells, and, after being digested, the hard parts are regurgitated in such numbers that the bottom over large areas is said to be paved with them. Spawning takes place at moderate depths, but the buoyant eggs rise to the surface, where they float until hatched. On the European coasts the spawning season is in March and April, but with us during the winter. The fecundity of the codfish is truly astounding, not less than 9,100,000 eggs having been estimated to be produced in a single year by a 75-pound fish, while 2,000,000 to 4,000,000 is the average yield of those of ordi-

nary size. The eggs are small, about one seventeenth of an inch in diameter, and, although buoyant, have no oil globule, as do many other pelagic eggs. They hatch in from 12 days to 3 weeks, and the young fry, which feed on small crustaceans, grow rapidly, becoming about two inches long in four months and about one foot at the end of a year, though the variation in size is very great. That there has been a great decrease in the numbers of cod frequenting the inshore banks is well known, and many suggestions have been made to account therefor. The late Prof. Baird connected it with the decrease in the number and size of the schools of herrings, a favorite food of the cod, itself due to the building of dams and other obstructions which have prevented their entrance into the rivers for spawning purposes. In an attempt to overcome this condition the United States Fish Commission has been engaged for several years in collecting and hatching enormous numbers of cod eggs at its Gloucester and Woods Hole stations, with every promise of a considerable degree of ultimate success. During the winter of 1901–2, the last season for which statistics are available, no less than 338,000,000 cod eggs were thus handled.

Next to the herring, the cod is the world's most important economic fish, and in the United States the most important. During 1901 the aggregate value of the fresh and salt cod landed at Gloucester and Boston, the two largest shipping points, was nearly $3,000,000, and the total annual value of the cod-fisheries of both sides of the North Atlantic cannot be less than $25,000,000.

Some idea of the magnitude of the cod-fishing industry may be gathered from the fact that out of a total population in Newfoundland of 220,000, more than half that number gains its livelihood from it. The Newfoundland cod fisheries are the oldest in America, and a description of the methods pursued there may well represent those of other and younger stations.

The island was discovered, or, granting an earlier discovery by the Northmen, rediscovered, by John Cabot, 24 June 1497. Soon after this event Portuguese, French, Basque, and Spanish fishermen established fisheries on its shores. When, in 1583, Sir Humphrey Gilbert took possession of the island in the name of Queen Elizabeth, small English colonies were established along the east coast, and several French ones on the southern shore. In 1713 the Treaty of Utrecht declared Newfoundland and its dependencies to belong wholly to Great Britain, but reserved to the French a right to fish and cure on parts of the coast, now known as the "French shore," extending from Cape St. John on the east to Cape Ray on the southwest. This reserved right has given rise to many complications, but more with respect to the lobster fishery than the cod industry. Of such prominence is the cod in the social economy of the island that the local courts have determined that the word "fish," if unqualified, must be deemed to mean codfish, which, in the northern and southern coast settlements, is so often used as an equivalent of money as to be called "Newfoundland currency." It is measured by the quintal of 112 pounds, and in this form pays for food, clothing, and medicines, as well as fees for physician, the clergyman, and the lawyer. The fish "flakes" (see below) are so numerous in all the towns, that it would be impossible to guard their contents; so stringent laws have been passed to prevent theft, and the convicted thief is frequently sentenced to several years' imprisonment, though he may take but a single fish.

While Newfoundland craft are to be seen in numbers upon the Grand Banks, during the last few years the crews have confined their operations largely to the waters in the vicinity of the island. Although the cod are somewhat smaller, they are fully as numerous and of excellent quality, while, in a good season fish weighing 10 or 12 pounds are frequently caught. The vessels range in size from the schooner, 125 feet long and over 100 tons burden, to the sailboat manned by two men, who cast their lines or set their nets under the lee of the rocky shores perhaps not more than 500 feet from land, for schools of fish are to be found in proximity to the coast as well as 100 miles away from it, depending largely upon the course of the Labrador current, which furnishes their principal food supply. The larger vessels are schooner-rigged, and usually carry two jibs, a mainsail, foresail, and main topsail, with sometimes a small jigger extending over the stern, and staysail rigged between the two masts. In addition, they carry a triangular riding-sail to assist in steadying them when at anchor. The larger ones are manned by from 15 to 30 men, provided with lines for deck-fishing as well as with set-lines and trap-nets. Each carries its complement of boats, and, on arriving at a fishing-ground, a part of the crew throw their lines over from the deck, while others bait and put out the set-lines and the trap-nets from the smaller boats, visiting them at regular intervals to gather in the fish, which are taken to the schooner to be hastily cleaned, salted, and packed in the hold until the "fare" is completed. The captain usually keeps his boat anchored as long as the school which has been "struck" remains. The fish may stay on one feeding-ground four or five days, or perhaps disappear in four or five hours after the vessel has cast anchor. Then the set lines and nets are taken up, the vessel weighs anchor, and search for another school begins.

In offshore fishing the trap-net is also used in addition to set-lines, and the larger boats occasionally use hand-lines as well, if the fish bite freely. A very large catch is made, however, with the set-lines and nets, and the boatmen go out every morning to take out the fish and bait the hooks, perhaps paying another visit in the evening. Upon the return of the men to the home settlement with their boatload of fish, the women and children join them in cleaning the fare, salting it, and spreading it on "flakes" to dry. At times the fishing is so good that the men make three and four trips daily to the nets and lines, carrying home a good load on each trip. Then the women and children prepare the fish in order to save time.

The time required to cure the codfish varies from 4 to 10 days according to the weather. With a succession of sunny days, the fare will be thoroughly cured in less than a week, but the fish must be protected against rainy weather, in spite of the salt with which they are rubbed after being cleaned.

The "flakes" are composed of platforms of boughs, elevated from 6 to 10 feet above the ground upon scaffolding; and the fish are laid

upon the boughs so closely together, that at a distance the "flakes" look as if they were covered with pieces of white canvas. Each fish is turned over at least once every 24 hours, in order to cure both sides thoroughly; and when the process is completed the fish is as stiff as a piece of board. No other ingredient except salt is required for the ordinary curing, although some of the cod prepared at the larger settlements are ground into fine particles after being dried, and mixed with a jam made of small berries. This is placed in jars and sold as a preventive of scurvy. The fares secured by the larger vessels remain in their holds until the cargo is completed. On arrival at St. Johns, or the home port, the cargoes are sold, in a partly cured condition, to the merchants, who finish the preserving process. In buying the fish from the large vessels, as well as from the fishermen in the settlements about the coast, the cod are valued according to their weight, and generally sorted in three different sizes, the largest bringing a proportionately greater price. The merchant, as he is known in Newfoundland, is the large dealer who exports the fish to the tropics and Europe. He buys from both the fishermen and the "planters." The latter are a sort of middlemen, and usually have "stations" located at different points along the coast. These stations include general stores containing everything required by the fishermen. The people in the vicinity can go to the station and exchange their harvest for what they need at home and the outfit required for fishing, and, if anything is left to their credit, can obtain its equivalent in money. Many of them, however, are usually in debt to the planter, and, in a good year, the surplus remaining after obtaining their necessities goes in payment of the debt of a previous season. The planters also buy schooner loads, and many of them own steamers and sailing vessels which make regular trips around the island, carrying the fish purchased by the planter to the general market at St. Johns or one of the other large towns.

While the number of cod caught varies considerably according to the season, the average catch is from 1,250,000 to 1,500,000 quintals, the value, of course, depending on the price. Within the last two or three years the revenue from this source has aggregated about $5,000,000, not counting $300,000 for codfish oil, and a small sum for the oil derived from the livers of the codfish for use in medicine. The number of crews engaged in codfishing can only be estimated, owing to the variety of craft and the wide field of their operations. Authorities on the subject, however, estimate that fully 60,000 men are engaged in the fishery each year, and that a fleet of fully 1,000 two-masted vessels, hailing from the island alone, ply upon the nearby waters and on the Banks. Practically all of these vessels are home-made, the wood for both hulls and spars being secured from forests in the interior, while the sails and rigging are imported chiefly from England. For a full account of the natural history of the codfish, consult Goode, 'American Fishes'; and for statistics of the fisheries and other information, the 'Annual Reports' of the U. S. Commissioner of Fish and Fisheries.

Cod-liver Oil, an oil extracted from the livers of different kinds of cod — the *Gadus morrhua* being specified in the pharmacopœia — and allied species. It has a fishy taste and odor, is insoluble in water, but dissolves in ether, and is colorless or pale yellow. The tint, however, depends on the mode of preparation, some kinds being pale brown, and others dark brown. The finest and palest oil is produced from fresh and carefully cleaned liver, the oil being extracted either in the cold or by a gentle heat. The darker kinds are obtained at a higher temperature, and often from the livers in a putrefying state. Only the pale oils are used in medicine, the dark oils are too rank and acrid, and they are only used in dressing leather. The oil is prepared in Great Britain, in Newfoundland, and in Norway, and it has also been prepared in Iceland.

Cod-liver oil has a specific gravity of 0.93. It is a somewhat complex substance, but the main ingredients appear to be olein and margarin. Acetic, butyric, and other acids are also present, and to these the oil may owe some of its odor. It contains, besides biliary matters, a peculiar body called gaduin, and inorganic substances, including minute quantities of iodine, bromine, sulphur, and phosphorus. It is questioned, however, whether iodine and bromine are constant constituents.

In medicine cod-liver oil is very highly prized, because it is a readily assimilable fat, splitting readily in the intestines and easily digested. Perhaps next to milk fat or egg fat it is one of the most easily taken up of the fatty bodies. It is therefore particularly valuable in the treatment of the chronic wasting diseases, proving especially serviceable in consumption. It is also of service in weak, puny children, and can be taken to advantage by adults with chronic nervous disorders. In fact cod-liver oil is very valuable in most affections of the nervous system. As it is the fat in cod-liver oil that is valuable the various forms of proprietary preparations on the market that claim to contain the active principles without the oil should be looked upon with suspicion. The oil is usually very unpalatable; hence the many emulsions that are put up. These, if they contain the pure oil in reasonable quantities, are excellent. There are many commercial cheats in cod-liver oil, and reliable preparations only should be used.

Codazzi, Agostino, ä-gōs-tē'no kō-dät'sē, Italian engineer: b. near Ferrara 1792; d. Colombia June 1859. He made several campaigns under Napoleon, and afterward distinguished himself as an engineer in South America. He entered the Colombian service with the rank of lieutenant-colonel of artillery, and was employed in making charts and in preparing plans of defense. In 1831 he was appointed by Paez to prepare partial charts of the new republic of Venezuela. This work occupied nearly nine years, and was twice interrupted by military defensive expeditions, in which Codazzi took part. He was rewarded with the rank of colonel. He devoted the years 1838–9 to exploring the wilderness of Guiana, and penetrated nearly to the sources of the Orinoco. The important additions to geography which were obtained from this expedition induced the congress of Venezuela to furnish him means to make public the result of his labors. For this purpose he went to Paris, where his work appeared in 1841, entitled 'Resumen de la Geografia de Venezuèla,' accompanied by an

extensive chart of Venezuela. Codazzi afterward established a German colony in Venezuela. In 1848 he was employed by the government of Colombia in a topographical survey of that country.

Cod'dington, William, New England colonist: b. Boston, Lincolnshire, England; d. Rhode Island 1 Nov. 1678. He was one of the founders of the colony of Rhode Island. He arrived in Massachusetts in 1630, remained in Boston for several years, but not being able to agree with the authorities of the colony, he removed in 1638 to Aquidneck, or Rhode Island, where he founded a colony to be governed "by the laws of the Lord Jesus Christ." It was soon found necessary to abandon this vague scheme, and in 1640 he himself was chosen governor, and in 1647 aided in the formation of a regular body of laws. He was unable to secure the reception of Rhode Island into the colonial confederacy. In 1674 and 1675 he was again elected governor.

Code, a term now generally confined to jurisprudence, and used to designate a systematic compilation of law authorized by governmental authority to take the place of prior existing law. It is in this sense applied to the codes of Theodosius, Justinian, and Napoleon. The word is used more generally in the United States as applied to a concise, comprehensive, systematic formation and re-enactment of the law, deducted from both its principal sources, the pre-existing statutes, and the adjudications of courts as distinguished from compilation of statute law only. Codes such as here described have been adopted and are in use in many of the States. They are, in the most part, modeled upon the Code of Civil Procedure of New York. The purpose of a code is to simplify methods of legal procedure and to model and bring together in a codified form the confused mass of laws, contradictions, repetitions, and disorder which have grown up during a long period of time. Such a codification of law has always been deemed a most difficult task, and though many times agitated in England, it has never been earnestly undertaken, and is not likely to be for some time. The same causes which made such a codification necessary in the time of the Emperor Justinian exist to-day in many countries and in most of the States of the United States. While the *Corpus Juris Civilis,* or body of civil laws, drawn up by Justinian's commission of 10 learned civilians, was the most important and complete of ancient codes up to that time, there had been other compilations under the empire. These compilations had been made by private lawyers, and formed the basis of the *Codex Gregorianus et Hermogenianus,* which in turn were the models for the imperial codes of Theodosius and Justinian.

The *Codex Theodosianus* was the work of a commission of 16, to whom, in 435 A.D., the Emperor Theodosius entrusted the task of collecting the edicts and constitutions. It was published in 438 A.D., was a work of great importance, and formed the masterpiece on which every later code was based. It was the initiative of a digest of the whole Roman law. In 528 the Emperor Justinian ordered a new collection to be made, and for this purpose appointed 10 commissioners with full power to make such changes as they might deem necessary in the language of the constitution. They were authorized in their compilation to use the codes, Gregorian, Hermogenian, and Theodosian, and the constitutions, with the understanding that the new code was to supersede the sources from which it had been compiled. The Code Justinian was completed within 14 months, and was subsequently revised to take in new decisions and constitutions of the emperor. The original code was lost. The revised one, which has been preserved, was published in 534, and is divided into 12 books and each book into titles.

Code Napoléon.— The civil code of France in force at the present day takes its name from the great Napoleon. It was undertaken under the consulship of Napoleon by the most eminent jurists of France, and was published in 1804. It is the most celebrated of modern codes. The *Code Napoléon* (under which name four other codes of commercial law, criminal law, penal law, and the law of procedure, drawn up at the same time, are often included) was a code in the fullest and strictest meaning of the word, in that it was not merely a collection of the law, but was a complete and thorough statement of the law. The need of a codification of the laws of France had been urged by eminent jurists and statesmen for some time before Napoleon took the matter up and carried it through. Previous to the adoption of the *Code Napoléon* there had been some partial codes in France; such as the *Code Henri,* made by Brisson in the reign of Henry III.; the *Code Murvillac* or *Michau* under Louis XIII. (1629), relating to judicial procedure, and the *Code Louis XV.,* by Chaussepierre, containing the ordinances from 1722 to 1740. There were several of these ordinances enacted in the reign of Louis XVI. No decided move was made to bring about a codification of the confused condition of the laws of France for the purpose of shaping them into a homogeneous jurisprudence until the Revolution had cleared the way. By the consular decree, 12 Aug. 1800, a commission was constituted to compare the order which had been followed in the preparation of the projects for a civil code "hitherto published, to determine the plan which the commissioners should think best to adopt, and to discuss the chief principles of civil legislation."

Napoleon, on becoming consul, appointed a commission headed by M. Tronchet, and including Portalis, Bigot de Préameneu, and Maleville, to review all previous efforts at codification and to suggest a new plan. In 1801 the commissioners reported a draft for a civil code, which was submitted to the court of cassation and other courts of appeal, and with the reports of the judges, was finally brought before the council of state, in which Napoleon (then first consul) presided in person and took part in the discussion as to the terms and scope of the code. The whole revision after much debate was finally adopted under the title of *Les Cinque Codes,* consisting of the civil code, distinguished by the name *Code Napoléon,* the code of criminal procedure, penal code, the code of civil procedure, and the code of commerce. The entire work was first published under the title *Code civil des Français,* but Napoleon subsequently had it published as the *Code Napoléon,* as he considered the code one of the crowning glories of his reign. The *Code*

Napoléon consists of 2,281 articles. It has been said of this code that it is the product of Roman and customary law, together with the ordinances of the kings and the laws of the Revolution. Although political upheavals have caused some changes and modifications, the code remains virtually the same as when it left the hands of its framers. The extent of its influence upon the laws of other countries has been very great, as it formed the basis of the codes of the two Sicilies (1819), the Netherlands in 1837, the Swiss cantons from 1819 to 1855, Bolivia in 1843, and the civil code of the State of Louisiana.

Code Frederic.— This is a revision of the Prussian laws, published by Frederick the Great 1749–51, and revised after 1780, but not in force until 1794, was intended, according to its preface, to obviate the difficulties of the Roman codes, the disputes of the commentators, and the contradictions between Roman and German law. It has been subjected to many changes.

Codes in the United States.— The first important experiment with a code in the United States was made in Louisiana, which State, originally a French colony, afterward ceded to Spain, again returned to France, and subsequently acquired by the United States from France, has had many changes of law. After the United States acquired Louisiana there arose a strong demand for a code, owing to the great confusion of laws. In 1806–8 a code was adopted, but only to supersede the ancient laws when they conflicted with it. A complete civil code was adopted for the State in 1824, which had for its basis the *Code Napoléon,* although some provisions of the common law were injected into it.

The most important code ever undertaken in the United States is the one which was prepared for the State of New York many years ago under the guidance and supervision of David Dudley Field. This code, although published, and having formed the foundation for many of the codes adopted by the various States, was never accepted by the legislature of New York. As early as 1839 David Dudley Field advocated and urged the adoption of a code by that State. The revised constitution of New York (1846) ordered the appointment of two commissions: one to reduce into a system the whole law of the State, the other to revise and simplify the rules of pleading. Both commissions were appointed by the legislature in 1847. The commissioners to revise and simplify pleadings and practice made a report on 27 Feb. 1848, which contained an incomplete code of civil procedure and practice in the courts of record. This report was immediately adopted by the legislature, but the complete codes of civil and criminal procedure were never adopted. On 6 April 1857, the legislature created a new commission to prepare codes. The commissioners named were David Dudley Field, William Curtis Noyes, and Alexander W. Bradford. After some eight years they reported a code — or rather three codes — which was never adopted, although reported favorably by the committees of several legislatures.

The code of civil procedure of the David Dudley Field commission formed the foundation, and was largely adopted in the codes of Ohio, Indiana, Missouri, Wisconsin, Iowa, Minnesota, Kansas, Nebraska, Nevada, California, Oregon, North Carolina, South Carolina, Washington, Montana, Alabama, the Dakotas, Wyoming, Utah, and Arizona, and it is the basis of the present codes of civil and criminal procedure in the State of New York, which are codes of practice and pleading, as distinguished from a code of substantive law. The principal feature of the code of civil procedure as adopted by these States was the fusion of law and equity and the simplifying of the written pleadings.

LEWIS P. CLOVER.

Code of Khammurabi. See KHAMMURABI.

Code Napoléon, a code of laws in France, framed by a committee appointed by Napoleon Bonaparte when first consul. This committee, consisting of Portalis, Bigot-Préameneu, Malleville, Tronchet, and the minister of justice, was directed by a decree dated 24th Thermidor, VIII. (13 July 1800),—

— to compare the order which had been followed in the preparation of the projects for a civil code hitherto published, to determine the plan which the committee shall think best to adopt, and to discuss the chief principles of civil legislation.

In the following year, 1801, these commissioners reported a draft of a civil code, which was in the first instance submitted to the court of cassation (q.v.) and the various courts of appeal. With the reports of the judges of these courts the draft was submitted to the council of state, over which the first consul presided, and in which every part was thoroughly discussed. In the work entitled 'Conférence du Code Civil, avec la Discussion Particulière du Conseil d'État et du Tribunat, etc.' (8 vols. Paris 1805), a detailed and very carefully prepared report of these discussions is contained. Each article, after having been discussed in this body, was presented to the tribunate, where it underwent another discussion, and was returned to the council of state as adopted, rejected, or amended.

Of the five codes prepared in this way, namely, the 'Code Civil,' published in 1804; the 'Code de Procédure Civile,' published in 1806; the 'Code de Commerce,' published in 1807; the 'Code d'Instruction Criminelle,' published in 1808; and the 'Code Pénal,' published in 1810; the first was called by way of eminence, by a law of 3 Sept. 1807, 'Code Napoléon.' At the restoration its name was changed back to 'Code Civil,' and during the time of the second empire it was again called 'Code Napoléon.' It is divided into 2,281 paragraphs, which are numbered, and consist of a few lines each. The work is divided into three books (livres); each book into a certain number of titles; each title is comprised in one or more chapters. A preliminary title, 'On the Publication, Effects, and Application of the Law in General,' precedes the whole. The first book is entitled 'Of Persons,' and in 11 titles treats, (1) of the enjoyment and privation of civil rights; (2) of civil acts, such as the registry of births, marriages, and deaths; (3) of domicile; (4) of absentees; (5) of marriages; (6) of divorce; (7) of the relations of father and son; (8) of adoption and official guardianship; (9) of the paternal power; (10) of minority, guardianship, and emancipation; (11) of majority, of guardian-

ship of persons of age (interdiction), and judicial counsel. The second book is entitled 'Of Property and the Different Modifications of Ownership,' and in four titles treats, (1) of the distinction of property into real and personal (*immeubles et meubles*); (2) of ownership; (3) of usufruct, of use and habitation; (4) of servitudes (easements, *des servitudes ou services fonciers*). The third book is entitled 'Of the Different Modes of Acquiring Property,' and in 20 titles treats, (1) of successions; (2) of donations *inter vivos* and testaments; (3) of contracts, or conventional obligations in general; (4) of engagements formed without a convention; (5) of the contract of marriage, and the rights of the parties respectively; (6) of sale; (7) of exchange; (8) of the contract of letting to hire; (9) of partnership; (10) of loan; (11) of deposit and sequestration; (12) of contracts connected with chance (*aléatoires*, such as wagers and life-rents); (13) of powers of attorney; (14) of becoming security; (15) of transactions; (16) of bodily duress in civil cases; (17) of furnishing security; (18) of mortgages; (19) of taking and setting off by execution; (20) of prescriptions.

The work already quoted, 'Conférénce du Code Civil,' is indispensable to a complete understanding of the code, because it gives the history of each law. It first presents each article in the code as finally adopted. Next follow the different forms and drafts of each article discussed in the council of state, with the report of the discussions. To this succeed the observations made in the section of legislation of the tribunate. We learn from this work how active a part Napoleon took in the formation of the code, as his remarks are given as well as those of the others, and he was present during almost the whole of the debates. Under the first empire the adoption of the 'Code Napoléon' was made obligatory on all the countries subject to the French. After the battle of Leipsic, in 1813, which freed Germany from the power of France, it ceased to be obligatory in the German states, but it continued to influence considerably their legislation. At present this code is recognized in the kingdom of Belgium (with some modifications), in the grand-duchy of Baden, in the kingdom of Italy, and elsewhere in Europe. In the United States it was a model for the code of Louisiana.

Code'ine, Codein, Codeina, or **Codeia** (Gr. κώδεια, "poppy-head"), a vegetable alkaloid closely allied to morphine and constituting about 0.5 per cent of the weight of opium. Codeine has the formula $C_{17}H_{18}(CH_3)NO_3 + H_2O$, and is known to the chemist as methylmorphine, since it is derived from morphine by substituting methyl (CH_3) for one atom of the hydrogen that morphine contains. Codeine may be prepared by adding calcium chloride to an aqueous extract of opium and evaporating to the point of crystallization. The hydrochlorides of morphine and codeine which are obtained in this manner are dissolved in water, and the morphine is precipitated by the addition of ammonia. Codeine hydrochloride remains in solution, and may be obtained by evaporation and crystallization, and further purified by recrystallization from ether. Codeine acts as a strong base, and its solution reddens litmus paper, neutralizes acids, and precipitates solutions of lead, iron, and copper. From aqueous solution it is deposited in the form of trimetric crystals, as indicated by the formula given above. Crystals free from water may be obtained by deposition from a solution in carbon disulphide. When treated with strong sulphuric acid and a small quantity of ferric chloride ($FeCl_3$), codeine compounds give an intense blue color. This reaction is of great value in testing for the presence of the alkaloid. Codeine is used in medicine as a narcotic and hypnotic. Its properties are very similar to those of morphine, but by reason of the methyl groups introduced it has more action on the spinal cord than morphine has. It thus does not cause sleep or relieve pain as readily as morphine, and causes more reflex excitability. It may even cause convulsions in children. It is valuable where a milder sedative than morphine is desired, as there is less euphoria produced and less likelihood of forming a habit. Its use is not free from danger, however, and very small doses have been known to prove fatal.

Codemo, Luigia, loo-e'jē-ä kō dā mō, Italian novelist: b. Treviso 5 Sept. 1828. In 1851 she became the wife of the Chevalier Karl von Gerstenbrand. Her first work, 'Memoirs of a Peasant' (1856), evinced a true insight into lowly life; and in the numerous sketches and tales that followed it, she showed a profound sympathy with the common people. Her writings have passed through several editions. Among her works are: 'Miseries and Splendors of the Poor'; 'The New Rich'; 'A Lady of Heart.'

Co'dex, with the ancients, the trunk of a tree stripped of the bark. Before the invention of paper, wooden tablets covered with wax, which were written on with the style, and put together in the shape of a book, were called codex. The word was afterward retained, in times when paper was used for writing, to denote a large book. Thus important works, particularly old manuscripts of poets, historians, etc., which had been preserved, were called *codices manuscripti*. In like manner a collection of laws was called codex, with the addition of the name of the sovereign under whom, or of the person by whom it had been compiled, as *Codex Gregorianus, Codex Theodosianus, Codex Carolinus.*

Codex rescriptus (Latin, a re-written codex) is the name given to ancient manuscripts, which, in the Middle Ages, were used, after the original writing had been in a great measure effaced, for the copying of other works, generally ecclesiastical treatises. Thus the Institutions of Gaius, discovered by Niebuhr at Verona in 1816, and published by Göschen in 1821, is a *codex rescriptus.* Some skill is required to read the ancient letters under the others. The Greek name for *codex rescriptus* is *palimpsest,* now more frequently used. The biblical writings themselves have been sometimes effaced to make way for homilies and legends. One of the oldest manuscripts of the New Testament, designated by the letter C, is a *codex rescriptus,* on which the works of Ephraem Syrus have been written. See PALIMPSEST.

Codex Argenteus, a translation of parts of the Bible in the Gothic language, attributed to Ulfilas, bishop of the Dacian Goths in the 4th century. It is written on vellum, the leaves of which are stained with a violet color; and on

this ground, the letters, all uncials or capitals, are painted in silver, except the initials, which are gold. The book, however, gets its name from its elaborately wrought silver cover, and not from its lettering. It throws much light on the kindred languages of Germany. The 'Codex' contains only fragments of the gospels and of the epistles of Paul, some psalms, and several passages from Esdras and Nehemiah. It was discovered by some Swedish soldiers in the monastery of Werden in Westphalia, in 1648; then deposited in Prague; afterward presented to Queen Christina, who placed it in the library of Upsala; next carried off by Vossius; and finally restored to the University of Upsala, which regards it as its most precious possession.

Codex Sinaiticus, sī-nā-īt'ī-kŭs, a very ancient and valuable manuscript of the Greek Septuagint version of the Old Testament (including the Apocrypha), the whole of the New Testament, the Epistle of Barnabas, and a part of the Shepherd of Hermas, discovered in the monastery of St. Catherine, on Mount Sinai, by the German scholar Tischendorf, 4 Feb. 1859, while traveling in the East by the desire of the Czar Alexander II. When the discovery was made Tischendorf endeavored to persuade the monks to make a present of the manuscript to the czar, and although he was not immediately successful, he was allowed to take it to St. Petersburg on loan. Ultimately, in 1869, the manuscript was formally presented to the czar as Tischendorf had desired. In 1860 an account of the manuscript was published by the discoverer at Leipsic. It is written on parchment in four columns, in early uncial characters, and bears every mark of possessing great antiquity, perhaps being even older than the Vatican MS., which, before the discovery of the Sinaitic MS., was recognized as the oldest known manuscript of the Old and New Testaments. It is assigned by Tischendorf himself to the 4th century. The Old Testament in this manuscript is defective, but the New Testament is complete, not a word being wanting, which is the more remarkable, inasmuch as it is the only manuscript of the New Testament which is complete. From this circumstance, as well as from its great age, it acquires a value in relation to the text of the New Testament, which can scarcely be overestimated. Two gaps in the Old Testament part of the manuscript are curiously supplied by another manuscript which Tischendorf had discovered in the same monastery in 1844, and which he had brought to Germany and named *Codex Friderico-Augustanus,* in honor of the king of Saxony. From this coincidence, as well as the general resemblance of the two manuscripts, it is inferred that the last-named manuscript is really a part of the Codex Sinaiticus, which is generally believed to be the case. A splendid fac-simile of the manuscript was published by Tischendorf under the auspices of the czar at St. Petersburg, in 4 volumes folio, toward the end of 1862. This was followed in 1863–4 by two smaller editions of the New Testament part of it.

Codex Vatica'nus, an ancient Greek MS. of the Old and New Testaments, so called from being contained in the Vatican library at Rome, where it was placed early in the 16th century. It is written on thin vellum, in small uncial characters. In the greater part of the manuscript there are three columns to a page, and this fact is regarded as one among other indications that it is later than the Sinaitic manuscript, which has four columns to a page. The manuscript is assigned to the 4th century, and until the discovery of the Sinaitic it was regarded as the best manuscript of the Old and New Testaments. The greater part of Genesis in the Old Testament, and the whole of the pastoral epistles and the Revelation in the New Testament are wanting. The first collation of this MS. was by Bartolocci, in 1669. An edition of it by Cardinal Mai was published in 1857, after having been 19 years in print without being published; but it did not satisfy the expectations of scholars. A fac-simile of it was published in 1868.

Cod'icil, an addition to, qualification of, or change in a will. It must be in the same form as a will, and be executed with the same formalities. All the laws applying to wills are the same for a codicil. A codicil properly executed is a republication of the will, and makes the will speak from the date of the codicil. The will and codicil are read together as one instrument. There may be more than one codicil to a will; and where there are several, if the last one is properly executed, referring to a former paper in such a manner as to identify it, that paper, although not properly executed, may be read into the will. See WILL.

Codification. See CODE.

Codil'la, the coarsest part of hemp, which is sorted out by itself. This term is also applied to the coarsest part of flax.

Codlaeum. See CROTON.

Codlin-moth, a moth the caterpillar of which attacks the fruit of the apple (q.v.).

Cod'man, John, American sea-captain and miscellaneous writer: b. Dorchester, Mass., 1814; d. Boston, 6 April 1900. He was the author of: 'Sailors' Life and Sailors' Yarns' (1847); 'The Mormon Country' (1876); 'Round Trip by Way of Panama, etc.' (1879); 'Winter Sketches from the Saddle' (1888); etc., besides many newspaper and magazine articles on current topics.

Codogno, kō-dōn'yō, Italy, a town in a fertile district between the Po and Adda, 17 miles southeast of Lodi. It has a large trade in Parmesan cheese and wheat, and carries on a number of manufactures. The French defeated the Austrians here in 1796. Pop. 10,000.

Cod'rington, SIR Edward, English admiral: b. 27 April 1770; d. London 28 April 1851. He entered the navy as midshipman in 1783, became lieutenant in 1793, and the following year received the appointment of captain. He obtained a gold medal for his services at the battle of Trafalgar, took part in the Walcheren expedition, and was afterward actively employed both in the Peninsular and second American wars. In 1821 he became vice-admiral. His name is principally famous in connection with the battle of Navarino, where he commanded the united squadrons that overthrew the Turkish fleet in 1827. In 1837 he became full admiral.

Co'drus, the 17th and last king of Athens. Tradition tells that during his reign Attica was attacked by the Dorians, or, according to some, by the inhabitants of the Peloponnesus, or the

Thracians. The assailants, inquiring of an oracle what would be the result of their incursion, received for answer that they would be successful if they avoided killing the Athenian king. Codrus, becoming acquainted with this answer, resolved to sacrifice himself for his country. He disguised himself in a peasant's dress, entered the enemy's camp, provoked a quarrel with the soldiers, and was slain. The Athenians, upon hearing of this, sent a herald to demand the body of their king. The courage of the assailants was so damped that they retired without striking a blow. In honor of their patriotic monarch the Athenians abolished the royal dignity, substituting that of a responsible archon, esteeming no one worthy to be the successor of Codrus. They also used his name as a common term to express a man of distinguished excellence.

Co'dy, William Frederick, American scout, hunter, and showman, best known as "BUFFALO BILL": b. Scott County, Iowa, 26 Feb. 1846. His parents moved to the country about Fort Leavenworth, Kansas, where the father was killed in the "Border War" with the Indians when the boy was but an infant. When still very young he was employed by the express companies as a rider to carry packages and valuables on horseback across the country, a most dangerous occupation. Soon he became known as a fearless and perfect rider, a keen scout, a reliable plainsman and hunter. When but little over 21 he attracted the notice of United States army officers, who were constantly in need of the services of expert scouts who could be depended upon and who knew the habits and languages of the red man. In 1868–9 he was made chief of scouts by Gen. Sheridan, then campaigning against the hostiles. Colonel John Schuyler Crosby, then adjutant under Sheridan, says of Cody: "He carried despatches 100 miles for Gen. Sheridan through terrific fire of hostile bands of Indians and returned with replies safely." This and his many personal encounters with the Indians, in some of which he saved the day for the troops, made him a noted man. He is the last of the six great scouts of America — Boone, Crockett, Carson, Bridger, "Wild Bill," "Buffalo Bill." He gained this name from his dexterity as a hunter, his record being 4,862 buffalo in one season — 69 in one day. He continued actively engaged in frontier work for many years, killing the Cheyenne chief, "Yellow Hand" in a celebrated personal encounter during the Sioux war of 1876. Early in the eighties he began the carrying out of a cherished idea — to gather about him some of the remaining elements which went to make up a frontier life and exhibit this unique existence in the eastern States and in Europe. He presently accomplished this end, forming the exhibition called the "Wild West," now known the world over. In this he has gathered scores of Indians, some of whom were once his mortal foes; hundreds of "cow-boys"; the old "Deadwood coach," used so many years to carry mail and passengers, and much other really valuable material. With this gigantic show he has toured America and Europe for nearly 20 years, amassing a fortune which he has invested in lands in Nebraska and Wyoming. In the latter State is a town named after him, on his land. In 1901 he became president of "The Cody Military College and International Academy of Rough Riders," a school to be established on his property in Wyoming where young men may learn to ride and become masters of themselves and their horses — a post-graduate school in manhood, as he terms it. He is a unique character, the connecting link between the rough life of our brave fathers in the Far West and these days of automobiles and wireless telegraphy.

PUTNAM DREW.

Coe, Edward Benton, American clergyman: b. Milford, Conn., 11 June 1842. He was graduated at Yale 1862, studied at Union Theological Seminary 1862–3, and in France and Germany 1864–7. From 1864 to 1879 he was Street professor of modern languages at Yale, and on 2 Oct. 1879 was ordained by the Classis of New York as one of the ministers of the Collegiate Reformed Dutch Church. He was pastor of the Fifth Avenue and West 48th Street Church till January 1899, since when he has been senior minister without charge of a specific congregation. He has published a number of sermons, and a volume entitled 'Life Indeed' (1899).

Coe, George Albert, American educator: b. Monroe County, N. Y., 26 March 1862. He graduated at the University of Rochester 1884, and in theology at Boston University 1887 obtaining the traveling fellowship of the latter college and studying at the University of Berlin 1890–1. He was acting professor of philosophy in Northwestern University 1891–3, when he was elected to the John Evans chair of philosophy there. Besides articles in philosophical and theological journals, he has written 'The Spiritual Life: Studies in the Science of Religion' (1900).

Coe College, an educational institution for both sexes, located at Cedar Rapids, Iowa. It was organized in 1881, under the auspices of the Presbyterian Church, and reported at the end of 1902 that it had 25 professors and instructors, 305 students, and 3,500 volumes in the library.

Cœcilian, or **Cæcilian,** sē-sĭl'yăn, limbless amphibians, constituting a family, *Cæciliidæ* or *Cæciliidæ,* and an order *Apoda* or *Gymnophionia.* They are remarkable for the entire absence of limbs, even the internal limb girdles having disappeared, and the bony roof to the temporal region of the skull. In the latter feature they simulate the extinct *Stegocephali,* to which some zoologists believe them to be rather closely related, though the temporal roof is formed by different bones. The form is worm-like, and, notwithstanding that the number of vertebræ may exceed 200, the tail is very short. A series of annular scales, somewhat embedded in the skin, protect the body externally, and as a further adaptation to their burrowing habits the eyes are rendered nearly or quite useless by being buried beneath the skin, the deficiency in sight being compensated by the presence of a pair of nearly unique retractile sensory tentacles.

Some species are viviparous, others oviparous. In the case of the latter the female coils about the eggs and protects them until hatched. The young of many are noteworthy in the possession of external gills, while the respiration of the adults is pulmonary. Their food consists principally of earthworms and subterranean insect larvæ.

Dr. Boulenger recognizes 17 genera and 4[illegible] species, but probably many remain undiscovered. None have been found except in a zone encircling the earth, chiefly within the limits of the tropics; South and Central American species are numerous; but none are certainly known from North America. Consult: Boulenger, 'Proceedings of the Zoological Society of London' (1895); Sarasin, 'Forschungen auf Ceylon' (Vol. II.).

Co'educa'tion, a term meaning joint education, has come to be specifically applied to the education of both sexes in the same class or institution. In the western States and Territories of the United States it is almost the only system of education, and it is rapidly becoming the prevailing system in the South, where the influence of the State universities is predominant. On the other hand, in the New England and middle States the great majority of the youth of both sexes are still receiving a separate college education. Coeducation was introduced into colleges in the West as a logical consequence of the so-called American system of free elementary and secondary schools. During the great school revival of 1830–45 and the ensuing years until the outbreak of the Civil War in 1861, free elementary and secondary schools were established throughout New England and the middle States and such western States as existed in those days. It was a fortunate circumstance for girls that the country was at that time sparsely settled; in most neighborhoods it was so difficult to establish and secure pupils for even one grammar school and one high school that girls were admitted from the first to both. In the reorganization of lower and higher education that took place between 1865 and 1870 this same system, bringing with it the complete coeducation of the sexes, was introduced throughout the South both for whites and negroes, and was extended to every part of the West. In no part of the country, except in a few large eastern cities, was any distinction made in elementary or secondary education between boys and girls. The second fortunate and in like manner almost accidental factor in the education of American women was the occurrence of the Civil War at the formative period of the public schools, with the result of placing the elementary and secondary education of both boys and girls overwhelmingly in the hands of women teachers. This result proved not to be temporary, but permanent, and from 1865 until the present time, elementary and secondary education of both boys and girls has been increasingly in the hands of women. When most of the State universities of the West were founded they were in reality scarcely more than secondary schools supplemented, in most cases, by large preparatory departments. Girls were already being educated with boys in all the high schools of the West, and not to admit them to the State universities would have been to break with tradition. Women were also firmly established as teachers in the secondary schools, and it was patent to all thoughtful men that they must be given opportunities for higher education, if only for the sake of the secondary education of the boys of the country. The development of women's education in the East has followed a different course because there were in the East no State universities, and the private colleges for men had been founded before women were suffered to become either pupils or teachers in schools. The admission of women to the existing eastern colleges was, therefore, as much an innovation as it would have been in Europe. The coeducation of men and women in colleges, and at the same time the college education of women, began in Ohio, the earliest settled of the western States. In 1833 Oberlin Collegiate Institute (not chartered as a college until 1850) was opened, admitting from the first both men and women. It was the first institution for collegiate instruction in the United States where large numbers of men and women were educated together, and the uniformly favorable testimony of its faculty had great influence on the side of coeducation. In 1853 Antioch College, also in Ohio, was opened, and admitted from the beginning men and women on equal terms. From this time on it became a custom, as State universities were opened in the far West, to admit women. Utah, opened in 1850; Iowa, opened in 1856; Washington, opened in 1862; Kansas, opened in 1866; Minnesota, opened in 1868; and Nebraska, opened in 1871, were coeducational from the outset. Indiana, opened as early as 1820, admitted women in 1868. The University of Michigan was, at this time, the most important western university, and the only western university well known in the East before the War. When, in 1870, it opened its doors to women, they were for the first time in America admitted to instruction of true college grade. The step was taken in response to public sentiment, as shown by two requests of the State legislature, against the will of the faculty as a whole. The example of the University of Michigan was quickly followed by all the other State universities of the West. In the same year women were allowed to enter the State universities of Illinois and California; in 1873 the only remaining State university closed to women, that of Ohio, admitted them. Wisconsin which, since 1860, had given some instruction to women, became in 1874 unreservedly coeducational. All the State universities of the West, organized since 1871, have admitted women from the first. In the 20 States which, for convenience, are classified as western, there are now 20 State universities open to women, and, in four Territories — Arizona, Oklahoma, Indian, and New Mexico — the one university of each Territory is open to women. Of the 11 State universities of the southern States the two most western admitted women first, as was to be expected. Missouri became coeducational as early as 1870, and the University of Texas was opened in 1883 as a coeducational institution. Mississippi admitted women in 1882; Kentucky in 1889; Alabama in 1893; South Carolina in 1894; North Carolina in 1897, but only to women prepared to enter the junior and senior years; West Virginia in 1897. The State universities of Virginia, Georgia, and Louisiana are still closed to women. The one State university existing outside the West and South, that of Maine, admitted women in 1872.

The greater part of the college education of the United States, however, is carried on in private, not in State universities. In 1897 over 70 per cent of all the college students in the United States were studying in private colleges, so that for women's higher education their admission to private colleges is really a matter of much

greater importance. The part taken by Cornell University in New York State in opening private colleges to women was as significant as the part taken by Michigan in opening State universities. Cornell is in a restricted sense a State university, inasmuch as part of its endowment, like that of the State universities, is derived from State and national funds. Nevertheless, there is little reason to suppose that Cornell would have admitted women had it not been for the generosity of Henry W. Sage, who offered to build and endow a large hall of residence for women at Cornell University. After carefully investigating coeducation in all the institutions where it then existed, and especially in Michigan, the trustees of the university admitted women in 1872. The example set by Cornell was followed very slowly by the other private colleges of the New England and Middle States. In Massachusetts Boston University opened its department of arts in 1873, and admitted women to it from the first; but no college for men followed the example of Boston until 1883, when the Massachusetts Institute of Technology admitted women. This school, like Cornell, is supported in part from State and national funds. In 1892 Tufts College was opened to women. In the West and South the case is different, and the list of private colleges that one after another have become coeducational is too long to be inserted here. Among new coeducational foundations the most important are, on the Pacific coast, the Leland Stanford Junior University, opened in 1891; and in the middle West, Chicago University, opened in 1892. (For Chicago's recent attitude, see UNIVERSITY OF CHICAGO.)

Of the 480 colleges for men enumerated by the commissioner of education, 336, or 70 per cent (or, excluding Catholic colleges, 80 per cent) admit women. In the western States there are, excluding Roman Catholic colleges and seminaries, out of 195 colleges 182 coeducational, and only 13 colleges for men alone. In the southern States and southern middle States, excluding Roman Catholic colleges and seminaries, out of 161, there are 125 coeducational and but 36 colleges for men only. Among these 36, however, are some of the most important educational institutions in that section — Johns Hopkins University, the University of Georgia, the Louisiana State University, Tulane University, and the University of Virginia. In New England and the northern middle States, out of 64 colleges, excluding Roman Catholic colleges and seminaries, only 29, or less than half, are coeducational. The colleges for men only include (with the exception of Cornell) all the largest undergraduate colleges in this section — Harvard, Yale, Columbia, Princeton, Pennsylvania.

Five important universities, closed to women in their undergraduate departments, have each affiliated to them a women's college through which women obtain some share in the undergraduate instruction given, the most important being Harvard, Columbia, and Western Reserve University. Of these five, four (all but Harvard) admit women without restriction to their graduate instruction, and in addition Yale, the University of Pennsylvania, and New York University make no distinction between men and women in graduate instruction. The Johns Hopkins University maintains a coeducational medical school. Princeton is the only one of the large university foundations that excludes women from any share whatsoever in its advantages.

All the arguments against the coeducation of the sexes in colleges have been met and answered by experience. It was feared at first that coeducation would lower the standard of scholarship on account of the supposed inferior quality of women's minds. The unanimous experience in coeducational colleges goes to show that the average standing of women is slightly higher than the average standing of men. Many reasons for the greater success of women are given, but the fact, however it be explained, remains and is as gratifying as astonishing to those interested in women's education. The question of health has also been finally disposed of; thousands of women have been working side by side with men in coeducational institutions for the past 25 years and undergoing exactly the same tests without a larger percentage of withdrawals on account of illness than men. The question of conduct has also been disposed of. None of the difficulties have arisen that were feared from the association of men and women of marriageable age. Looking at coeducation as a whole, it is most surprising that it has worked so well. Not only is the number of coeducational colleges increasing, but the number of women relatively to the number of men is increasing also. Between 1890 and 1898 men in coeducational colleges increased 70.0 per cent, but women in coeducational colleges increased 105.4 per cent. There is every reason to suppose that this increase of women will continue. Already girls form 56.5 per cent of the pupils in all secondary schools; and 13 per cent of the girls enrolled and only 10 per cent of the boys enrolled graduate from the public high schools. It is sometimes said that men students, as a rule, dislike the presence of women, but statistics show that the number of men increases more rapidly in coeducational colleges than in colleges for men only. It is women who have shown a preference for separate education; women have increased more rapidly in separate colleges for women than in coeducational colleges. It will be observed, however, that the separate colleges for women, like the separate colleges for men, are in the East; it is in the East only that any preference for separate education is shown by either sex. This preference is natural, since college life as it is organized in a woman's college seems to conservative parents less exposed, more in accordance with inherited traditions; and girls, who in their own homes lead guarded lives, are to be found in women's colleges rather than in coeducational colleges. Then, too, for the present, much of the culture and many of the priceless associations of college life are to be obtained, whether for men or women, only by residence in college halls, and no coeducational, or even affiliated, colleges have as yet organized for their students such a complete college life as the independent woman's college. In professional schools, including the graduate school of the faculty of philosophy, coeducation is even at present almost the only method. There are in the United States only four graduate schools for men closed to women, and only one independent graduate school maintained for women offering three years' consecutive work leading to the degree of Ph.D.

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Coefficient of Expansion. See GAS; HEAT; THERMOMETER; THERMOMETRY.

Coefficient of Friction. See FRICTION.

Coefficient of Induction. See ELECTRICITY; INDUCTION.

Coehorn, koo'hōrn, **Menno,** BARON VAN, Dutch engineer: b. near Leeuwarden, Friesland, 1641; d. The Hague 17 March 1704. In his 16th year he entered the service as captain, and soon rose to the rank of a colonel. During the siege of Graves he made use for the first time of the small mortars, called in honor of their inventor *coehorns,* used for throwing grenades. In the war of 1689, against France, he again distinguished himself. His defense of Fort William, in 1692, which he himself had planned, against the attacks of Vauban, attracted much attention. Both commanders displayed all their talents. In 1702 he published at Leeuwarden his new theory of fortification. In 1703 he directed several sieges. He fortified almost all the strong places in Holland. Bergen-op-Zoom he considered his masterwork. His system, and that of Vauban, are entirely different. Vauban operated by manœuvres, and by the skilful direction of his ordnance and his men saved both, and wearied and divided the forces of the enemy; Coehorn crushed by an overpowering mass of artillery and men, and sacrificed both for a rapid and powerful effect.

Cœle-Syria, sē'lē-sĭr'ĭ-a ("Hollow Syria"), the ancient name of the large valley lying between the Lebanon and Anti-Lebanon mountain ranges in Syria. The valley is about 100 miles in length. Near its centre are the ruins of Baalbek, or Heliopolis, and near the ruins rise the rivers Orontes and Litany, which water and fertilize the plain. The name also at one time included all the country (except Judea and Phœnicia) extending from Seleucis to the confines of Egypt and Arabia.

Cœlebs (sē'lĕbz) **in Search of a Wife,** a moral tale by Hannah More, published 1808. This is the best-known work of fiction by that prolific moralist. It was written after she had passed her 60th year, and was intended as an antidote to what she considered the deleterious influence of the romantic tales of that day. In 'Cœlebs' she sought to convey precepts of religion, morals, and manners, in the form of a novel. The book had an instant and great popularity. The first edition was sold in a fortnight, and 11 within a year. Its republication in the United States was also highly successful.

Cœlenterata, sē-lĕn-tẹ-rā'ta. The zoophytes or radiate animals of older writers included, among others, the *Actinia* or sea-anemone, the coral, the fresh-water *Hydra,* the sea-firs (*Sertularia*), and the *Medusidæ* or jelly-fishes. These forms were united under the common designation *Cœlenterata* by Frey and Leuckart, and recent observations tend to include the sponges likewise in the same class. Omitting the sponges, however, as their relations are still uncertain, the *Cœlenterata* may be defined as animals whose body wall, consisting of two layers, ectoderm and endoderm, encloses a cavity which has only one external aperture, and which discharges the function at once of digestive and circulatory organ. The outer surface may secrete a horny sheath, as in the sea-firs, or may develop in its substance the hard calcareous skeleton of the corals. The *Hydra,* if divided transversely at any point, shows only a single circular boundary; but the *Actinia,* if similarly treated, is seen to consist of an external and an internal circle, between which radial partitions pass. This is due to the fact that the oral margins are prolonged inward for a short distance as a funnel, which terminates by a truncated open end: the matters received into the funnel and then digested circulate in the compartments outside the funnel, while the effete portions are rejected by the mouth. The *Hydra* and *Actinia,* which are the simplest representatives of the two principal divisions of the class, are at first sight alike in their perfect radial arrangement; but in the *Actinia* bilateral symmetry may be recognized, in so far as the presence of a tubercle within the tentacular circlet indicates the point through which a section would divide equally the cylindrical animal. The structure of the coral will be given under that heading. The Venus' girdle (*Cestum veneris*), the spherical *Cydippe,* and the *Beroë,* are the commonest members of the *Ctenophora,* whose locomotive organs consist of cilia arranged on definite bands which divide the surface. The *Hydrozoa* comprise a very varied assemblage of fixed or free-swimming forms, of single animals or clusters aggregated into a compound mass by a process of gemmation, the various members of the group giving off buds which remain in organic connection with the parent mass. This, the simplest mode of multiplication, is obviously asexual, and the development of ova may take place at some part of the compound mass. But the most interesting phenomena are presented by those forms which illustrate what is known as alternate generations, when from the egg is produced an organism which is unlike that which gave it birth, but whose progeny exactly repeats the form whence the egg was derived. Thus from the egg may be produced a fixed compound structure like the sea-fir, from which a free-swimming zoöid is given off; and in this an egg is produced whence the fixed form is again developed. These free-swimming zoöids are the familiar umbrella-like disks of our jelly-fishes, and these are either gymnophthalmatous, or naked-eyed, the eye-spots on the margin of the disk being exposed; or else these spots are covered by a fold of the body-wall, as in the covered-eyed or steganophthalmatous *Medusæ.* These free-swimming forms move by the contraction of their umbrella; but the air-sacs developed in the Portuguese man-of-war and the like assist or supersede the muscular action of the disks. The majority of these *Medusæ* are known to be merely the sexual phases in the alternate generations, and the difficulty of their determination may be guessed from the fact, that the one "generation" may consist of zoöids seven feet in circumference, while that from which they proceeded is only half an inch in height. The researches of Allman have shown a beautiful series of gradations connecting the apparently quite dissimilar members of the group. Thus the umbrella-like zoöids may remain in connection with the parent mass of which they are buds, and the free-swimming zoöids are shown to be merely detached reproductive organs.

Cœliac Artery, an artery issuing from the aorta just below the diaphragm. It is called also the cœliac axis.

Cœlostat, sē'lō-stăt, an astronomical instrument in which an image of the sky is shown reflected in a plane mirror. Such an instrument has recently (1903) been completed for the Smithsonian Institution at Washington. It will be used primarily for the study of solar phenomena.

Cœnogenesis. See RECAPITULATION THEORY.

Coercion Acts. See IRELAND.

Coethen, kē'tĕn, Germany, a town in the duchy of Anhalt, in a fertile and attractive district on the Ziethe, about 80 miles southwest of Berlin. It was, till 1853, the capital of the former duchy of Anhalt-Cœthen. It consists of the old and the new town and several suburbs; has a fine Protestant cathedral church in the Gothic style, with old glass-paintings and a fine organ; the former ducal residence with library, picture-gallery and museum; a gymnasium, normal and several other schools. There are manufactures of machinery and metal goods, and various other industries. Beet-sugar is a staple article of commerce. The town dates back to the 10th century. Pop. 23,000.

Cœur, Jacques, zhăk kėr, French merchant and royal treasurer: b. Bourges toward the end of the 14th century; d. Chios, in the island of Scio, 25 Nov. 1456. His vast commercial enterprise attracted the attention of Charles VII., who in 1435 appointed him master of the French mint, and afterward treasurer. His excellent management of affairs caused the king to ennoble him, and to intrust him with high functions in the French provinces, and diplomatic missions in Italy. Cœur contributed 200,000 crowns to help the king in rescuing Normandy from the English. After the successful end of the war, his influence became so great as to give offense to envious persons, who after the death of the king's mistress, Agnes Sorel, charged him with having poisoned her, and caused him to be arrested (1451), and his vast property to be confiscated. Although the charge was proved to be groundless, he was detained in prison until 1455, when he effected his escape. Repairing to Rome, he was kindly received by Pope Nicholas V., and was enabled to gather the broken remains of his fortune. He had vainly claimed the clemency of Charles VII. in favor of his family, and it was under Louis XI. only that his memory was exculpated from all charges, while a part of his property was afterward restored to his descendants.

Cœur d'Alêne, kėr dă-lăn (Fr. "awl-heart"). 1. A name given by the French *voyageurs,* traditionally from the stinginess of a chief, to a tribe of Indians of the Salishan stock, though with a dialect widely different from the other members. Their own name is Skitswish, which Lewis and Clarke rendered Skitzoomish. When found by Lewis and Clarke they occupied a considerable tract in northern Idaho and Washington, near the lake named after them. There were perhaps 2,000 of them, rather squalid and unadventurous, though cruel; they lived on roots, fish, and small game, and did not visit the buffalo grounds. Father de Smet visited them in 1841, and the next year a Catholic mission was established among them, and they became Christians. They had regular dwellings and a mill; but they were hostile to the encroaching whites, and in 1858 their chief, Vincent, with a band of his warriors, joined in a war on them, which was only put down by Gen. Wright after two sharp battles, at Four Lakes and Spokane Plains. In 1867 part of them were placed on a reservation in Idaho, and in 1872 the rest were removed to the Colville Reservation, between the Okanogan and Columbia rivers.

2. A lake in northern Idaho, situated among mountains of the same name. The rivers Cœur d'Alêne and St. Joseph flow into the lake at its southern end, and the Spokane River is its outlet at the north. The region is a mining district, and has been the scene of serious labor troubles, especially in 1892 and 1899.

Cœur d'Alêne, a novel by Mary Hallock Foote, published 1894. It is a story of the Colorado mining camps, full of realistic details. Its situations turn upon the labor strife between union and non-union miners in 1892, which forms the sombre background of a bright lovers' comedy.

Cœur de Lion, kėr dė lē-ôn, a title given to several historical personages, as Richard I. of England; so called from the prodigies of personal valor performed by him in the Holy Land; Louis VIII. of France, frequently called *Le Lion;* and Bolaslas I. of Poland, also called "The Intrepid."

Coffee, the seed of an evergreen shrub, which is cultivated in tropical countries, supposed to be native to Abyssinia, although it was early found in Arabia. The plant belongs to the genus *Coffea,* order *Rubiaceæ.* In the wild state it grows to a height of from 6 to 30 feet, but in cultivation it is pruned and kept between 6 and 10 feet. The leaves are green, glossy on the upper side, and somewhat resemble those of the laurel, but less dry and thick. The flowers are white, fragrant, and grow in clusters from the axils of the branches. The fruit, often called berries, grows in clusters of from 3 to 12, each with a short stem or sessile. The fruit when ripe resembles in appearance a dark-red cherry, or a medium-sized cranberry. Each berry contains two seeds embedded in a yellowish, sweetish pulp which, when ripe, is delicious.

The trees are raised from seed grown in nurseries, and when of a size to endure variations of temperature, usually in about six months' time, they are transplanted to the coffee orchard. They begin to bear when three years old, and yield fruit for about 20 years. Considerable space is left between the trees, and corn, bananas, and plantain are grown among them, especially when young. The first year's crop is small, but when in full bearing a tree will yield from one to five pounds, according to location and variety. The regions best adapted to the growth of coffee are between the parallels of 15 north and 15 south latitude, and from 1,000 to 4,000 feet above sea-level. It is cultivated from lat. 25° N. to 30° S., in places where the temperature does not fall below 55° F. Moist and somewhat shady slopes are found most desirable. Little streams of water are conducted to the roots of the trees, which are kept very wet until the fruit is nearly ripe, then the water is turned off to keep the fruit from becoming too succulent. The fruit varies in size and color

according to the altitude in which it grows; that from highlands is small and green; that grown on lowland and near the coast is larger and of a yellowish tinge. The wild trees of Liberia, which grow in the lowlands, produce the largest fruit known, but it is of inferior quality. The coffee from the Far East can be distinguished by its large bean of a yellow color, while that of Central and South America is smaller and of greenish color. The fruit is harvested with great care, cloths being placed under the trees before shaking them. The fruit is then exposed to the sun to dry, after which it is pulped, washed, dried again, hulled, cleaned, and sorted before it is ready for the market. In some places, especially Brazil, the bean is pulped by machinery as soon as it is taken from the tree, and thus the time necessary to get the coffee ready for market is shortened.

Some of the coffee-producing countries of the world to-day are: Brazil, the Philippines, Hawaii, Cuba, Porto Rico, Jamaica, Central America, and parts of Africa, Arabia, Java, and Ceylon. Brazil has a larger coffee-bearing area than any other country; it produces more than two thirds of all the coffee consumed in the world. One year, when the crop was unusually good, Brazil produced 660,000 tons, and that same year the world's consumption was 600,000 tons. Coffee planting in Brazil has been the most successful farming in the world. Sao Paulo, a city of 250,000, owes its existence to the trade in the coffee raised in the great orchards in the vicinity. In some of the orchards there are about 5,000,000 trees. Large quantities of the Brazilian coffee are shipped annually to Aden (Arabia) and reshipped to other parts of the world as mocha. The producing of coffee in Yemen, or Wady Negram, or anywhere near Mocha is a thing of the past; but one kind of coffee-berry raised in Brazil and in some other countries much resembles in form and flavor the old market mocha. Coffee planting is no longer pursued to any extent in Ceylon. The red lands in the province of Sao Paulo, in Brazil, seem to be particularly favorable to the growth of the tree, and this section seems immune to the leaf disease which has destroyed the industry in Ceylon and in some parts of the West Indies. Giving the soil a rest or changing crops may result in again placing Ceylon among the places producing an excellent quality of coffee. The names given to coffee are usually those of the cities from which shipments are made.

The difference in taste of coffee as found in our markets is principally due to two causes: (1) the roasting to either a reddish-brown or a dark brown; (2) the picking of coffee when some berries are green, others red, and still others a dark purple, the last being the ripe fruit. Thus we have three grades from each tree; add the difference in roasting, as mentioned, and we have six grades; then take the perfect berry, which is flattened on one side, and the spherical berry, the so-called mocha, and that gives 12 grades of coffee.

In Porto Rico and Cuba coffee of a good quality is raised, but as yet in small quantities. In the Hawaiian Islands coffee of excellent quality is produced, and the orchards are increasing in size and number. Hawaiian coffee brings the highest price of any on the Pacific coast. In the Philippines there are splendid orchards, especially in the southern islands of the archipelago, known as the Sulu or Jolo group. On the island of Jolo are fine coffee-trees that bear much earlier after planting than those of Brazil. There are large tracts of land in the Philippines which are as favorable for coffee growing as any in Brazil, but the area that may be devoted to coffee farming is not so great.

The United States leads the world in the consumption of coffee. The yearly consumption in Great Britain declined steadily during the last half of the 19th century. This is attributed to the adulterations which at one time were extensively practised. Probably few articles of food are subjected to so much adulteration as coffee. Substances of an entirely foreign nature are often palmed off as genuine coffee, or are offered as substitutes. Dandelion, parsnip, carrot, and beet roots, beans, lupins, rice, and various cereals, roasted and ground, have all been employed, and within recent years the manufacture of artificial coffee has been undertaken on a considerable scale, the material being mixed to a stiff paste and run through a machine for which patents have been granted, and from which it emerges in the shape of "coffee-beans," which, after drying and roasting, are well calculated to deceive the eye, though not the nostrils or palate. These adulterations can be readily detected, for genuine roasted coffee may be soaked in cold water indefinitely without the bean losing its smooth surface or hard, tough consistency, nor will it impart its color to the water; whereas chicory and other imitations become soft and spongy and render the water muddy. As far back as the eighties it was estimated that something like 18,000,000 pounds of various vegetable substances were annually sold as coffee.

In Medicine.— Many of the leading medical men of the day hold that the action of coffee on the body is due to two or three factors. If coffee is mixed with milk or cream, it gives a certain amount of nutritive matter; but its action is usually that due to the volatile oils, and to the caffeine contained. The volatile oil, like others in this class, stimulates peristalsis, and assists to overcome constipation — in this respect coffee and tea being quite opposites — and it also aids in the expelling of flatus; but taken too often and in too large quantities the oil contributes to the causation of a certain amount of gastric indigestion. The more delicate the aroma of coffee the less the oil, and the better from this standpoint. The action of caffeine is much more complex.

So far as coffee-drinking is concerned, the action of caffeine is that of a cardiac stimulant, a nerve-muscle excitant, a diuretic, and a cerebral excitant. Thus it may cause a sense of undue fullness in the blood vessels. It almost invariably causes a slight muscular tremor, which is not noted in those who do not use their hands for fine work, as artists, for example. It causes an increased flow of urine, and tends to prevent sleep. Time, custom, usage, dose, and the individual's reaction all modify these general laws; but these reactions occur, although none of them may be of sufficient grade to make the observer cognizant of the action. Thus many people are not kept awake by coffee. They have probably habituated themselves and require larger doses.

Hot coffee is one of the best heart tonics known, and it is sometimes used in large quan-

tities by rectum in cases of shock, opium poisoning, pneumonia, etc. Coffee is also valuable in many types of headache and in many cases of nausea. Its excessive use leads to great muscular irritability, gastritis, restlessness, and sleeplessness. It is held by many medical men that the effects of coffee as a beverage are wholly bad. They say that the caffeine in the coffee, or in other vegetable substances — tea, coffee, kola, guarana, and maté, or Paraguay tea — is a stimulant to the brain, nerves, heart, and kidneys. In small doses it helps to resist fatigue, increases mental power and promotes excretion of urine. Large doses or continued use, however, tend to make a person nervous, to induce irritability of the heart with considerable depression, and to upset the stomach. The mildest results of an overdose are a tendency to wakefulness, but there are recorded a number of deaths from heart-failure due to its employment in large doses. It is used largely as a heart-stimulant and diuretic, but its action is characterized by great variability. Individual susceptibility to it varies so greatly that what would be a poisonous dose for one person would scarcely affect another. The usual dose is half a grain to three grains.

History. — The early history of coffee is obscure; as an article of diet, its introduction is recent; to the Greeks and Romans it was wholly unknown. It was first introduced into Persia from Abyssinia, and next in the 15th century by a Mohammedan priest at Aden. From Aden it was carried to Mecca, where first the pilgrims or Hadjis, and then the rest of the people, began to use it. From Arabia it was taken to Cairo, Egypt, where in 1511 it was prohibited because it was believed to be an intoxicant and came within the class of things forbidden as food by the Koran. The Sultan Causon removed the prohibition, and coffee passed along the coast by way of Syria and around to Constantinople. Again it was opposed as one of the articles not to be used as food according to the Koran. Thus its use was permitted and allowed for many years. The Turks are now immoderate coffee-drinkers.

Prior to the 18th century all the coffee used in Europe was brought from Arabia Felix via the Levant. In 1652 Edward, a merchant, in trade with Turkey, introduced coffee into England; in 1697 Van Horn introduced it into Batavia, and from there it was taken to France and the West India Islands. In 1754 Father Villaso, a Franciscan monk, took a plant to Rio Janeiro and cultivated it in the garden of the monastery of St. Anthony. This one plant was the means of introducing coffee into Brazil.

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Coffee-bug, an insect (*Lecanium coffeæ*), of the *Coccus* family (*Coccidæ*), very destructive in coffee plantations.

Coffee House, a house of entertainment where persons are supplied with coffee and other refreshments. Such houses were formerly the chief resorts of every class for purposes of conversation and information, and the meeting-places of politicians, literary men, etc. Constantinople is believed to have been the first European capital in which coffee-houses were instituted, the year of their establishment there being 1554 A.D. In 1650 the first one in England was opened in Oxford. They were suppressed by Charles II. in 1675, but were soon allowed to be reopened.

Coffee-nut: Coffee-tree. See Kentucky Coffee-tree.

Coffer-dam, a water-tight enclosure round a space where it is intended to found the pier of a bridge, quay, etc., so constructed that the water may be pumped out of it and the masonry executed "in the dry." It is formed of one or more rows of piles (usually two), between which clay is rammed. The piles, generally driven close together, are sometimes grooved and tongued; but if the water be not very deep the piles are placed some distance apart, and boards let into the grooves. Of course great care must be taken that no water can enter at the joints or at the junction with the natural soil, and that the structure is sufficiently strong to resist the great pressure of water from without. If the bottom is of rock, and piles cannot be driven, coffer-dams may be formed of two parallel stone walls, the intervening space filled up with clay. Iron caissons are also used instead.

Coffer Fish, or **Trunk Fish,** a peculiar genus (*Ostracion*) of bony fishes in the small order *Plectognathi,* and in the suborder *Sclerodermi,* which also includes the file-fishes. The body is enclosed in a firm box formed of hexagonal bony scales fitted into one another like a mosaic. The snout, the bases of the fins, and the end of the tail are the only soft-skinned parts. Over a score of species are known from tropical and sub-tropical seas. The best-known form is *O. quadricornis* from the tropical Atlantic.

Cof'feyville, Kan., a city of Montgomery County, situated on the Verdigris River, and on the Missouri P., Atchison, T. & S. F., and other railroads. There are gas wells in the vicinity, and the city has a large trade with Indian Territory, and a number of manufacturing interests. Pop. (1900) 4,953.

Coffin, Charles Carleton, American novelist and lecturer: b. Boscawen, N. H., 26 July 1823; d. Brookline 2 March 1896. He began life as a civil engineer, and afterward gave his attention to telegraphy. In 1851 he began to write for the Boston papers; and during the Civil War and the Austro-Prussian war of 1866 was war correspondent for the Boston *Journal,* writing over the signature of "CARLETON." His books include: 'Days and Nights on the Battle-Field' (1864); 'Four Years of Fighting' (1866); 'Our New Way Round the World' (1869); 'Story of Liberty' (1878); 'Boys of '76' (1879); 'Old Times in the Colonies' (1880); 'Life of Garfield' (1883); 'The Drum-Beat of the Nation' (1887); 'Marching to Victory' (1888); 'Freedom Triumphant' (1891).

Coffin, SIR Isaac, English admiral: b. Boston, Mass., 16 May 1759; d. England 23 July 1839. He entered the English navy as midshipman in 1773, served on various ships on the

American station, in 1778 was appointed lieutenant, and in 1781 commander. On 16 March 1781 he acted as signal-lieutenant to Admiral Arbuthnot in the action off Cape Henry, and in 1782 was present as a volunteer under Admiral Hood in the engagement between Rodney and De Grasse. In 1798, when Minorca fell into the hands of the English, he was appointed superintendent of the arsenal at Port Mahon. In 1804 he was advanced to the rank of rear admiral of the blue; next year was made a baronet; in 1808 vice-admiral, and in 1814 admiral. In 1826 he founded a school in Nantucket, Mass., still called by his name.

Coffin, James Henry, American scientist: b. Williamsburg, Mass., 6 Sept. 1806; d. Easton, Pa., 6 Feb. 1873. He was graduated at Amherst, 1828. He taught at Greenfield, Mass., Ogdensburg, N. Y., 1829–40; at Williams College 1840–3; Norwalk (Conn.) Academy 1843–6, when he was elected professor of mathematics and astronomy in Lafayette College, Easton, Pa., where he remained till his death. His reputation is due to his achievements in meteorology, a subject he began to investigate as early as 1838. In 1853 he published his theory of atmospheric circulation, including the principle quoted in Europe since 1860 as 'Buys-Ballot's Law.' He wrote: 'Solar and Lunar Eclipses' (1845); 'Winds of the Northern Hemisphere' (1853); 'Psychrometrical Tables' (1856); 'The Orbit and Phenomena of a Meteoric Fire-Ball, 20 July 1860' (1869); 'Elements of Conic Sections' (1874); 'The Winds of the Globe; or, the Laws of Atmospheric Circulation over the Surface of the Earth' (1875), completed by his son, S. J. Coffin. See Clyde, 'Life of J. H. Coffin' (1882).

Coffin, John Huntington Crane, American mathematician: b. Wiscasset, Maine, 14 Sept. 1815; d. Washington, D. C., 8 Jan. 1890. He was graduated at Bowdoin 1834, and in January 1836 entered the United States navy as professor of mathematics, serving in the West India squadron, and at the Norfolk navy yard. He had charge of the mural circle in the Naval Observatory at Washington from 1843 to 1853, when he was transferred to the Annapolis Naval Academy, taking charge of the department of mathematics, and later astronomy and navigation. From 1865 to 1877 he had charge of the 'American Ephemeris and Nautical Almanac.' In 1877 he was placed on the retired list. Bowdoin conferred the degree of LL.D. upon him in 1884, and in 1863 he became one of the corporate members of the National Academy of Sciences, named by Act of Congress. He published 'Observations with the Mural Circle, with Formulas, Tables, and Discussions, 1845–9', published in the observatory volumes for those years; 'The Compass' (1863); 'Navigation and Nautical Astronomy' (1868); 'Observations of the Total Eclipse of the Sun, August 1869' (1884).

Coffin, Joshua, American antiquary: b. Newbury, Mass., 12 Oct. 1792; d. there 24 June 1864. He was graduated at Dartmouth College in 1817, and was a teacher for many years. Whittier was one of his pupils, and addressed to him the poem 'To My Old School-Master.' Coffin was an ardent abolitionist, being a founder and first recording secretary of the New England Anti-Slavery Society 1832. He compiled: 'Sketch of the History of Newbury, Newburyport, and West Newbury, 1635–1845' (1845); 'List of Some of the Descendants of Mr. E. Woodman (of) Newbury, Mass., 1635' (1855); 'The Toppans of Toppan's Lane: Their Descendants and Relations' (1862).

Coffin, Levi, American philanthropist: b. near New Garden, N. C., 28 Oct. 1798; d. Avondale, Ohio, 16 Sept. 1877. He was a farmer's son, and early evinced interest in the negro's welfare. Proving successful in business, he actively aided slaves to gain freedom, largely through the "underground railroad." Thousands of escaping slaves were aided on their way to Canada by him. He helped found the Freedman's Bureau in 1863, and after the Civil War was active in schemes to advance the welfare of the colored people. He was known popularly as "President of the Underground Railroad."

Coffin, Robert Barry, American journalist and miscellaneous writer: b. Hudson, N. Y., 21 July 1826; d. Fordham, N. Y., 10 June 1886. He was on the staff of the 'Home Journal' of New York (1858), and was also art critic of the *Evening Post*. His humorous sketches, which appeared in many periodicals over the pen-name "Barry Gray," have been extensively read. Among his publications are: 'My Married Life at Hillside' (1865); 'Cakes and Ale at Woodbine' (1868); and 'The Home of Cooper' (1872).

Coffin, Robert Stevenson, American printer and poet: b. Brunswick, Maine, 1797; d. Rowley, Mass., 7 May 1827. He served his apprenticeship as a printer in Newburyport; was a sailor during the War of 1812, and at one time a prisoner on board a British frigate, and subsequently worked on newspapers in Boston, New York, and Philadelphia, publishing occasional verses in the poet's corner. He came to be known, perhaps from his own pretentiousness, as "The Boston Bard," and his poems were collected in a volume entitled the 'Oriental Harp, Poems of the Boston Bard.'

Coffin, William Anderson, American painter: b. Allegheny, Pa., 31 Jan. 1855. He was graduated at Yale 1874, studied art in the United States 1874–7, and then in Paris under Leon Bonnat 1877–82. He opened a studio in New York 1882, and has become well known as a painter of landscapes and figure pieces. In 1886 he won the Hallgarten prize of $200; was awarded a medal at the Paris Exposition 1889; received the Webb prize of the Society of American Artists 1891; and was gold medallist of the Philadelphia Art Club 1898. He was art critic of the New York *Evening Post* 1886–91, and of the New York *Sun* 1896–1900. In 1901 he was director of fine arts at the Pan-American Exposition in Buffalo, N. Y. Among his best-known pictures are: 'The Rain,' in the Metropolitan Museum; 'Une académie de peinture moderne'; 'An Examination' (time of Louis XIII.); 'The Close of Day' (1881); 'The Hayfield' (1886).

Cof'fin, a box or case designed to hold a corpse for interment or cremation. Coffins were used by the ancients mostly to receive the bodies of persons of some distinction. Among the Romans it was latterly the almost universal custom to consume the bodies with fire, and deposit the ashes in urns. Even at the present time coffins are not used in the East, either by

Mohammedans or Christians. In Egypt coffins seem to have been used in ancient times universally. They were of stone, earthenware, glass, wood, or a kind of pasteboard made by gluing cloth together. (See SARCOPHAGUS.) Coffins among Christians were probably introduced with the custom of burying. (See BURYING-PLACES.) It has been often proposed that they should be made with a hole opposite the place of the mouth of the body, so as to allow breathing in case of revival. Of course it would be necessary, at the same time, to let the coffin stand for some days in a convenient place, as is the custom in some parts of Germany. It has recently been proposed to employ coffins of wicker-work, while some strenuously advocate the burning of all dead bodies. See CREMATION.

Cofre de Perote, kō'frā dā pā-rō'tā, Mexico, a mountain about one mile from the town of Perote, and 70 miles northwest of Vera Cruz. It is 13,414 feet high. The English name is the Four Parts, or the Square Mountain. It is formed of basaltic porphyry.

Cog-wheel, a wheel with cogs or teeth. The pitch of such a wheel is the distance, measured along the pitch-line (explained below), between the centres of two successive teeth. The pitch-surface is an imaginary smooth surface between the tops and bottoms of the teeth, which is such that the velocity-ratio which would be produced by rolling contact with the pitch-surface of another toothed wheel would be the same as that actually produced by the action of the cogs. The pitch-circle (or pitch-line) of circular wheels is a section of the pitch-surface made by a plane perpendicular to the surface and to the axis of the wheel. The distance from the centre of the wheel to the pitch-line is the primitive radius, that from the centre to the crest of the cog being the true radius. The face of a cog is its outer surface, and the space between two adjacent teeth is the inter-dental space. Various kinds of toothed wheels are in use, such as the spur-wheel, the crown-wheel, and the bevel-wheel.

Coggeshall, England, a town in the county of Essex, 42 miles northeast of London, on the left bank of the Blackwater. The place was once famous for the manufacture of a kind of baize, celebrated under the name of "Coggeshall whites." The hamlet of Little Coggeshall is on the opposite side of the Blackwater, which is crossed here by an ancient bridge of three arches, said to have been built by King Stephen, who founded here also an abbey for Cistercians.

Coghetti, Francesco, frän-chĕs'kō kōgĕt'tē, Italian painter: b. Bergamo 4 Oct. 1804; d. Rome 21 April 1875. He was a profound student of Raphael and is best known by his masterly frescoes in the basilican church at Savona. He adorned several Roman palaces with frescoes, and was knighted for his 'Condemnation of Saint Stephen.'

Coghlan, kŏg'lan, **Charles Francis,** American actor: b. Paris, France, 1841; d. Galveston, Texas, 27 Nov. 1899. He was educated for the bar in London, but went on the stage, making his American début in 1880 as Captain Absolute in 'The Rivals.' He took leading parts for many years, being a refined and capable impersonator of old school gentlemen. He wrote: 'Jocelyn'; 'Lady Barter'; and other plays.

Coghlan, Joseph Bullock, American naval officer: b. Frankfort, Ky., 8 Dec. 1844. Graduated in 1863 from the United States Military Academy, he at once saw service as ensign in the Civil War, in 1868 rose to be lieutenant-commander, and later served successively on board the Richmond, Saugus, Monongahela, and Indiana. In 1882 he was promoted commander, and in 1896 captain. As commander of the Raleigh of the Asiatic station from 1897, he took part in the battle of Manila Bay, 1 May 1898. On 2–3 May he commanded expeditions for the reduction of all Spanish batteries at the mouth of the bay, and on 7 July an expedition for the capture of Isla Grande, Subig Bay, Luzon. He was commissioned rear-admiral in 1902 and appointed to command the Caribbean squadron of the North Atlantic fleet.

Coghlan, Rose, American actress: b. Peterborough, Eng., 1853. She rose from humble roles in England to be leading lady, making her American début in 1872. From 1880 to 1889 she was Wallack's leading lady and since 1893 has "starred" in various American and English companies.

Cognac, kōn-yäk, France, in the department of Charente, on the Charente River, 22 miles west of Angoulême. It is situated on a hill crowned by an old castle. It is famous for the brandy which bears its name and which is exported to all parts of the world, chiefly to England, the north of Europe, and America. Some English houses, established here in 1780, began the manufacture of this brandy and developed its enormous trade.

Cogniet, Leon, lā-ôn kōn-yā, French historical and portrait painter: b. Paris 29 Aug. 1894; d. there 20 Nov. 1880. He studied under Guerin, obtained the Grand Prix de Rome in 1817, and became a member of the Institute in 1849. Many famous artists of a later day were pupils in his studio. The Church of the Madeline in Paris contains a 'Magdalen' by Cogniet.

Cogno'vit, in law, a written confession given by the defendant that the action of the plaintiff is just, or that he has no available defense.

Cogs'well, Joseph Green, American librarian and bibliographer: b. Ipswich, Mass., 27 Sept. 1786; d. Cambridge, Mass., 26 Nov. 1871. He graduated at Harvard in 1806, and practised law for a few years in Belfast, Maine. He was a tutor at Harvard 1813–15, and after four years of study in Europe he was made professor of geology and mineralogy, and librarian at Harvard. In 1823, in connection with George Bancroft, he founded the famous Round Hill school at Northampton, Mass., the plan and methods of instruction being based on an examination of the best English and German systems of education. The school was discontinued in 1836. After a period of editorship of the New York 'Review,' Cogswell, with John Jacob Astor, Fitz-Greene Halleck, and Washington Irving, formulated the plan of the Astor Library. Cogswell was appointed its chief (1848), a place for which his remarkable attainments as a bibliographer eminently qualified him,—he went abroad to purchase books, and laid the foundation of the present collection with rare discrimination and economy. He presented to it his own fine collection of bibliographical works, and prepared a catalogue of its contents. Advancing years

caused his retirement in 1861. He was a frequent contributor to the leading reviews, such as the 'North American Review,' 'Blackwoods,' and the 'Monthly Anthology.'

Cogswell, Mason Fitch, American physician: b. Canterbury, Conn., 28 Sept. 1761; d. Hartford, Conn., 10 Dec. 1830. He was adopted by Samuel Huntington, president of the Continental Congress and governor of Connecticut, and graduated valedictorian at Yale 1780. He studied medicine with his brother James, at the soldiers' hospital in New York during the Revolution, and eventually became one of the best-known surgeons in the country. He was the first in the United States to remove a cataract from the eye, and to tie the carotid artery (1803). Mainly through his influence the first asylum for deaf-mutes was founded in this country at Hartford, and his daughter Alice was its first pupil. He was also a founder of the Retreat for the Insane in the same city.

Cohen, Alfred J. See DALE, ALLEN.

Co'hen, Jacob da Silva Solis, American physician: b. New York 28 Feb. 1838. He graduated M.D. at the University of Pennsylvania 1860, and in 1861 became assistant surgeon of the 26th Pennsylvania regiment, serving with the expedition to Port Royal and with the South Atlantic blockading squadron till January 1864. In 1866 he settled in practice in Philadelphia, and has made a specialty of diseases of the throat and chest. He has written many important articles and books on these topics, chief of which are: 'Diseases of the Throat and Nasal Passages' (2d ed. 1879); 'The Throat and the Voice' (1880); 'Treatise on Inhalation'; 'Croup in its Relations to Tracheotomy.' and since 1880, 30 other special studies, which have been published in the New York 'Medical Journal,' Philadelphia 'Medical News,' etc.

Cohen, Katherine M., American artist: b. Philadelphia 18 March 1859. Receiving her early training at private schools and Ogontz, Pa., she displayed a taste for art which was developed by study at School of Design, Pennsylvania Academy of Fine Arts, Students' Art League under Saint Gaudens, and six years in Paris schools. She has been engaged in sculpture since 1880 and her chief works have been portraits and bas-reliefs, decorative works and paintings of figure and landscape. Among her principal successes have been: Portrait of Gen. Beaver for Smith Memorial, Fairmount Park; 'The Israelite'; 'Priscilla'; 'Rabbi-ben-Ezra'; 'Romola'; 'Lorna Doone.'

Cohen, Mendes, American civil engineer: b. Baltimore 4 May 1831. Educated in private schools he soon displayed a bent toward engineering, and engaged in practical study at the locomotive works of Ross Winans, Baltimore, 1847–51. His active service became continuous, first at the engineer corps of the B. & O. R.R. 1851–5; then as assistant superintendent Hudson R.R. 1855–61; and, 1861–3, as president and superintendent O. & Miss R.R. (of Illinois). For some years he was engaged in the special service of Phila. & Reading, and became comptroller and assistant to the president of the Lehigh Coal and Navigation Company. In 1894 he was appointed by President Cleveland as member of the board to examine and report a route for the Chesapeake & Delaware Ship Canal. In Baltimore he has long been honored with important civic trusts.

Cohen, Solomon, American lawyer: b. Georgetown, S. C., 15 Aug. 1802; d. Savannah, Ga., 14 Aug. 1875. At an early age he became a lawyer and he soon was classed with leading lawyers of his day and State, who directed the political thought and education of the people. In 1838 he settled in Savannah, where he maintained a leading position at the bar, attaining so deserved a popularity that he was sent to the Legislature, and assumed a prominent part in municipal affairs. He was one of the founders of the system of public education in the State. He was appointed postmaster of Savannah by President Pierce, and was continued by President Buchanan, holding the same position under the Confederate government. In 1866 he was elected member of Congress from the first district of Georgia, but was not allowed to serve.

Cohen, Solomon Solis, American physician: b. Philadelphia, 1 Sept. 1857. After a course of study at the Central High School in his native city, he graduated from Jefferson Medical College in 1883, and made so thorough a record for scholarship that since 1888 he has been lecturer in clinical medicine at Jefferson Medical College, and since 1890 professor of clinical medicine and therapeutics at Philadelphia Polyclinic and College of Graduates in Medicine. He was elected president of the Philadelphia County Medical Society, 1898–9. His published writings include: 'Therapeutics of Tuberculosis'; 'Essentials of Diagnosis,' and he has edited 'System of Physiologic Therapeutics.'

Coherer, an electrical instrument, part of the receiver in Marconi's system of wireless telegraphy, consisting of a small glass tube about one and a half inches long, into which two silver plugs are tightly fitted. A small gap separates these plugs, and in this gap a mixture of nickel and silver filings is placed. Under ordinary conditions the resistance of this gap is too high to allow of any current passing from the local cell or battery; but under the influence of electric waves these filings instantly cohere, and the tube becomes a comparatively good conductor. Connected with this tube is a cell and a relay. By the cohesion of the filings the current from the cell is allowed to pass through the tube and actuate the relay. When once this is achieved, it becomes a very simple matter to make a bell ring or work a Morse siphon.

The filings, however, having cohered under the influence of an electric wave, remain in this condition unless shaken up. An automatic tapper, or discoherer, somewhat similar to an electric-bell tapper, minus the bell, is so adjusted as to tap the tube and shake the filings up, thus decohering them and bringing them to their normal condition, when they are again in a state to receive another impulse.

The oscillations set up by the transmitter at a distant station act on the vertical conductor or resonator which is connected with the sensitive tube at the receiving station, cohere the filings in the tube, and allow the local cell to actuate the relay. This, in its turn, causes the larger battery to pass a current through the tapper, or interrupter, and also

through the electro-magnets of the recording instrument. See WIRELESS TELEGRAPHY.

Cohe'sion, the force by which the various particles of the same material are kept in contact, forming one continuous mass. Its action is seen in a solid mass of matter, the parts of which cohere with a certain force which resists any mechanical action that would tend to separate them. In different bodies it is exerted with different degrees of strength, and it is measured by the force necessary to pull them asunder. According to Sikingen, the relative cohesive strengths of the metals are as follows:

Gold	150,955
Silver	190,771
Platinum	262,361
Copper	304,696
Soft iron	362,927
Hard iron	559,880

Cohesion in liquids is very much weaker, the parts being disjoined with much more facility; and in substances existing in the gaseous form it is entirely overcome, the particles repelling instead of attracting each other.

Cohesion in bodies is weakened or overcome by two general causes — by the repulsion communicated by heat, or by the attraction which may be exerted by the particles of one body on those of another.

Heat communicated to a solid body always diminishes the force with which the attraction of aggregation or cohesion is exerted; if the heat be increased to a sufficient extent the cohesion is so far weakened that the body passes into the liquid form; and if carried still farther, the attractive force is entirely overcome, repulsion is established between the particles, and the body passes into the gaseous state.

The same effects are produced by the exertion of that attraction which unites the particles of one body with those of another. If a liquid be poured on a solid, it often happens that their mutual attraction is sufficiently powerful to overcome the cohesion of the solid; its particles are consequently disunited, to combine with those of the liquid, and it entirely disappears. This forms the chemical process of solution (q.v.). A similar effect is sometimes produced by the chemical action of a gaseous body.

When these powers, whether of heat or of chemical attraction, are withdrawn, cohesion resumes its force, but with results which are different, according to the circumstances under which this happens. When the attraction of aggregation is suddenly and forcibly exerted, the particles are united, in general, indiscriminately, and according to no regular law. If a body which has been melted is suddenly cooled to a sufficient extent, it becomes solid, and forms a mass of no regular structure or figure; or if its cohesion has been suspended by the chemical attraction exerted by another body toward it, and if this attraction suddenly cease to operate, the force of cohesion is resumed, and the solid substance appears in the form of a powder. This latter case forms the chemical operation denominated precipitation (q.v.). But if the force of cohesion is exerted more slowly the particles are united, not indiscriminately, but usually with regularity, so as to form masses of regular structure and figure, bounded by plane surfaces and determinate angles. This forms the operation of crystallization; and such masses are denominated crystals (q.v.).

Cohe'sion Figures. When small drops of various liquids lighter than water, and slightly soluble in it, are allowed to fall on the surface of perfectly pure water, the drops form curious figures on account of the differences between the capillary tensions of the air surfaces of the liquids. (See CAPILLARITY.) These are called cohesion figures. They were investigated by the late Mr. Tomlinson, the results of whose researches are published in various papers in the 'Philosophical Magazine' since October 1861. Creosote, for example, forms a disk which sails about on the surface with a rapidly quivering motion. Ether, again, forms a circular figure composed of a central boss, surrounded first by a flat depressed ring, and then by a raised ring, the edge of which is waved. Mr. Tomlinson has observed many other liquids. The figures last for a short time, gradually disappearing as the drop becomes dissolved in the water. The slightest impurity in either liquid changes the figure by altering the superficial capillary tension of the liquid. Hence Mr. Tomlinson proposed to observe the figure as a test of the purity of certain essential oils. In applying the test it is necessary to have the water perfectly pure and clean, and Mr. Tomlinson has given special methods of cleansing the glass vessel into which distilled water is put. Mr. Tomlinson has also examined cohesion figures of fluids dropped on other liquids besides water, as cocoanut oil, castor oil, melted paraffin, etc.

Cohn, kōn, **Adolphe,** American educator: b. Paris, France, 29 May 1851. He was graduated from the University of Paris in 1868 and served as a volunteer in the French army during the Franco-German war from July 1870 to February 1871. In 1875 he came to New York and taught languages for some years, when his ability secured him a tutorship in French at Columbia University in 1882, in which he served as instructor for two years. He was instructor at Harvard 1884–5, and assistant professor in French 1885–91. In 1891 he became professor of Romance languages and literature at Columbia, which position he still holds. He is a singularly successful teacher, and many of his pupils hold posts of prominence. In addition to numerous contributions to literary periodicals, he has published: 'Voltaire's Prose' (with Woodward) (1897); 'Le Sage's Gil Blas' (with Sanderson) (1899).

Cohoba'tion, an operation in which a fluid is converted into vapor by heat, and is then condensed, but instead of being collected in a separate receiver, as in distillation, it is made to flow back into the heated vessel. It is employed to produce a change in the fluid by continued heating, but more frequently to subject some substance to the action of a fluid without either loss of the latter or the necessity of adding fresh quantities of it.

Cohoes, kō-hōz', N. Y., city of Albany County, at the confluence of the Mohawk and Hudson rivers, and near the junction of the Erie and the Champlain canals, and on the New York Central and the Delaware & Hudson R.R.'s, nine miles north of Albany. The Mohawk River has a fall of over 70 feet at this point, and supplies great power, making Cohoes a very important manufacturing community.

The Mohawk River is crossed by a dam above the falls, and the water is supplied to the mills and factories by means of canals. The principal manufactures are cotton, woolen and worsted knit goods, foundry and machine shop products, boots and shoes, tobacco, paper boxes, and bread and bakery products. The city is connected with Albany, Troy, and other neighboring cities by electric street railways. The most noteworthy buildings are the public library, St. Bernard's Academy, the Egbert public high school, and several of the numerous churches. Cohoes was first settled by the Dutch about 1630, and for some time was a part of Rensselaer Manor. It was chartered as a city in 1870. Pop. (1900) 23,910.

Co'hort, a division of the Roman army, the tenth part of a legion, containing three maniples or six centuries. The number of men varied with that of the legion, the 10 cohorts always containing an equal number. When the legion numbered 4,000 men, the cohort consisted of 60 triarii, 120 principes, 120 hastati, and 100 velites, in all 400 men. The centurion of the first century of the first maniple of the first cohort was the guardian of the eagle or colors of the legion, and hence the first cohort was always regarded as superior in dignity to the others.

Cohosh, kō-hŏsh' (*Cimicifuga racemosa*), also called black snakeroot, is a plant belonging to the crowfoot family (*Ranunculaceæ*). Besides this species there are about four others also called cohosh, herb-christopher, and rattlesnake herb, which are widely distributed from Nova Scotia and Anticosta, south to Georgia, westward to Missouri, and northward to British Columbia. It is an erect perennial herb growing in woods. The plant has powerful medicinal properties and is a valued remedy in rheumatism, epilepsy, etc. The blue cohosh (*Caulophyllum thalictroides*) is a powerful antispasmodic and emmenagogue. It is also a diaphoretic and diuretic, and has been used successfully in this country as an anthelmintic.

Coif (French, *coiffe*), the badge of serjeants-at-law, who are called serjeants of the coif, from the lawn coif which they wore under their caps when created serjeants. The cap worn by women of religious orders, usually white, and worn under the veil. The name is sometimes given to the small cap worn by monks who have the tonsure.

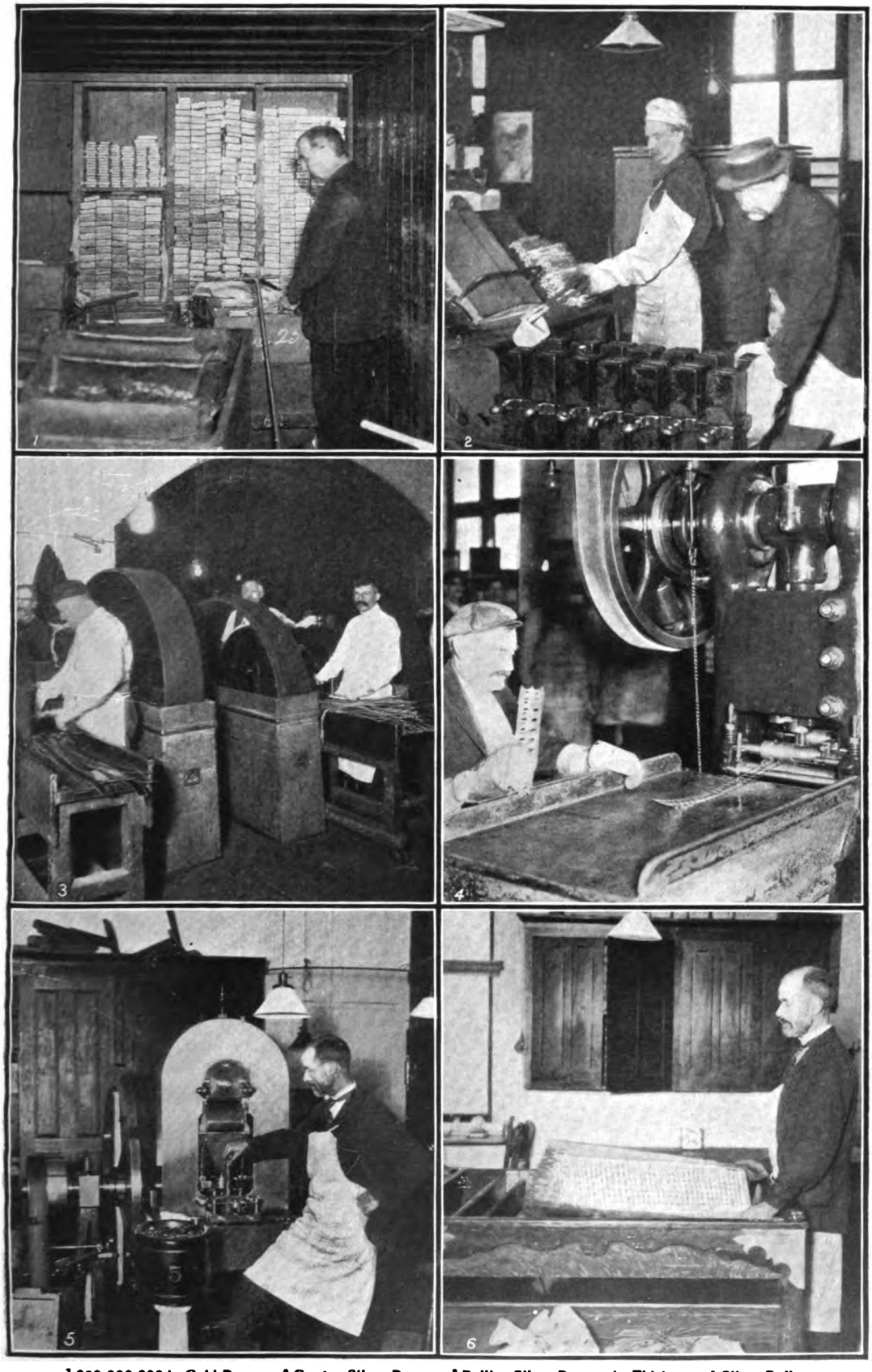
Coimbatore, kō-ĭm-bạ-tōr', or **Coimbetoor,** British India, a district in Madras presidency, with an area of 7,842 square miles. The country has on the west the range of lofty mountains called the Western Ghauts; a continuation of which also bounds it on the north. On the east it is bounded by Salem and Trichinopoly, and south by Madura and Travancore, west by Malabar and Cochin. It is fertile, producing sugar, cotton, rice, and tobacco; and well watered by several rivers. The climate is very malarious in some parts. The principal towns are Coimbatore, Erroad, and Carroor. In 1799, on the death of Tippo, and the division of his territories, Coimbatore was ceded to the East India Company.

Coimbatore, British India, city and capital of the district of Coimbatore, situated at the foot of the Western Ghauts, on the river Noyel, 90 miles south of Seringapatam, 252 southwest of Madras. It has wide streets, is well built and well drained, has an agreeable climate, and is more suitable for the residence of Europeans than most Indian towns. It suffered much in the wars between the British and Mysore sovereigns. Pop. (1901) 52,968.

Coimbra, kō-ēm'brä, Portugal, capital of the province of Beira, on a hill above the Mondego River, here crossed by a stone bridge, 135 miles northeast of Lisbon. Its streets are steep and narrow, its manufactures confined chiefly to earthenware and combs, and its interest consists mainly in its historical associations. The place derives its name from the Roman Conimbria, traces of which lie to the south; it was held by the Goths, and from them passed to the Moors, from whom it was finally conquered in 1064, by Fernando the Great, aided by the gallant Cid. Coimbra was the capital of Portugal for about two centuries and a half from its erection into a kingdom in 1139, and many of the early kings are buried in and around the old town. Of the public buildings, the most noteworthy are the older of the two cathedrals, the Church of San Salvador, and the ruined Convent of Santa Clara; across the river is the Quinta das Lagrimas, "House of Tears," where Inez de Castro was murdered. The University of Coimbra, the only one in Portugal, was originally established at Lisbon in 1288, but was transferred here permanently in 1537. It has five faculties and some 900 students; attached to it are a museum, an observatory, a botanical garden, and a library of over 80,000 volumes.

Coin, Spain, city in the province of Malaga, 21 miles north of the city of Malaga. It consists of well-built houses, spacious and clean streets, three squares,—in the centre of the largest square is a handsome fountain. The chief manufactures are linen and woolen fabrics, esparto mats, soap, paper, hempen shoes, wine and oil. The exports are cattle, grain, and fruits. In the neighboring hills are marble quarries, and jasper of all colors. Pop. 10,000.

Coin. The coin of a nation is said to be the life-blood of its trade. The "Mint" is the place of its origin. Coinage is therefore a monopoly, possessed and exercised by all firmly established governments. The mint of the United States was authorized by Act of Congress 1792, and its general operations began in 1793. At that time the appliances of coinage were few and crude, the striking of coin being by the old screw hand press, and the annual output confined to narrow limits. It was not until 1836, when the mint was removed from Seventh Street, Philadelphia, to more commodious quarters at Chestnut and Juniper streets, that improved appliances were introduced. At that time the steam operated coining-press invented by M. Thonnelier, a Frenchman, was introduced, and greatly facilitated the process of minting. Twenty years later this press was remodeled and much improved, continuing in use for 14 years, when it was superseded by the perfected machines now in use. The introduction of the steam coining-press inaugurated the improvements which have made the mint of the United States one of the finest equipped mints in the world. From 1836 to the present time the progress of the mint has been largely experimental. New and improved machinery



[1] $50,000,000 in Gold Bars. [2] Casting Silver Bars. [3] Rolling Silver Bars to the Thickness of Silver Dollars.
[4] Cutting Silver Planchets, or Blanks. [5] Striking the Impression. [6] Counting Cents.

THE MANUFACTURE OF COINS AS CARRIED ON AT THE UNITED STATES MINT, PHILA., PA.

has been added from time to time and improved scientific processes have been adopted. The humid assay process for determining the fineness of gold and silver was introduced in the year 1836. The platinum apparatus for the assay of gold was introduced in 1867. This was an English invention, and a great improvement upon the method formerly in use. Automatic machines for the separation of coin blanks into "standard," "heavy," "light," and condemned "light" pieces were introduced in 1877. Improved rolls for converting ingots into coin strips, as well as gas annealing furnaces, may be said to have completed the equipment of the mint.

The organization of the mint, under the original and subsequent Acts of Congress, and until 1873, provided for a director, located at the parent mint at Philadelphia, an assayer, melter and refiner, coiner, and engraver of dies, with a necessary subordinate clerical force, the assayer, melter and refiner, coiner, and engraver, being designated as "operative officers." The director was subject to the orders of the Secretary of the Treasury. After the creation of branch mints and assay offices the heads of such institutions reported to the director at Philadelphia. By the Act of 1873 the mint was reorganized, with a bureau at Washington, where the director was located. The resident chief officer at the mint was by that Act designated as superintendent, ranking with the chief officers of the mints at San Francisco and at New Orleans, and the chief of the assay office at New York. The chief officers of the branch mints and minor assay offices were designated as "assayers-in-charge," reporting to the director at Washington. The mint service is now under this reorganized form. The superintendents and the operative officers are appointed by the President and hold their official positions at his pleasure.

The processes of the mint can best be considered under the head of routine. The mint purchases at its counter all gold presented in value not less than $100, providing the deposit is not too base for economical conversion into coin or fine bars. All deposits are made with the weigh clerk at the weigh room, who carefully weighs the same on the delicate balances, which are adjusted to show variations of one hundredth of a troy ounce. The weight is carefully recorded in the books of the weigh clerk and registrar of deposits, together with the description of the bullion and the name of the depositor, both officers being present and carefully noting the same. The deposit is then locked in a copper box and sent to the deposit melting room, where it is melted and cast in the form of a bar. From this bar the assayer cuts clips, weighing from 18 to 20 one hundredths of an ounce, two clips being taken, one from the upper side at one end, the other from the under side at the other end. These clips are assayed separately to determine the homogeneity of the metal. This assay determines the proportions of fine metal in the bar, and upon this assay the money value is determined and the depositor is paid. The loss of weight by melting is carefully noted and recorded. A slight allowance is made after melting to the melter and refiner and the weight so established becomes the true weight. As soon as the fineness of a day's deposits is reported by the assayer, they are delivered to the melter and refiner, and by that officer sent to the refinery, where the silver is separated from the gold and the base metals eliminated wholly, only the precious metals being accounted for.

The next step in the conversion of bullion into coin is the assembling of the refined metal into "melts" of about 3,000 ounces to which sufficient copper is added to render the melted mass 900 parts fine, which is the standard fineness of United States gold and silver coin. When melted the metal is cast into ingots of the size proper for the production of the coin required. This alloy is rigidly tested by assay, and if found standard within the legal tolerance it is so declared, and the ingots are delivered to the coiner for conversion into coin. They are first taken to the rolls, "broken down," annealed, and delivered at the finishing rolls, where they are converted into coin strips of the requisite thickness for coin blanks. The strips are then taken to the cutting machines, where they are converted into coin blanks which go to the selecting tables for the elimination of imperfect pieces and fragments. The accepted blanks are then sent to the adjusting room, where, if gold, each piece is weighed, the heavy pieces being reduced by filing and brought within the limit of legal tolerance. If the blanks be silver they are passed through automatic selecting machines which separates them into standards, heavies, lights, within tolerance, and condemned lights. The blanks are next passed into a machine and "upset," or "milled," which process so raises the edge of the piece as to protect the work on the stamped coin from abrasion. The blanks are then annealed, treated to a dilute sulphuric acid bath, and cleansed and brightened, and when thoroughly dried are ready for the coining presses. These presses work automatically, the only hand action being to fill the feeding tubes. The pieces are automatically seized by conveyers and centered between the obverse and reverse dies within a collar a little exceeding the piece in diameter. The impact of the dies, brought together by the operation of a toggle joint, forces the metal to flow to the full diameter of the collar, which is grooved inside, and puts a fine reeding upon the edge of the coin. The finished coin is then automatically passed on, and is followed by others, the delivery for large coins being at the rate of 80 or 90 per minute. Dimes are struck at the rate of 100 and 120 per minute.

The standard, heavy, and light coins are then separately counted by gauge, and made into drafts of $5,000 each, if gold, and drafts of $1,000 each, if silver. As the standard weight of gold drafts of $5,000 is 268.75 troy ounces, the standard, heavy, and light coins are mingled in due proportion to make that standard weight, no greater variation than 1/100 of an ounce being allowed. The standard weight of $1,000 in silver dollars is 859.375 ounces, and of subsidiary silver 803.75 ounces, with a tolerance of 2/100 of an ounce. The perfected drafts are then weighed in the presence of the superintendent, enclosed in canvas bags, and delivered to that officer. The mint balances are adjusted to the troy pound (5,760 grains) which is the mint unit of weight. This weight is a duplicate of the troy pound established by a royal commission in England in 1758, reaffirmed in 1838. It is kept in a special safe at the Phila-

delphia mint. In order to secure an exact conformity in weight and fineness of United States coin, a fixed number of coins is taken from every delivery, sealed in the presence of the superintendent and the assayer, and deposited in a receptacle called "the pyx," each of those officers having a key, both keys being required to open the pyx. These reserved pieces await the assembling of the Assay Commission, annually appointed by the President to meet on the second Wednesday in February, when the pyx is opened and exhaustive tests of the weight and fineness of the contents are made.

Location and Equipment.— The mint of the United States is located on Spring Garden Street between Sixteenth and Seventeenth streets, Philadelphia. The construction is of light granite and of the Roman Ionic order. It has an interior ground floor space of 58,000 square feet. Its equipment consists of eight boilers of 1,200 horse power capacity, for heating, ventilating, and electric lighting. To avoid the transfer of power by shafting the machinery is chiefly operated by independent motors. The building is lighted by 4,000 incandescent and 16 arc lights. There are 51 telephones connecting the departments and various offices. A gas plant capable of delivering upward of 20,000 cubic feet per hour furnishes fuel for the melting, annealing, and assaying furnaces. The ventilating is by fans operated by attached motors. The spacious melting department is equipped with 13 gas and 3 coal heated furnaces, with power topping machines. The coining department has 23 coining-presses with an average capacity of 110 pieces of finished coin, each, per minute; 10 milling, or upsetting machines, each capable of an out-turn of an average of 500 milled blanks per minute; a full equipment of trains of break-down and finishing rolls; 8 strip annealing gas furnaces, and 1 furnace for annealing blanks; 8 automatic presses for cutting blanks from coin strips; 6 automatic weighing machines for the separation of blanks into standard, heavy, light, and condemned pieces, together with appliances for cleaning, whitening, and drying blanks after annealing. The assaying department is equipped with every known appliance for determining the fineness of gold and silver, both by the platinum and the humid processes. The refinery operates largely the acid process of separating, but it has a plant for refining by electrolysis, and the process has proved a success, considerably increasing the capacity of the refinery.

The engraving department provides all of the coin dies used in the mints of the United States. It has every facility for die-sinking, hubbing, and annealing the steel from which dies are produced, as well as a geometric lathe for transferring designs. The department for the manufacture of medals of a national character is in charge of the engraver, who provides the dies. The medal department is equipped with three hydraulic presses of the respective capacity for exerting a pressure of 1,100, 400, and 300 tons. These powerful presses are operated by electric motors. The machine shop has every appliance for the construction, or the assembling and finishing, of all machinery used in the mint. There are 20 steel-lined vaults for the storage of coin and bullion and for the use of the operative officers. One of these vaults has a floor-space of 5,200 square feet, with a storage capacity of 112,000,000 silver dollars. Another has a floor-space of 4,160 square feet. Six others have each a floor-space of 2,562 square feet. The basement vaults are built wholly independent of the enclosing walls, with a free passageway around them. The doors are massive, and provided with the finest locks procurable, to which time-locks are attached. More than 3,250,000 pounds of steel enter into the construction of these vaults. The vestibule is highly ornate, the corridor extending through the cross section from east to west is finished in richly variegated marble, and the main staircase is of white marble. The floors are of messanine, the symbolic panels in the vestibule of glass mosaic. The ceilings are finished in white and gold.

The cabinet, or museum, is in a spacious room at the head of the main staircase in the rotunda. It contains a fine collection of the coins of all nations, ancient and modern, a full line of medals of a national character, and many rare medals of foreign countries. There is also a fine collection of curios, many of them collected in distant lands. The working capacity of the mint considerably exceeds the national demand for its product. Congress has therefore authorized coinage for other nations at a fair remuneration. Pursuant to this authorization the mint has coined much gold and silver, as well as copper and nickel coin, for several of the South American and most of the Central American states. Prior to the annexation, the mint at San Francisco coined money for the Sandwich Islands. Admission to the mint is free to the public on every working day between the hours of 9 A.M. and 2 P.M. The building is patrolled day and night by an armed guard.

JOHN H. LANDIS,
Supt. United States Mint, Philadelphia.

Coinage, the process of converting an authorized alloy of the money metals into the circulable coin of the country. The metal is alloyed and cast into ingots of sizes suitable to the production of the denomination of the coins required. Thus, for the double eagles, our largest gold coin, the ingot is cast 12⅝ inches in length, 1½ inches in width, and half an inch in thickness. Such an ingot weighs about 80 ounces troy, of the approximate value of $1,488. The ingots for the eagles are cast 11 15-16 inches in length, 1 2-16 inches in width and half an inch in thickness. The weight of such an ingot is about 62 ounces troy. The half eagle requires an ingot 12 inches in length, ⅞ inch in width and 7-16 inch in thickness. The ingots are taken to the break-down rolls in drafts of about 50 ingots, where they are passed through the rolls several times, according as they prove more or less malleable. If passed through the rolls six times the dimensions of a double eagle ingot will be increased to 26¼ inches in length, 1 9-16 inches in width, and 7-32 inch in thickness. The broken-down ingots are then sent to the annealing furnace, heated by gas fuel to about 1,500 degrees F. and being laid singly upon a carrier traveling the whole length of the furnace, remain until the strips become a uniform cherry-red. They are then removed and plunged into a bath of cold water to remain until cool enough to handle. The strips are then wiped dry and passed on to the finishing rolls.

The next step will depend upon the condition of the metal. Should it retain indications of the hardness and springiness resulting to the breakdown process, it is subjected to a second breakdown by being passed three or four times through the rolls. The malleability of the metal being sufficient, the strips are taken to the finishing rolls or "rolls of precision." After being passed through these rolls four times the strips develop the required thickness and uniformity for the production of blanks. At this stage the double eagle strip attains a length of 47⅜ inches, a width of 1⅝ inches and is reduced to a thickness of 7-64 of an inch. For ease in handling the strips are now cut in half by multiple shears and delivered at the cutting presses, where test planchets are cut from several strips and weighed, to determine if the strip, when converted into planchets (coin blanks), approximates to standard weight. The cutting presses are automatic. The strip is seized by a grip and drawn under a steel punch working in a matrix cutting the planchets at the rate of 80 each minute. The planchets are next cleansed and sent to the selecting table where the imperfect pieces are separated from the perfect and the latter are sent to the adjusting room. The adjusting consists in the careful weighing of each blank separately to ascertain if it corresponds to the standard weight and legal tolerance, the latter being for double eagles and eagles ½ grain per piece, and ¼ grain each for half eagles and quarter eagles. Pieces found in excess of legal weight and tolerance are reduced by filing the edges until they conform to the limit. Such pieces are placed by themselves and marked "heavies." Pieces a little less than the standard weight, but within the limit of legal tolerance, are placed in another receptacle and marked "lights." Those found of exact legal weight are placed in another receptacle and marked "standard."

The planchets so adjusted are then taken to the milling machines by the operation of which a protecting edge is raised on each piece. This edge is to preserve the face of the coin from abrasion. When milled the planchets are conveyed to the cleaning room where they are annealed until of a cherry-red and then treated to a bath of dilute sulphuric acid, by which process they are thoroughly cleansed and brightened. The annealing of the planchets after the milling process having prepared them for the stamping, when cleansed and brightened they are washed in boiling water, dried by riddling in sawdust, when they are ready for the coining press. It will be understood that the three descriptions of blanks, namely: "Heavies," "lights," and "standards" — have been kept separate throughout the processes, and are never mingled until the coiner makes up the drafts of finished coin for bagging. The planchets therefore go to the presses by those divisions.

The coining press used in all first-class mints is a wonderful exhibition of mechanical skill. Its frame is of cast-iron of several tons weight, with a central arch in which are placed the working parts. The frame combines stability and rigidity. The mechanism of the working parts is automatic. The setting of the dies is a work of precision and can be properly done only by a person, who, being a skilled mechanic, has reinforced his native ability by long experience. In order to set his dies properly he must take into account the condition of the metal to be stamped, whether it be soft and ductile or hard and brittle. Upon these qualities of the metal depends the distance apart of the dies at the moment of their impact upon the planchets. The blanks are fed into a vertical tube of equal diameter, and when the press is in motion automatic fingers seize the bottom planchet by its periphery and carry it forward to a collar, a little larger than the piece to be stamped. The piece drops into the collar, and a toggle joint causes the dies to approach each other and exert a pressure of about 160 tons upon the soft planchet. The planchet, being ductile, is by this pressure made to fill the entire space within the collar, which is grooved, and imparts the reeding to the edge of the coin. The finished coin is automatically released and falls into a pan below, to be followed by other coins at the rate of 90 or 120 per minute. The first number relates to large gold coins and silver dollars, the latter to small gold and small silver coins. It should perhaps be stated here that while the essential processes in coining are the same in all modern mints the routine is not uniform. In the mint of the United States the coin after stamping is returned to the adjusting room and each piece weighed separately. The necessity for this arises out of the possibly defective rolling of the strip from which the blank is derived. The density of the metal varies somewhat, and there may be also defective sonority developed in the process of stamping. In order to secure sonorous coin it is sometimes the practice to ring every piece (this relates to gold coin and silver dollars), and if any fail to give the proper tone they are rejected and sent to the melting pot. The pieces which stand the test are then returned to the coiner for conversion into uniform drafts for delivery to the superintendent, or other officer authorized to receive and hold coined money of the government.

As a matter of law and regulation the coiner is required to make up gold coin into drafts of $5,000 of the uniform weight of 268.75 troy ounces. As the weight of the pieces separately weighed are not uniform, though all within the limit of legal tolerance, the coin is separated by the adjusters into "heavies," "lights," and "standard." Gold coins may vary from ¼ of a grain in the half and quarter eagles to ½ a grain in double eagles and eagles. The coiner takes "heavies," "lights," and "standards" in such proportions as will make drafts of 268.75 ounces and mingles them in the delivery pans. The drafts are then weighed, after counting the pieces in detail, and being found of the required weight, are set aside for final delivery. The drafts must not vary to exceed 1-100th of an ounce above or below the standard weight of $5,000, stated in the foregoing. Before delivery to the superintendent the latter takes a good number of pieces at random from the proposed delivery and carefully weighs them. If found within the legal limit of tolerance the delivery is accepted; but if the weight of any piece proves it outside that limit the delivery is rejected, to be weighed, readjusted, and recounted. It is proper to say that such a necessity seldom arises.

The practice now is to adjust all silver coins, excepting dimes. Dollars are made in drafts of $1,000 of the weight of 859.375 ounces. These

drafts are constituted of "heavies," "lights," and "standard," and the only variation from that standard weight is 2-100 of an ounce. Subsidiary silver coin is delivered in drafts of $1,000, of a weight of 803.75 ounces, with an allowance of 2-100 of an ounce for half and quarter dollars, which are adjusted, and 1-100 of an ounce for dimes, which are not adjusted. It will be seen that all of the processes involved in coining money are works of precision, from the breaking down of the ingot to the issue of the perfect coin. All must be rigidly calculated, nothing can be left to chance. The presence of any of the base metals, as well as of the rare and valuable ones, may destroy the ingot for coinage. Arsenic lead and antimony cause most of the unworkability of the money metals, but this disability is lessening through the processes of advanced science.

Great advances have been made in the processes involved in coining as conducted in modern times. The substitution of the coining press operated by power for the hand screw press of olden times practically revolutionized the business. The introduction of automatic weighing machines for separating the blanks into "heavies," "lights," "standard," and "condemned," has simplified the process of adjusting. In fact the silver coins, with the exception of dimes, are now separated by the automatic weighing machines. The very great improvement in rolls for producing the coin strips from the ingot has made this new and rapid mode of selection possible. The draw-bench, made necessary to cure the defects of the rolls, has practically disappeared. Constant trying has produced rolls of such precision that the thickness of a coin strip can be regulated to the thousandths if required.

The automatic selecting machine in use at the mint of the United States at Philadelphia was invented and constructed by Seyesse, an Austrian, at Vienna. The blanks are fed into the machine through a vertical tube the size of the diameter of the blank. The feed is automatic and the pieces are conveyed into minute balances finely adjusted to grains, and by a complex and ingenious arrangement of parts are, according to weight, whether light, heavy, standard, or condemned lights; shunted into the conduits strictly according to their varying weights, and through these conduits, or ways, are delivered, each to its proper receptacle at the discharge end of the machine. The standard and the accepted light pieces are then ready for milling. The heavy pieces are adjusted by weighing on a delicate balance, and if found to exceed the legal tolerance are reduced by filing the edge of the piece. By this method the necessity for hand adjusting is minimized, and the rapid production of coin greatly facilitated. Other automatic selecting machines are employed in the mints of foreign countries, but have not been found so satisfactory as the Austrian machine, in this country.

One of the most difficult of the processes of coining has been the annealing process, because it is vital to the successful reduction of the ingot to the coin strip. Formerly the process was conducted in a furnace heated by wood fires. Much depended upon the fuel. Perfectly seasoned hard wood, preferably oak, was required for good work. In annealing gold strips in a wood furnace the strips were enclosed in copper canisters, sealed to air tightness, and remained in the furnace about three fourths of an hour. Silver strips were sometimes subjected to the heat for an hour or more. In all annealing of strips in the wood-fire furnaces the strips were superposed unavoidably, and it was not always easy to determine when the draft reached a uniform cherry-redness. Delays, and refractory metal, were common with the old method of annealing. Besides, the method was the reverse of economical, owing to oxidation of the metal.

In substituting the gas annealing furnace for the wood-fire furnace the work of rolling the metal soon became a work of precision. A considerable saving of time was also effected. The gas annealing furnace for strips has a heating chamber 10 feet in length, 17½ inches in width, and 10 inches in depth. A score of hollow rolls, named "conveyers," mounted on hollow shafts of cast-iron, are so ribbed as to divide the face into several parts conformed to the width of the strips. These ribs separate the strips and prevent superposition. The gas burners enter the heating chamber at the bottom and are in sections, in order to secure independent control. Through these burners a mixture of gas and air is injected along the whole length of the chamber. The strips to be annealed are placed on the rolls at the entrance of the furnace, the rolls are rotated by worm wheels, and pass entirely through the chamber, to enter a hood at the discharge end of the furnace. In this hood the strips, now of a cherry-red, are met by a flame surcharged with gas to prevent oxidation. A spray of water is applied to the strips outside the hood to cool them before they reach the air. This prevents the oxidation of the copper with which the metal is alloyed. The process thus described occupies about six minutes, instead of the hour, or even more, by the wood-fire furnaces. The time required in annealing silver is about 20 or 25 minutes as to the larger denominations. Dimes, however, not being adjusted, and the coin strip being produced from the dollar ingot, require a more prolonged annealing. The improvement in annealing has made it possible to produce from the ingot strips as high as 83 to 96 per cent of standard blanks, and blanks within the limit of tolerance, suitable for coining. This high percentage of good blanks is undoubtedly due to improved annealing and rolling. It is a higher percentage than has ever been secured when the defects in annealing and rolling were in part remedied by the draw-bench. As that machine is still employed in mints not strictly up to date, it may not be amiss to say, that in principle the draw-bench is a wire-drawing machine. As under the old mode of developing the ingot into the coin strip the ductility of the strip was not uniform, some parts being more refractory than others, and hence not reduced to a uniform thickness by the rolls, it was found necessary to pass the strips through a rigid die. The strips were then pointed so as to be firmly gripped by the nippers of the draw-bench which, retreating, drew the strip through the rigid die and gave it a uniform thickness, now imparted by rolls of precision without wasteful annealing. This improvement not only works a reduction of waste, but saves a delay between the finishing rolls and the cutting presses.

The preparation of the strips, the cutting of the blanks and the striking of medals is, at the mint of the United States, part of the coiner's duty. Medals may be of gold, silver, copper, or alloys of copper. The strips are rolled to the required thickness, which is usually with reference to the diameter of the proposed medal. The strips are then conveyed to the cutting press of great power and converted into blanks, which are annealed and placed between the dies of a hydraulic press capable of delivering a blow of from 300 to 1,100 tons. Nearly all medals of a national character require from three to six blows, owing to the high relief of the design and the sluggish flow of a large quantity of metal. Medals three inches in diameter require a press of higher power, and must be annealed after each blow until the finishing blow is delivered. The process of medal striking is therefore necessarily slow. Small medals of low relief may be struck by an ordinary coining press. Gold and silver medals of a national character are, respectively, of metal practically fine.

The processes of coining are of such precision that seldom a single piece in a million pieces will be found beyond the legal tolerance of 1½ grains for silver and from ¼ to ½ grain for gold.

JOHN H. LANDIS,
Supt. United States Mint, Philadelphia.

Coir, kir, the outer coating of the cocoanut, often weighing from one to two pounds; when stripped off longitudinally it furnishes fibres from which are manufactured matting, bagging, sails, ropes, and cables. The general preparation is simple; after being soaked for some months in water the fibrous coats become soft; they are then beaten to remove the other substances with which they are mixed, which fall away like sawdust. The fibres thus cleaned are ready for being spun into long yarns, woven into sailcloth, or twisted into cables. Cordage made of this material rots in fresh water and snaps in frost, but from the fact of its being strengthened by salt water, and its extreme buoyancy as compared with hemp cables, floating as it does in water, and also its great strength and elasticity, it is preferable in many respects to ropes of hemp. It has been proposed to employ it in the construction of deep-sea telegraphs, as being much cheaper and lighter than gutta-percha.

Coire, kwär, or **Chur,** Switzerland, capital of the canton of the Grisons, on the rivers Plessur and Rhine. It is irregularly built, and possesses many houses in the ancient style of architecture. The most remarkable buildings are the old Romanesque cathedral, partly dating from the 8th century, and the old Episcopal palace. Adjoining this is a lofty tower believed to be of Roman origin. Among modern buildings are a Protestant church, government buildings, and a hospital. Not far from Coire the Rhine begins to be navigable for small vessels. Until 1498 Coire was a free imperial city, but at that time came under the government of the bishop, who was under the Archbishop of Mentz. After having been repeatedly in the hands of the Austrians, French, and Swiss, in 1802 it was definitely united to the Swiss republic. Pop. 9,500.

Coit, James Milnor, American educator: b. Harrisburg, Pa., 31 Jan. 1845. He graduated at Hobart College 1865, and was manager of the Cleveland Tube Works 1873–5. In 1876 he became master in natural sciences at St. Paul's School, Concord, N. H., and is now (1903) acting head master there. He is a member of the leading scientific societies of the country, and has published: 'Manual of Chemical Arithmetic' (1886); 'Treatise on the X-Rays and Their Relation to the Medical and Surgical Sciences' (1897); 'Liquid Air' (1899).

Coit, Stanton, American lecturer on ethics: b. Columbus, Ohio, 11 Aug. 1857. He was educated at Amherst and Columbia colleges, and Berlin University, and has for many years lived and lectured in London, England, where he is chairman of the West London Ethical Society. He has published in German and Dutch, 'The Ethical Movement in Religion'; in English, German, and Dutch, 'Neighborhood Guilds.'

Cojutepeque, Central America, a town in the republic of Salvador, and on the direct route between the town of San Salvador and San Vincente. There is a lake of same name at some miles distance, the fish of which are often cast ashore dead in considerable quantities. Pop. 5,000.

Coke, kōk, SIR **Edward,** English jurist: b. Mileham, Norfolk, 1 Feb. 1552; d. Stoke Pogis 3 Sept. 1634. He was educated at Trinity College, Cambridge. From the university he went to London, and entered the Inner Temple. He pleaded his first cause in 1578, and was appointed reader of Lyon's Inn, where his lectures were much frequented. His reputation and practice rapidly increased, and he was placed in a situation of great respectability and affluence by a marriage with a co-heiress of the Paston family. He was chosen recorder of the cities of Norwich and of Coventry; was engaged in all the great causes at Westminster Hall, and in the 35th year of Elizabeth chosen knight of the shire for his county, and speaker of the House of Commons. In 1592 he became solicitor-general, and soon after was appointed attorney-general. He acted the usual part of a crown lawyer in all state prosecutions; and one of the most important that fell under his management, as attorney-general, was that of Essex, which he conducted with great asperity. Soon after the accession of James I. he was knighted. The celebrated trial of Sir Walter Raleigh followed, in which Coke displayed a degree of arrogance to the court, and of rancor and insult toward the prisoner, which was universally condemned at the time, and has been deemed by all posterity one of the greatest stains upon his character. On the discovery of the gunpowder plot he obtained great credit by the clearness and sagacity with which he stated the evidence; and in 1613 he succeeded to the important office of chief justice of the Court of King's Bench, but was in much less favor with James than his rival Lord Bacon. He was, in fact, too wary and staunch a lawyer to commit himself on the subject of prerogative; and as his temper was rough, and his attachment to law truly professional, he could scarcely forbear involving himself with a court so notorious for arbitrary principles as was the English during the reign of James. The honorable zeal which he displayed in the execrable affair of Sir Thomas Overbury, and in the prosecution of

the king's wretched minions, Somerset and his countess, for that atrocious murder, made him enemies; and advantage was taken of a dispute, in which he erroneously engaged with the Court of Chancery, to remove him, in 1616, both from the council and his post of chief justice. His real offense, however, was a refusal to favor the new favorite Villiers in some pecuniary matter. Coke was reinstated in the council in 1617, and actively engaged in prosecutions for corruption in office, and other crimes of a nature to recruit an exhausted treasury by the infliction of exorbitant fines. On the accession of Charles I. he was nominated sheriff of Buckinghamshire, in order to prevent his being chosen member for the county, which, however, he represented in the Parliament which met in 1628. The remainder of his career was highly popular; he greatly distinguished himself by his speeches for redress of grievances; vindicated the right of the Commons to proceed against any individual, however exalted; openly named Buckingham as the cause of the misfortunes of the kingdom; and, finally, sealed his services to the popular part of the constitution, by proposing and framing the famous "Petition of Rights," the most explicit declaration of English liberty which had as yet appeared. This was the last of his public acts. Two days before his death the king caused his house to be searched for seditious papers, and all his manuscripts were carried off. Sir Edward Coke was a great lawyer, but a great lawyer only. In mere legal learning he has perhaps never been excelled, but he was essentially defective in the merits of systematic arrangement and regard to general principles, without which law is a mere collection of arbitrary rules, undeserving the name of science. It must be admitted, however, that his writings, and especially his commentary on Littleton's 'Treatise on Tenures,' form a vast repository of legal erudition. In short, he was a man of immense professional research, and great sagacity and perseverance in a chosen pursuit; and, as usual, more philosophical and general powers were sacrificed to its exclusiveness. His principal works are: 'Reports,' from 1600 to 1615; 'A Book of Entries' (1614); 'Institutes of the Laws of England,' in four parts; the first of which contains the commentary on Littleton's 'Tenures'; the second, a commentary on Magna Charta and other statutes; the third, the criminal laws or pleas of the crown; and the fourth, an account of the jurisdiction of all the courts in the kingdom; 'A Treatise of Bail and Mainprise' (1636); 'Reading on the Statute of Fines, 27 Edward I.' (4to); 'Complete Copyholder' (1640).

Coke, Thomas, 1st bishop of the Methodist Episcopal Church in the United States: b. Brecon, South Wales, 9 Sept. 1747; d. at sea 2 May 1814. He was educated at Oxford, and entering the ministry of the Established Church, obtained a curacy at South Petherton. His preaching, however, was thought too evangelical, and he was finally excluded from the pulpit. Sympathizing strongly with the Methodists, he sought an interview with Wesley, which resulted in his joining that society, and being appointed to London, where his zeal and talents as a preacher soon brought him into favorable notice. He rendered valuable assistance to Wesley in procuring what was called the deed of declaration, which provided for the settlement of the Methodist chapels in the connection, and restricted the conference to 100 of the preachers and their successors for ever. So rapidly did he rise in public estimation, and so fully had he gained the confidence of Wesley, that he was appointed president of the Irish conference in 1782. Wesley set apart Coke by ordination as bishop of the Methodist Church in America, and gave him authority to ordain Francis Asbury to the same office as joint superintendent. In 1784 he arrived in New York, and sought an interview with Asbury, to whom he communicated the objects of his mission. A conference being called 25 December, Coke was duly recognized, and under its authority he proceeded on the 27th to ordain Asbury a bishop, and as such they were duly accredited as the joint superintendents of the Church in America. In company with Asbury he traveled, visiting the different conferences, until June 1785, when he returned to England, and visited Wales, Scotland, and Ireland. Subsequently he returned to America, and attended the conferences, traveling extensively throughout the entire connection. The first mission which he established was in the West Indies, in 1786, whence, after visiting the several islands, he went to South Carolina and engaged again in the regular work of the episcopacy. After traveling through the States, he embarked from Philadelphia for England in 1787. He revisited the West Indian and other American missions again and again, crossing the Atlantic 18 times in all. He was a prolific author and published: 'Commentary on the Holy Scriptures' (1803–7); 'Life of Wesley' (1792); 'History of the West Indies' (1808); etc.

Coke, the coherent cellular mass left after the expulsion of the volatile products of coal by heating in an oven. It is an aggregation of the particles of the fixed carbon in the coal.

Manufacture of Coke.— In general principles, coke-making differs little from charcoal-making, except that the carbon molecules are broken up more completely, requiring a higher heat. In coking, the organic compounds are destroyed, and the decomposition products form new compounds, stable at the higher temperatures. Gas begins to come off when the coal charged in the oven reaches a temperature of 100° C., and is given off till a dull red heat is attained. Tarry products are given off up to 600° C. The highest temperature reached is about 1,400° C., falling to 800° C. when the charge is drawn. The time required for coking is from 18 to 72 hours, varying with the coal and type of oven. The products, besides coke, are (1) illuminating gas, vapor, and diluents; (2) ammonia liquor; (3) tar, containing hydrocarbons of the fatty, or paraffine, and of the aromatic or benzene series, neutral compounds, acids, and bases; and (4) asphaltum.

Coal is made into coke in ovens of various types. The oven most used for making foundry and blast-furnace coke in the United States and England is the beehive oven, a development of the dirt-covered pile of wood used in charcoal-burning. The beehive oven has been used in Connellsville, Pa., the coke-producing centre of this country, for nearly 70 years. It is a dome-shaped chamber of bricks, 11 to 12 feet in diameter and 5½ to 6 feet high. The ovens

are arranged in rows and charged at the top from cars or larries, and drawn through doors at the bottom. The average charge is about 100 bushels of coal, and the average yield about 120 to 125 bushels of coke. By weight the average yield of coke is from 63 to 66 per cent. The time required in the beehive oven is 48 hours, though coke has been made in less time. The beehive ovens erected in the last few years are of larger size than the dimensions given.

The Belgian oven is a horizontal chamber 21 feet long, 8 feet wide, and 2½ feet deep. The average charge is 9 gross tons, yielding 6.3 tons of coke or 67 per cent.

The Coppée oven, a development of the Belgian oven, much used abroad, is 30 feet long, 6½ feet high, arched at the top, 21 inches wide in front, and 26 inches in the rear. It is charged from the top by four openings. The charge is from three to five tons, and the time required is about 24 hours. In the beehive oven the heat of the walls from the previous charge starts combustion, and air is admitted through flues which are closed when burning has gone far enough. The escaping gases and other products burn and are lost. In the Coppée oven vertical flues in the side walls communicate with the interior. The volatile products of distillation burning in these flues give heat for combustion. No by-products are saved, but the oven will coke lean and non-coking coals, and less fixed carbon of the coal is burnt than in the beehive.

The Otto-Hoffman oven is a development of the Coppée, with a Siemens regenerator, by which the air supplied to the furnace is heated to 1,000° C., while the products of combustion, after passing through the regenerator, are cooled, and the tar, ammonia liquor, etc., are recovered. In the Semet-Solvay by-product oven the coking chamber is 30 feet long, 16 to 17 inches wide, and 5 feet 6 inches high. The flues in which the products of distillation burn are horizontal and thin. The usual time of coking is 18 to 22 hours.

The advantages of the Coppée over the beehive oven are quicker work, higher yield of coke, and the ability to coke lean coals. In the Semet-Solvay and Otto-Hoffman ovens the by-products recovered are of value, so much so that the beehive oven is abandoned on the Continent. American and English ironmasters have clung to the beehive because of having rich or "fatty" coals, and because of the silvery lustre of the coke produced, though by-product oven coke is of just as good quality. In 1891 there were 12 Otto-Hoffman and 8 Semet-Solvay plants in the United States, and their output of coke was an insignificant percentage of the total. In 1900 fully 42 per cent of the coke made in England was from beehive ovens.

Objects of Coking.— Coke, though used as a domestic fuel and for locomotives, is used chiefly in metallurgical work. In the blast-furnace it reduces ores by combining with the oxygen in them; in the cupola furnace it is used simply to produce a high heat; hence there is a difference between blast-furnace and foundry coke, the latter being the purer. The objects of coking are: (1) to get a fuel rich in carbon by expelling volatile constituents; (2) to get a fuel giving no gas or smoke which would interfere with metallurgical operations; (3) to get an infusible fuel, since a fuel which softens and swells on heating prevents the charge in a blast-furnace from sinking evenly; (4) to reduce the sulphur present in coal, in organic compounds, or combined with iron. Coke has almost replaced charcoal and anthracite coal in blast-furnace work. In 1872 the blast-furnaces of this country used 500,000 tons of wood charcoal, 947,000 tons of coke, and 1,407,000 tons of anthracite; in 1892, 537,000 tons of charcoal, 7,154,000 tons of coke, and 1,798,000 tons of anthracite and coke. In 1902 the coke consumption reached 12,750,000 tons, while the charcoal and anthracite consumption was probably less than in 1872.

Coking and Non-Coking Coals.— A coking, or caking coal, is one which softens and becomes pasty or fuses on heating, while bubbles of gas escape; but there are all gradations between coking and non-coking coals, and why one cokes and another does not is undetermined. It may be due to differences in the carbon molecules. Coking seems to bear some relation to the percentages of combined hydrogen and oxygen, and of free hydrogen in the coal, and to the specific gravity. A coking coal may give from 50 to 87 per cent of coke, much depending on the method of coking. Coking coals rich in carbon and poor in gas give the most coke. Hydrogen lowers the yield by forming volatile compounds with carbon, the one having the lowest carbon percentage being methane, CH_4. A large percentage of oxygen causes losses by making a rapid formation of gas and smoke on heating, while water and ash in the coal render necessary more heat, thus burning up some of the carbon. Silica, clay, and iron in the coal hinder coking, but lime, by increasing the fusibility, facilitates it. Coke can be made from non-coking coals by mixing them with coals which cake, or by coking in special ovens.

Composition of Coke.— The composition of some representative American cokes is shown in the following table:

Name	Carbon	Ash	Sulphur	Moisture	Volatile Matter
Connellsville, Pa.....	87.481	11.323	.691	.492	.013
Irwin, Pa.....	88.240	9.414	.962	.....	1.384
Blossburg, Pa.....	84.760	13.345	.998	.175	.722
St. Bernard, Ky.....	86.930	12.10	1.96	.....	.....
New River, W. Va...	92.180	6.680	.618	.110	.....
Tracy City, Tenn.....	83.364	15.440	.142	.....	.....
Warrior, Ala.....	88.224	11.315	.563	.362	.990
Crested Butte, Colo.....	92.030	6.620	.....	1.35	

Good coke has a metallic ring, is of a silvery lustre or has a light gray color with a dark gray or black powder, though coke made in by-product ovens is dark and of excellent quality. The color is influenced by several things. For cupola work a coke should be below 1.25 in sulphur. Good coke should be hard enough to bear the burden in a blast-furnace without crushing.

Coke Production.— The United States in 1901 produced 21,795,883 short tons of coke, not including any of the coke made in gas manufacture; Great Britain, in 1900, produced 28,500,000 tons. The rank of the chief coke-producing States in 1901 was:

States	Tons	States	Tons
Pennsylvania	14,355,917	Virginia	907,130
West Virginia	2,283,700	Colorado	671,303
Alabama	2,148,911	Wyoming	564,191

Of the Pennsylvania production, 10,235,943 tons or nearly 46 per cent of the total United

States production, came from the Connellsville district.

Bibliography.—'The Mineral Industry' (New York); 'Transactions' of the American Institute of Mining Engineers (New York); Stahl und Eisen (Düsseldorf); Summerbach and Anderson's 'Chemistry of Coke' (Glasgow 1899); 'Second Geological Survey of Pennsylvania,' Vol. K. (Harrisburg 1875). See also COAL; COAL TAR.

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Col, neck, in geography, a depression or pass in a mountain-range. In those parts of the Alps where the French language prevails, the passes are usually named Cols — as the Col de Balme, the Col du Géant, etc.

Cola, or Kola, a genus of plants belonging to the natural order *Sterculiaceæ*, found in the west of Africa. The *Cola acuminata* produces seeds which are largely used in Africa on account of their digestive, refreshing, and invigorating properties, and have also been introduced into America and elsewhere on the same grounds. They have been found to contain caffeine, the active principle of coffee, and also the same active principle as cocoa.

Co'la-nut, the seed of a tree (*Cola acuminata*) from 20 to 30 feet in height, belonging to the natural order (*Sterculiaceæ*), whose habitat is a region of west Africa stretching 500 miles from the coast into the interior, between Sierra Leone and Lower Guinea. The tree has become naturalized in the West Indies and Brazil. It bears a profusion of purplish flowers. The flower yields a large brownish-yellow fruit, which enfolds in the same follicle the red and white seeds that are somewhat inaptly called cola-nuts. In its tenth year the tree reaches its greatest fecundity, and then yields 120 pounds of seeds. They are gathered in October and November from a June flowering, and again in May and June from a December flowering. In the tropics the natives use the cola-nut as a stimulant and for medicinal purposes, and only recently has the nut passed from the narrow use of the aborigines into an extensive service of civilized man. An analysis of it shows that it contains nearly all the constituents of coffee, tea, and cocoa, and other constituents not possessed by them. But although the chemists can get at the elements of cola, a full explanation of its hidden potency has eluded them.

Colban, kōl'bän, **Adolphine Marie Schmidt,** Norwegian novelist: b. Christiania, Norway, 18 Dec. 1814; d. 1884. Left a widow without resources at 36, she went to Paris, where a lady of quality sent to the printer some of the widow's letters to her, entitling the collection 'Letters of a Barbarian.' Parisian society was captivated, and the author decided to exercise her newly discovered talent by writing stories in her own language. Between 1869 and 1881 she published seven volumes of tales, charming for their fine spiritual insight and their warm human sympathy; they were nearly all translated into German. Among them 'Jeg Lever' (1877) is perhaps the most noteworthy. Others are 'Tre Noveller' (1873); 'Tre nye Noveller' (1875); 'Cleopatra' (1880).

Colberg, or **Kolberg,** Prussia, seaport and watering-place in the province of Pomerania, on the Persante, near its mouth, 170 miles northeast of Berlin. It stands on a hill, surrounded with three suburbs. The principal church dates from 1316. In 1102 Duke Boleslaus of Poland vainly besieged Colberg, which endured long sieges in the Thirty Years' war, in the Seven Years' war, and again in 1807, when it was most gallantly defended against the French. Colberg has manufactures of woolens, agricultural machines, and spirits; and salmon and lamprey fisheries. Pop. 18,622.

Colbert, Jean Baptiste, zhŏn bäp-tēst kōl'-bār, French statesman and financier: b. Rheims 29 Aug. 1619; d. Paris 6 Sept. 1683. He entered in 1648 the service of Cardinal Mazarin, who availed himself of his assistance in the financial administration of the kingdom. Mazarin rewarded him in 1654 with the office of secretary to the queen, and recommended him to the king at his death in 1660. Louis XIV. made Colbert intendant of the finances. His task was to remedy the evils which the feeble and stormy reign of Louis XIII., the splendid but arbitrary measures of Richelieu, the troubles of the Fronde, and the confused state of the finances under Mazarin, had occasioned. He found fraud, disorder, and corruption prevailing everywhere. The domains were alienated. Burdens, privileges, and exemptions were multiplied without measure; the state was the prey of the farmers-general, and at the same time maintained only by their aid. The revenues were anticipated for two years, and the treasury empty. He began with establishing a council of finances and a chamber of justice. For the purpose of alleviating the public burdens he endeavored to lower the interest of the public debt; and in order to mitigate the odium of this measure consented to a considerable diminution of the taxes, and the remission of all arrears up to 1656. He abolished many useless offices, retracted burdensome privileges, diminished salaries, and by a better distribution and collection of the taxes was able to reduce them almost one half. Notwithstanding the expenses of nearly 10 years' war, and the prodigality of a luxurious king, Colbert succeeded in 22 years in adding to the revenues more than 28,000,000 livres, and making an equal diminution in the public burdens; and at his death in 1683 the revenue actually received amounted to 116,000,000. To his talents, activity, and enlarged views the development and rapid progress of industry and commerce in France were largely due. He constructed the Canal of Languedoc; formed the plan of that of Burgundy; granted premiums on goods exported and imported; regulated tolls; established insurance offices; made uniform laws for the regulation of commerce. Naval schools were established, and order was introduced into all branches of the marine. By the advice of Colbert Louis XIV. caused the civil and criminal legislation to be improved, and the arts and sciences encouraged. Under the protection and in the house of the minister (1663) the Academy of Inscriptions was founded. Three years afterward he founded the Academy of Sciences, and in 1671 the Academy of Architecture. The Academy of Painting received a new organization. He enlarged the Royal Library and the Garden of Plants, and built an observatory, in which he employed Huyghens and Cassini. He began the measurement of the meridian in France, and sent men of science to Cayenne.

After having conferred the greatest benefits on his country he died, out of favor with the king, and dreading the exhaustion of the treasury by the new war Louis was resolved upon making against Holland. See Gourdautt, 'Colbert, Ministre de Louis XIV.'

Colbrand, or **Colbronde,** the Danish giant slain by Sir Guy of Warwick. By the death of this giant the land was delivered from Danish tribute.

> I am not Sampson, nor Sir Guy, nor Colbrand, to mow 'em down before me.
> Shakespeare, 'Henry VIII.,' v: 4.

Colburn, kōl'bėrn, **Warren,** American mathematician: b. Dedham, Mass., 1 March 1793; d. Lowell, Mass., 13 Sept. 1833. He at first worked at a machinist's trade, but developed a taste for mathematics, and graduated at Harvard 1820. He became superintendent of the Merrimac Manufacturing Company at Lowell, devised important improvements in machinery, and for many years was a popular lecturer on the sciences. He is best known for his 'First Lessons in Intellectual Arithmetic' (Bost. 1821) which he had planned while a student at Harvard. This work had an enormous circulation both in America and Europe, being translated into the chief European languages, and even into several Oriental tongues. He also published a 'Sequel' to the arithmetic (rev. ed. 1833), and an 'Algebra' (1827).

Colburn, Zerah, American mathematician: b. Cabot, Vt., 1 Sept. 1804; d. Norwich, Vt., 2 March 1840. Before his sixth year he began to manifest wonderful powers of arithmetical computation. His father resolved to exhibit them in public; and the boy astounded by the rapidity and accuracy of his processes the learned mathematicians of Dartmouth and Harvard. In 1812 he was taken to London, and after traveling over England, Scotland, and Ireland, went to Paris, where he stayed 18 months. Returning to London in 1816, he was placed by the Earl of Bristol in Westminster School, where he studied for three years. He lost his father in 1824, and returned to America, where he was employed again in teaching. In 1825 he became connected with the Methodist Church, and after nine years' service as an itinerant preacher settled in Norwich, Vermont. He was professor of languages in the university of that town till his death. When a boy of six or seven years he could answer questions in multiplication of four or five places of figures, proportion, involution, evolution, compound fractions, and the obtaining of factors even of large numbers, with accuracy and a rapidity to which the most experienced mathematician could not attain, but his remarkable gifts were less apparent after he grew to manhood.

Colby, Frank Moore, American writer: b. Washington, D. C., 10 Feb. 1865. He graduated at Columbia University 1888, and took graduate studies in political science there. He taught history at Amherst College 1890–1; was lecturer in history at Columbia 1891–5; professor of economics in New York University 1895–1900, when he became an editorial writer on the *Commercial Advertiser.* He has done a large amount of editorial work on Johnson's 'Cyclopædia'; the 'International Cyclopædia,' and 'International Year Book,' editing the latter since its foundation in 1898, and was the managing editor of the 'New International Cyclopædia' (1902–3).

Colby College, a coeducational institution in Waterville, Me.; founded in 1818, under the auspices of the Baptist Church. After the first year's work, the courses are nearly all elective. The average number of students, each year, is 200. In the library are 37,900 bound volumes and about 21,000 pamphlets. The college is endowed about $500,000, and the property is valued at $254,000.

Colchester, kōl'chĕs-tėr, England, a borough and river port of Essex, on the Colne, 50 miles northeast of London. It is partially encircled by a wall built during the Roman period, and among relics of the past it contains a castle whose enormously thick walls date from the time of William Rufus, a picturesque, ivy-grown ruin of Saint Botolph's priory, while in the Church of the Holy Trinity is a Saxon doorway. The most important modern structure is the spacious and handsome Town Hall, completed in 1902. Colchester was known to the early Britons and the Romans as Camulodunum, and to the Saxons as Colneceaster. It has a large oyster-fishing trade, and exports of corn and malt. In 1648 Colchester stood a memorable siege of 11 weeks against the Parliamentary forces, who eventually starved out the royalist garrison and hung the leaders. See Cutts, 'Colchester' in 'Historic Town Series' (1889).

Col'chicine, a vegetable alkaloid obtained from plants of the genus *Colchicum* (principally from the roots and seeds) by successive extraction with hot alcohol, water, and chloroform, and subsequent repeated crystallization from all three of these solvents. It is a yellowish-white powder, with the probable formula $C_{22}H_{25}NO_6$. It acts as a weak base, but most of its compounds are decomposed by water. Preparations of colchicine are used in medicine for the treatment of gout. It is very actively poisonous, half a grain having proved fatal.

Colchicum, kŏl'chĭ-kŭm, a genus of herbs of the natural order *Liliaceæ.* About 30 species, natives of the Mediterranean region, have been described. They are nearly all autumn-blooming perennial plants which produce their leaves in spring from corms. The perianth, which resembles but is much larger than that of the crocus, is long and tubular, and varies in color from white to purple (in one species yellow). The leaves, which are broad and long in proportion to the size of the plants, die in early summer, and the flowers appear when nature is preparing for the winter. For this reason the autumn-blooming species are very popular in gardens. They are of easiest culture, the bulbs being planted in late summer and protected in severe climates with a winter mulch of litter or straw, which is removed in the spring. Beds once planted will need no further attention for several years, when they should be dug up, the corms divided and set in fresh soil in a sunny situation. The plants of some species are very acrid and are reputed poisonous, and when cattle have access to them are said to produce injuries of various kinds. Ordinary clean cultivation will soon rid any land of the plants. The corms and the seeds have been used in medicine for gout and rheumatism. *C. autumnale,* the best-known species, is popularly known as mea-

dow saffron and autumn crocus, names also given to other species.

In medicine the corm and seeds of *Colchicum autumnale* are used, in which the active principle is found in from .3 to .5 per cent. Colchicum has in medicine but one use; that is, in attacks of acute gout. These it cuts short, relieving the pain and shortening the attack better than any other drug. The reasons why are at present unknown, and the remedy is one of the few now remaining in modern medicine that are still used on empirical grounds only. Poisoning by this drug is not uncommon. The symptoms are those of an acrid gastro-enteric poison, with great pain, nausea, vomiting, and diarrhœa. There is marked depression of the pulse and of the respiration, and death is due to shock and collapse. Washing of the stomach is the first indication for treatment, notwithstanding the self-conservative vomiting. Castor oil, heat, alcohol, and mucilaginous drinks are indicated.

Colchis, kŏl'kĭs, or **Colchos,** the ancient name of a region at the eastern extremity of the Black Sea, resting on the Caucasus, and corresponding partly to Mingrelia. It is famous in Greek mythology as being the destination of the Argonauts. The people were celebrated for frugality and industry, and from their dark complexion, crispy hair, language, and customs, Herodotus is of opinion that they were of Egyptian origin. The country abounded, according to Strabo, in all kinds of fruits and material for ship-building. Linen was an important branch of manufacture, and wool of fine quality and in great quantity was produced. It was fruitful in poisonous herbs. In the 15th century it was subdivided into several principalities, and is now comprised in the Russian government of Trans-Caucasus.

Col'cothar, red oxide of iron, ferric oxide, Fe_2O_3. The reddish-brown powder that remains in the retorts when ferrous sulphate is distilled in the manufacture of Nordhausen sulphuric acid. It is used for polishing glass, and also as a pigment, under the name of «Indian red.» When in the finest state of subdivision it is known as «rouge,» and is much used for fine polishing by jewelers and others. Colcothar was the *caput mortuum vitrioli* of the alchemists.

Cold. 1. In physics and physiology, a relative want of heat. Since there are no determinate boundaries between cold and heat, it is a mere arbitrary distinction to call the degrees of the thermometer below the freezing-point degrees of cold. When the atmosphere, or any substance which comes in contact with the body, is at a lower temperature than the skin, it absorbs heat from the body, and is called cold. The physiological action of cold on the animal organism requires a brief notice. All animals (the warm-blooded animals to the greatest extent) have a certain power of maintaining the heat of the body in defiance of external cold. This power is mainly due to a process analogous to combustion, in which carbon and hydrogen taken into the system in food are made to unite with oxygen derived from the air by respiration. If the combustible materials are not duly furnished, or if the supply of oxygen be deficient (as in various diseased conditions), there must be a depression of temperature. Now, if the temperature of a bird or mammal (except in the case of hibernating animals) be lowered about 30° below its normal standard (which in birds ranges from 100 to 112°, and in mammals from 96° to 102°), the death of the animal is the result. The symptoms indicating that an animal or a man is suffering from a depression of the temperature of the body are: (1) retardation of the circulation of the blood, causing lividity of the skin, which is followed by pallor, in consequence of the blood being almost entirely driven from the surface through the contracting of the vessels; (2) a peculiar torpor of the muscular and nervous systems at the same time, manifesting itself in an indisposition to make any effort or exertion, and in intense sleepiness. The respiratory movements become slower and the loss of heat goes on, therefore, with increasing rapidity, till the fatal limit is reached and death supervenes. In hibernating animals (the marmot, dormouse, bat, etc.) the power of generating heat within their own bodies is very slight, their temperature following that of the external air, so that it may be brought down nearly to the freezing-point. Great or prolonged atmospheric cold is a most powerful depressing agent, and is a fruitful cause of disease and even of death. Whenever the temperature of the atmosphere is suddenly reduced, and particularly when it is reduced below the freezing-point, a considerable addition takes place to the mortality of the region. The effects of cold are, in ordinary circumstances, most apparent among the aged and the very young, and among those suffering from chronic disease.

2. In medicine, cold, as well as heat, is frequently employed for its therapeutic value. Cold is one of the most valuable means of obtaining lowered temperature. Cold sponging, ice-packs, alcohol evaporation, are useful in most fevers, are indispensable in sunstroke, and very refreshing in minor indispositions. Cold applied to an inflamed area diminishes the blood-tension by contracting the blood-vessels, and thus tends to limit inflammation. Cold applied to the skin, as by a wet pack, or as a shower, is a tonic, increasing metabolism, augmenting the appetite and giving mental and physical vigor. Cold applied as iced drinks, or cracked ice itself, is one of the best agents in nausea and gastric distress. Cold by means of ether or ethyl chloride spray is an excellent local anæsthetic for the treatment of local boils, felons, ulcers, etc., and is also used frequently in the extraction of teeth.

Catching cold is a term of wide popular use, and signifies an affection which is little treated of in medical literature, although an affection widespread and unpleasant. Catching cold is a process of disturbed equilibrium of the blood vessels. It is usually due to excessive evaporation from the skin caused by drafts of air, to which is added contraction of the blood vessels of the periphery of the body, with consequent engorgement and congestion in some internal organ. Keeping quiet, taking hot foot-baths, or hot drinks, sweating, etc., are measures that tend to bring the blood to the contracted areas, and away from the congested areas, with consequent good results. If, however, the disturbance becomes marked, if the exposure has been excessive, the congestion in an area becomes so serious that its local functions are diminished or aborted, and the congested blood vessels may be over-distended and paralysis result. Then an inflammatory reaction may ensue; the reduced

vitality of the part encourages the multiplication of ever-ready bacteria, and an acute diseased process may result. It may be a simple acute inflammation of the kidney; or if the pneumococcus is present in the lung, a pneumonia; or it may be a bronchitis. Taking cold is therefore a distinct process that predisposes to more severe affections. In most cases the secondary reaction of taking cold manifests itself in the mucous membranes of the air-passages, and running from the nose, some degree of cough, general malaise, languor, and muscular and joint pains are the results. Secondary infection, frequently through the superimposed influenza bacillus (if the condition be not primarily induced by that organism), results in the "grippe," following which bronchitis and pneumonia are very frequent.

No cold in the head, no general cold, should be neglected. Rest in bed, cathartics, hot drinks, and medical advice are desirable.

Cold Cream, a cooling ointment made by melting four ounces of white wax in one pound of almond oil by means of a gentle heat. Then mix gradually with a pint of rose-water in a warm mortar. Another recipe is: Take two parts of spermaceti, two parts of white wax, and three parts of almond oil; melt together, and then add rose-water as before. This ointment cools the skin, rendering it soft and pliable, and is successfully applied for the cure of chapped hands.

Cold Harbor, Battle of. By a series of bloody assaults and flank movements, beginning at the Wilderness 5 May 1864, Gen. Grant had, at the end of the month, forced Gen. Lee back to within a few miles of Richmond, and confronted him on the line of the Totopotomoy. On 31 May his army was along the road from near Hanover Court-House to Cold Harbor; the Sixth corps about six miles southeast of the court-house; to its left, in the order named, the Second, Ninth, and Fifth corps, these near Bethesda Church. The Eighteenth corps was at White House, on the Pamunkey, where it had just arrived from the Army of the James. Gen. J. H. Wilson's cavalry division was on the right of Grant's line, and Sheridan, with the two cavalry divisions of Torbert and Gregg, on the left. On the 31st Sheridan, after a severe fight, occupied Cold Harbor, but was so hard pressed by the Confederate cavalry division of Fitzhugh Lee and Clingman's brigade of infantry, and his position so exposed, that he fell back at night; but receiving an order from Gen. Meade that the place must be held at all hazards, he returned, and during the night entrenched. Lee's position was so strongly entrenched and so difficult of access that Grant determined again to extend by his left on Lee's right, and in view of this extension Cold Harbor was an important point, as there the roads concentrated from Bethesda Church, Old Church, White House, New Bridge, and all the bridges across the Chickahominy above and below New Bridge. Grant extended in that direction by transferring from his right. At 11.45 on the night of 31 May, Gen. H. G. Wright's Sixth corps was ordered from its position on the right to march along the rear of the army to Cold Harbor, 15 miles distant, and to be there by daylight on 1 June to support Sheridan, who, it was believed, would be heavily attacked at daybreak; but it was nine o'clock before he arrived, and Sheridan meanwhile had repulsed two determined attacks of Kershaw's division. At 3 P.M. 31 May the Eighteenth corps, Gen. W. F. Smith, was ordered by Gen. Grant to march from White House and form on the right of the Sixth. By a mistake in the order given it, it was late in the afternoon of 1 June when it reached its position. Opposing the two corps were the Confederate divisions of Gens. Hoke, Kershaw, Pickett, and Field, their main entrenched line about 1,400 yards distant; the interval between mostly open ground. About 300 to 400 yards in advance of the main line was a line of rifle-pits. It was necessary to take this position before Gen. Lee could concentrate on that flank and thus cover this road to Richmond. Between 5 and 6 P.M. Wright and Smith assaulted, and under heavy artillery and musketry fire Smith carried the advanced Confederate works and held them, taking many prisoners. Wright carried the advanced line and, breaking the left of Hoke and right of Kershaw, took parts of the main line, some of which he held, the Confederates falling back to a new line. The loss in the two assaulting corps was about 2,200. On the night of the 1st Sheridan had been ordered to attack on Wright's left, but received the order too late to execute it. On the morning of the 2d he advanced Gregg's division to Sumner's Bridge, on the Chickahominy, attacked a force of infantry, cavalry, and artillery, posted near the bridge, carried their advanced position, and held it until Hancock's corps arrived. Hancock's Second corps moved after dark of the 1st from the extreme right, under Meade's order to march with all speed, join Wright by daybreak of the 2d, and take position on his left, extending the line if possible to the Chickahominy. By an error of Hancock's engineer a wrong road was taken, and it was after seven o'clock when his head of column arrived; then under heavy skirmishing he formed line across the road from Cold Harbor to Dispatch Station. It had been the intention to attack the Confederate line early in the morning. Smith declared that the idea "was simply preposterous." Hancock's men were in an exhausted condition, and the attack was suspended until 5 P.M., and then deferred until 4:30 A.M. 3 June. At this time Grant's line was held on the right by Gen. J. H. Wilson's cavalry from the Pamunkey to Bethesda Church; Warren's Fifth corps, which had not moved, stretched from Bethesda Church about three miles to Beulah Church. Burnside's Ninth corps had been ordered to withdraw from the extreme right and form in Warren's rear to support his right. The Eighteenth corps was on the left of the Fifth, a wide interval between them; the Sixth and Second corps were on the left of the Eighteenth. Lee had observed that Grant was transferring the right of his army, by successive movements, to the left, and not proposing that Grant should take the initiative in attack, took it himself. On the morning of 2 June he ordered Early with three divisions to attack Grant's right flank and drive it down in front of the Confederate line. Early found Burnside in the act of withdrawing from near Sydnor's Mill, to take position in Warren's rear, attacked and captured the skirmish line, which had been left in the works, and fell upon his rear division, by which, with the assistance of the other divisions, Early was checked, but not before he had got in the

rear of a part of Warren's skirmish line, from which he took many prisoners. Warren repulsed Rode's division, which had attacked his front, and at night both sides entrenched. The Union losses 1 and 2 June were over 5,000 killed and wounded. Meanwhile Lee closed in to the right and formed his lines in front of Grant's left, his right on the Chickahominy, near Alexander's Bridge, his left extending a little west of north in the direction of the Totopotomoy. A. P. Hill's corps was on the right; Longstreet's, commanded by R. H. Anderson, in the centre; and Early's on the left, cavalry covering both flanks of the infantry. The line included the ground on which was fought the battle of Gaines' Mill, June 1862, and covered all the main roads to Richmond, being about six miles from the main exterior fortifications of the city and but half that distance from its most advanced works. Grant's whole line, except the cavalry on the left, was ordered to assault Lee's lines at 4.30 A.M. 3 June. Wilson, re-enforced by 2,000 cavalry and 3,000 infantry, was ordered from Hanover Court-House to Hawes' Shop to attack Early's left and rear. The main work was to be done by the Second, Sixth, and Eighteenth corps, supported by the Fifth and Ninth. No reconnaissance had been made in front, where the Confederate works were so constructed as to give a cross-fire upon assaulting columns. At the signal the assault was made at 4.30 A.M. On the left Barlow's and Gibbons' divisions of the Second corps leaped their works and, under a severe fire of artillery and musketry, drove in the enemy's advanced line and in many places gained the main line, but the latter was soon retaken and in 20 minutes from the time the signal was given the Second corps was repulsed with a loss of 3,000 men, including many of its most promising officers, who were killed on the works. The men did not retreat far, but lay down within a few yards of the Confederate works, and with bayonets, tin cups, and plates, began to entrench, skirmishing all the while. It fared no better with the Sixth corps. Its three divisions went forward, carried some advanced rifle-pits, assaulted the main line, and were met by a severe musketry fire and an enfilading artillery fire. They were repulsed with a loss of 800 killed and wounded, but gained positions at some points only 30 or 40 yards from the enemy's works, and held and entrenched them. On the right of the Sixth corps, the Eighteenth was obliged to form one division to the right to protect its flank, Martindale's and Brooks' divisions assaulted and were quickly driven back by a cross-fire of artillery and musketry, and it desisted from further effort after a loss of about 1,000 men. In less than an hour the three corps had lost nearly 5,000 in killed and wounded. Warren, on the right, reported that he could not advance unless the troops on his left advanced at the same time. Wright said that if he advanced without a corresponding advance of Smith on his right he would be taken in flank and reverse, and he was waiting for Smith and Hancock to move; and Smith said he could not move unless Wright covered his left flank. Gen. Meade ordered another assault, each corps to go forward without regard to those on the right or left, but it was not made, Hancock would not take the responsibility. Smith had all he could do in holding his own; Wright, also Hancock, merely transmitted the order to brigade and regimental commanders without enforcing it; and the men opened fire from their sheltered positions, without an effort to advance. Meade gave a third order for an advance of the entire line. Smith positively refused to obey, as it meant but a wanton waste of life to attempt it. Wright and Hancock merely transmitted the order, and again the men complied with it only by renewing fire from their positions. Grant got the opinion of his corps commanders that further assault was inadvisable, and at 1.30 P.M. orders were given to entrench "with a view to moving against the enemy's works by regular approaches." Farther to the right Burnside with the Ninth corps and Warren with the Fifth, who were to support the main assault, attacked Early in the morning, occupied some of the positions taken from them on the 2d, entrenched close up to Early's main line, and were about to assault, when they received orders to suspend attack. They had fought sharply during the morning, the Fifth corps losing about 500 killed and wounded, the Ninth corps about 800. Wilson's cavalry had a sharp engagement at Hawes' Shop, driving the enemy with some loss, and attacking the left and rear of Heth's division; but failing to connect with Burnside, they withdrew to Hawes' Shop. The loss of the Army of the Potomac for the entire day of 3 June was about 7,000 killed and wounded. All night of the 3d both armies were entrenching; no pickets could be thrown out, so close were the lines, between which lay many wounded. Some of the wounded were brought in, but it was not until the 7th that a truce was agreed upon, by which all could be removed, when exposure and starvation had transferred the greater part of them to the death-roll. Reguiar approaches were made by the Union lines, accompanied by constant and heavy skirmishing; an assault gave no promise of success; and on the night of the 12th Grant withdrew to cross James River. Grant had 103,000 "present for duty" at Cold Harbor. His loss (1–12 June) was 1,845 killed; 9,077 wounded; 1,816 missing; an aggregate of 12,738. Lee had not to exceed 65,000 men. His loss cannot be accurately given, but probably did not exceed 2,600 killed and wounded. Gen. Grant, in his 'Personal Memoirs,' says: "I have always regretted that the last assault on Cold Harbor was ever made. No advantage whatever was gained to compensate for the heavy loss we sustained." Consult: 'Official Records,' Vol. XXXVI.; U. S. Grant, 'Personal Memoirs,' Vol. II.; F. A. Walker, 'History of the Second Army Corps'; A. A. Humphreys, 'The Virginia Campaign of 1864–5'; I. R. Pennypacker, 'Life of General Meade'; The Century Company's 'Battles and Leaders of the Civil War.'

E. A. CARMAN.

Cold Spring Harbor, N. Y., a village of Suffolk County, on Cold Spring Harbor, and on the Long Island R.R. It was formerly a whaling port. It is now a summer resort, and has a fish hatchery and a school of biology.

Cold Storage, a method now generally employed for preserving perishable articles of food by the use of machines which reduce the temperature of the air. The same method is used extensively for preserving articles other than food which are destructible by high temperature. Refrigeration is often called ice-making, but in a cold-storage building the area

kept at a certain temperature by the frozen liquid is small compared with that kept at a proper temperature by ammonia and other substitutes for ice. Perhaps no product ever came into common use more rapidly than air treated according to the cold-storage method, unless electricity or steam be excepted. It is now indispensable in connection with some of the largest business enterprises, which, without it, would soon cease to exist. One of the most important uses of cold storage is in the transportation of beef, fruit and vegetables, etc., from place to place and from one country to another, especially from the United States and South America to Europe.

The extensive systems employed in breweries, provision depots, dairies, and distilleries have familiarized the public with the use of cold air; and no modern hotel or apartment house on a large scale is constructed without a plant for producing it by some process. It is as much a portion of the mechanical equipment as the elevator motor, or the lighting and heating apparatus. It is also being introduced for cooling purposes in theatre and other auditoriums; it maintains a pleasant temperature during the heated term in the hospital ward, and several companies have been formed to distribute it in cities through mains, as water and gas are supplied to the consumer. In some of the largest packing-houses of Kansas City and Chicago, not a pound of ice is used in a year for preservative purposes, although every department where the products of the beef, sheep, and hog are stored any length of time, is required to be at a temperature near or below the freezing point. Plants are now being made in this country to generate cold air for butter and butterine factories, ice-cream factories, chemical works, sugar refineries, molasses factories, paraffine works, oil refineries, stearine factories, chocolate factories, morgues, office buildings, skating rinks, steel-tempering plants, blast-furnaces, laundries, glue works, dry-plate works, dynamite-works, paint factories, soap factories, fur storage, India-rubber works and plants for seasoning lumber — a list including some of the country's most important industries.

While an extensive variety of machinery is being manufactured for refrigeration under a score of patents, the aim of all the inventors is the same — to perfect the most economical process to remove the heat from a certain temperature level to a higher level, discharging it at this point. With one ton of coal, a cold-air equivalent of from 8 to 14 tons of ice has been produced, the quantity varying according to the process employed. In the United States the refrigerating machines use anhydrous ammonia as the agent for generating low temperatures, mostly in conjunction with brine made from chloride of calcium and water. The ammonia is circulated through a series of pipes in which it evaporates. Then, in its gaseous form, it is pumped by the machine into the condensers and liquefied. The brine-cooler consists of a double pipe-coil. A small quantity of ammonia is injected through a needle valve, which allows a very fine stream to pass into the space between two pipes, running in a coil approximately 300 feet long surrounding a pipe containing the brine. From this coil the ammonia gas is drawn to the machine. The gas is forced thence into other coils, called the ammonia condensers, which have water circulating over them. It is now in a heated condition from the compression. The water running over these coils cools off the gas, and at the same time condenses it into liquid anhydrous ammonia. In this form the ammonia is conducted to a receiving tank, and from there it again passes through the needle-valve into the brine-cooler, going through the same circuit again and again. The brine-cooler represents the apparatus where the brine and ammonia systems are in conjunction, the brine being pumped through the cooler, and from there through coils of pipe in the room in which it is desired to reduce the temperatures. This is sometimes to 20° F. below zero for freezing fish, sometimes to 32° F. for preserving meat, and often to 50° F. for preserving fruits and other perishables. The temperature is easily adjusted to the required degree by controlling the brine-flow in the piping. By lessening or increasing the flow in a single pipe, a wide range of temperature can be produced. Thus the same room can be used either for freezing the articles it contains, or merely for chilling them.

The capacity of a refrigerating machine is based upon the weight of ammonia in the gaseous form which it can discharge in 24 hours, each pound of gas representing a certain quantity of heat-absorbing power. The unit of capacity is the refrigeration which would be accomplished by the use of one ton of ice. Such a quantity will lower the temperature of 28,400 pounds of water 10 degrees. Therefore, if a "one-ton" machine is employed, it will cool 197⅓ pounds of water to the extent of one degree a minute. Tests made of the York type machines of this capacity show that one will keep the "curing" department of a packing-house containing 12,000 cubic feet of space, at a temperature of 40° F. or 1,500 cubic feet at zero. In other words, it is sufficient to keep 10 beeves or 25 hogs chilled at the former temperature. As a single plant used in the large packing-houses and breweries may represent 500 tons capacity, it will be seen that the cold storage compartments are maintained on a very elaborate scale, a single one containing thousands of carcasses. The horse-power required for one of these large machines aggregates 625. The air-compressors are built in various designs, and are known as single and double acting.

In large cold-storage warehouses the floors are not over eight or nine feet high. The pipe is attached to the walls, and in wide rooms to the sides of posts running through the middle of the room, so that an equal temperature can be maintained in all portions. In others, like fish-freezing rooms, the pipes are even used as shelves to hold the tins filled with fish, which are frozen into bricks and piled away in another compartment. Poultry and game are also kept in a frozen state, and the meat remains almost as hard as stone while in the cold room. Butter also is kept at a temperature near zero, which is said to preserve the flavor contained in its volatile oil, so that it is equal to fresh butter. Eggs are preserved sometimes from two to six months, but require particular care. The air in the room should be neither too moist nor too dry, and the chamber should be neither without ventilation nor supplied with too much, as then the eggs would lose in weight on account of their liability to evaporate through the shell.

Eggs, butter, and milk are also liable to be tainted by any smell arising from the woodwork, or articles stored in the neighborhood, and the rooms have to be constructed and arranged with this point in view.

The above, it may be said, have been problems for the cold-storage experts to solve by practical experiments; but food products can be preserved in properly constructed houses with as little difficulty as any other articles. In the preservation of meat, from the time that the beef, sheep, or hog is killed, it is kept in cold storage or "chill" rooms, until the time that it is taken from the refrigerator to be prepared for the table. The "chill" rooms are used to take the animal heat out of the meat, and reduce its temperature from about 98° F. to cold-storage temperature, that is, from 32° F. to 40° F. For this purpose the meat is hung on rails in rooms which have chambers in the upper part over the rails for ammonia or brine piping, which reduces the temperature to a point near freezing before the meat is put in. After the meat is put in, the animal heat it still contains raises the temperature in the room, but this is again gradually lowered, in the course of 24 to 48 hours, to the proper degree for refrigeration. This length of time is required in order to chill the meat thoroughly. Should it become chilled on the outside and remain warm in the centre, the centre part of the meat would be spoiled. From the "chill" room the meat is run into the cold-storage rooms and hung on rails, where it is kept until such time as it is to be shipped. The choicest pieces are kept at least four weeks in cold storage, as the quality is thus improved, and, if the rooms are kept clean, these pieces will taste better than meat which has been recently slaughtered. For this reason, not only slaughter-houses, but depots of packers and other buildings where meat is kept in cold storage, even to small butcher establishments, are preferably cooled by refrigerating machinery, owing to its dryness and cleanliness.

In some of the large hotels refrigerators cooled by machinery are even placed close to the ovens or ranges where the viands are prepared for consumption, the refrigeration being maintained at the proper standard despite the outside temperature. High temperature is also the rule in candy factories, but manufacturers of chocolate candy have been using refrigerating machines for some time. They are forced to do this, as the compound is apt to become soft in hot weather, which, of course, would spoil the appearance of the goods for the market. The arrangement of the refrigerating piping for chocolate factories has been made in various ways. In some instances a large refrigerator is cooled in the centre of the workroom with the piping inside of it, this refrigerator being of such length that endless belting carrying tins with chocolate enters it on one side and brings them out chilled on the other. In other workrooms a series of pipe coils are simply placed along the ceiling, and the cold air coming down chills the confectionery as it is made by the employees in the same room. The chocolate is then stored in refrigerators, apart from the workroom, and there properly packed at a low temperature. After being packed it can be sent out, and ordinarily will keep for an indefinite length of time.

One of the most interesting applications of cold storage, however, and one which has become very extensive, is for preserving furs and woolens, which are kept at a temperature of not over 20° F. to keep the moths from destroying them. These rooms have a very interesting appearance, as among the trunks, boxes, and drawers of clothing there appear figures of bears, tigers, and other stuffed animals in threatening attitudes, put away through the hot season by their owners and taken out in the fall. Sometimes furs are left in storage continuously for several years, yet at the end of the time they are invariably found in perfect condition. Many of the trust companies in the larger cities have such cold storage compartments. In these fur and clothing rooms, where valuable carpets and rugs are also stored, the air is generally cooled outside of the room and circulated through it by means of fans.

The cold storage building erected by the United States government at Manila is probably unexcelled in scientific construction. It has a storage capacity for 1,200 tons of beef, 200 tons of mutton, 50 tons of butter, 100 tons of potatoes, and 100 tons of bacon; or, in other words, sufficient food to feed an army of 10,000 men for three months. In addition to the ordinary freezing apparatus it has an ice plant with a daily output of 40 tons. The elevator, with its 2,400 pound lifting capacity, as well as most of the other appliances in the building, are operated by electricity. Connecting with the elevator is an overhead tracking system extending four miles, and the mechanism is so complete that a ship landing at a near-by pier has only to open her hatches and her cargo is transported to the storage almost automatically. The power in the building is furnished by three 200-horsepower engines.

Cold Wave, a term commonly used in the United States to denote a fall of at least 20° in temperature in 24 hours, bringing the temperature below the freezing point. It is due to steady winds from the northwest, which bring with them the chill conditions of the great west Canadian plains. This chill seems due to anti-cyclonic conditions which bring down to the surface the cold air of the upper atmosphere, and cause it to flow out over the southern and eastern United States.

Colden, kōl'dĕn, **Cadwallader,** American scientist and colonial official: b. Dunse, Scotland, 17 Feb. 1688; d. Long Island, N. Y., 28 Sept. 1776. He was graduated from the University of Edinburgh in 1705, and emigrated to the American colonies in 1708. He devoted himself to botany and astronomy and also to public affairs, becoming surveyor-general of New York and president of the council. He sided with the crown in the contest over the stamp act. Among his correspondents were Franklin and Linnæus, and he wrote 'Cause of Gravitation' and 'History of the Five Indian Nations.'

Colden, Cadwallader David, American lawyer: b. near Flushing, L. I., 4 April 1769; d. Jersey City, N. J., 7 Feb. 1834. He studied law in England and the United States; began practice in New York in 1791, where he soon attained high rank in his profession. He was a member of the legislature and mayor of New

York (1818), a member of Congress (1821), and of the State senate (1824–7). He was an earnest advocate of the system of internal improvements that was an important political issue early in the 19th century. He wrote: 'Life of Robert Fulton' (1817); 'Memoir of the Celebration of the Completion of the New York Canals' (1825); 'Vindication of the Steamboat Right Granted by New York State' (1819).

Cold'stream, Scotland, a town in Berwickshire, on the northern bank of the Tweed, which is here crossed by a bridge (erected by Smeaton in 1766) that unites the two kingdoms, and forms a well-frequented thoroughfare. The ford of Coldstream was a favorite point with the invading armies of England and Scotland when they passed alternately into each other's country. Pop. 1,535.

Coldstream Guards, a regiment in the Foot Guards or Household Brigade, the oldest in the British army except the First Foot, now called the Royal Scots. Raised in 1660 by Gen. Monk at Coldstream, it was at first called "Monk's Regiment," but when Parliament consented to give a brigade of guards to Charles II., this corps, under the name of Coldstream Guards, was included in it.

Coldwater, Mich., a city and county-seat of Branch County. It is in the southern tier of counties, 153 miles west of Chicago and 126 miles east of Detroit, on the Coldwater River and the Lake Shore & Mich. Southern Railway. Coldwater was first settled in 1830 by Hugh Campbell, became a borough in 1837 and a city in 1862. It is governed by a mayor and a common council of eight members, four members of which are elected yearly for a term of two years. The city has three banks, churches of all denominations, is in the centre of a rich farming community, has cement, shoe, wagon, milling and other industries, and owns and controls its waterworks and electric-light plant. Pop. (1903) 7,000.

Cole, Asahel N., American agriculturist and editor: b. 1821; d. Wellsville, N. Y., 14 July 1889. He was educated in the public schools of western New York State, and when 21 entered politics. He figured prominently as a Republican in the party's early days, and in 1852 he founded the 'Genesee Valley Free Press,' the pioneer Republican paper. He was no less noted as an agriculturist, being widely known as the father of subsurface irrigation.

Cole, Grenville Arthur James, English geologist: b. London 21 Oct. 1859. He was educated at the City of London School and the Royal School of Mines, and has been professor of geology at the Royal College of Science for Ireland since 1890. He has published: 'Aids in Practical Geology' (1891, 4th ed. 1902); 'The Gypsy Road' (1894); 'Open Air Studies' (1895); 'As We Ride' (with Blanche Cole) (1902).

Cole, Joseph Foxcroft, American landscape painter: b. Jay, Maine, 9 Nov. 1837; d. Boston, Mass., 2 May 1892. He studied in Paris under Lambinet and Jacque, and exhibited at the Centennial Exhibition in Philadelphia, 'Twilight,' 'Melrose Highlands,' and 'Coast Scene in Normany,' for which he was awarded a gold medal. His work was somewhat impressionistic in character.

Cole, King, a legendary British king, described as a "merry old soul," fond of his pipe, and fond of his "bowl," and fond of his "fiddlers three." Colchester is said to have been his residence.

Cole, Samuel Winkley, American musician: b. Meriden, N. H., 24 Dec. 1848. He began his professional career at Portsmouth, N. H., 1877, was organist of the Clarendon Street Baptist Church, Boston, Mass., 1882–94, and teacher of sight singing in the New England Conservatory of Music since 1883. Since 1884 he has been supervisor of music in Brookline, Mass., and in Dedham, Mass., since 1886. In 1890 he produced Haydn's 'Creation' with the Dedham high school, and in 1891 Handel's 'Messiah,' being probably the first successful attempt in the United States to produce a complete oratorio with high school pupils. He has written: 'Child's First Studies in Music'; 'Course in General Sight-Reading'; 'New England Conservatory Course in Sight Singing.'

Cole, Thomas, American landscape painter: b. Bolton-le-Moors, Lancashire, England, 1 Feb. 1801; d. Catskill, N. Y., 11 Feb. 1848. His father, a woolen manufacturer, came to the United States when Thomas was 18 years old, and settled in Steubenville, Ohio. The son worked in his father's shop for two years, but the coming of a portrait painter to the village made him wish to be an artist. After a few lessons he set to work to paint pictures, and traveled for a while painting portraits and landscapes, but often had to paint chairs and japanned ware for a living. At last he went to New York, and by hard work succeeded in making himself one of the foremost landscape painters in this country. Among the best of his pictures are five called 'The Course of Empire,' and four called 'The Voyage of Life.' The last, showing childhood, youth, manhood, and old age, are very popular, and are well known through engravings. He was one of the founders of the National Academy, New York.

Cole, Timothy, American engraver: b. London, Eng., 1852. He emigrated to America in 1857; was burned out by the Chicago fire in 1871, and returned to New York penniless. In 1875 he entered the employ of the 'Century Magazine' (then 'Scribner's Monthly'), and in 1883 was sent to Europe to engrave pictures by the old masters. The first Italian series was finished in 1892, the Dutch and Flemish series in 1896, the English series, 1900, and he has of late been at work on a Spanish series. He stands easily at the head of living wood-engravers. His notes and short papers to accompany his engravings in the 'Century' have been published separately. He received a first class medal at the Paris Exposition, 1900.

Cole, Vicat, English landscape artist: b. Portsmouth, Eng., 1833; d. London 6 April 1893. He was a pupil of his father, George Cole (1810–83), a landscape painter also, and painted many studies from nature in Surrey, 'The Heart of Surrey' being one of his most noted works.

Cole, William Morse, American teacher: b. Boston, Mass., 10 Feb. 1866. He graduated at Harvard in 1890, and was instructor in political economy there 1890–3, and since 1900. From 1894 to 1898 he was a university extension lecturer, and secretary of the Massachusetts Commission on the Unemployed. He is the author of 'An Old Man's Romance' (1895), under the pseudonym of "Christopher Craigie."

Colebrook, Henry Thomas, English Sanskrit scholar: b. London 15 June 1765; d. there 10 March 1837. In 1782 his father's influence procured him a writership in the Bengal service. His duties as revenue officer at Tirhut led him to make a minute study of the state of husbandry in Bengal; his legal functions led him to study Indian law and learn Sanskrit; and he began in 1794 publishing essays on Indian religion, poetry, and science in the 'Asiatic Researches' of the Asiatic Society of Calcutta. His removal in 1795 to the magistracy of Mirzapur gave him the opportunity of cultivating the acquaintance of the learned men of the neighboring Sanskrit college at Benares, and with this advantage he brought out his 'Digest of Hindu Law on Contracts and Successions.' A mission to Nagpur (1799–1801) interrupted his work, and on his return he was appointed a judge of the new court of appeals at Calcutta, and at the same time honorary professor of Hindu Law and Sanskrit at the college of Fort William. Yet he contrived during this busy period to publish the first (and only) volume of his 'Sanskrit Grammar' (1805), based upon Pánini and the native commentators, to write his famous articles on the Vedas and on the sect of Jains, besides many other valuable essays for 'Asiatic Researches,' and also to supplement his 'Digest' by 'Two Treatises on the Hindu Law of Inheritance' (1810).

Coleman, Arthur Philemon, Canadian educator: b. Lachute, Quebec, 4 April 1852. He was educated at Victoria University and at the University of Breslau, and after some years of scientific work he became professor of geology and natural history in Victoria University, and in 1891 professor of assaying and metallurgy in the School of Practical Science, Toronto.

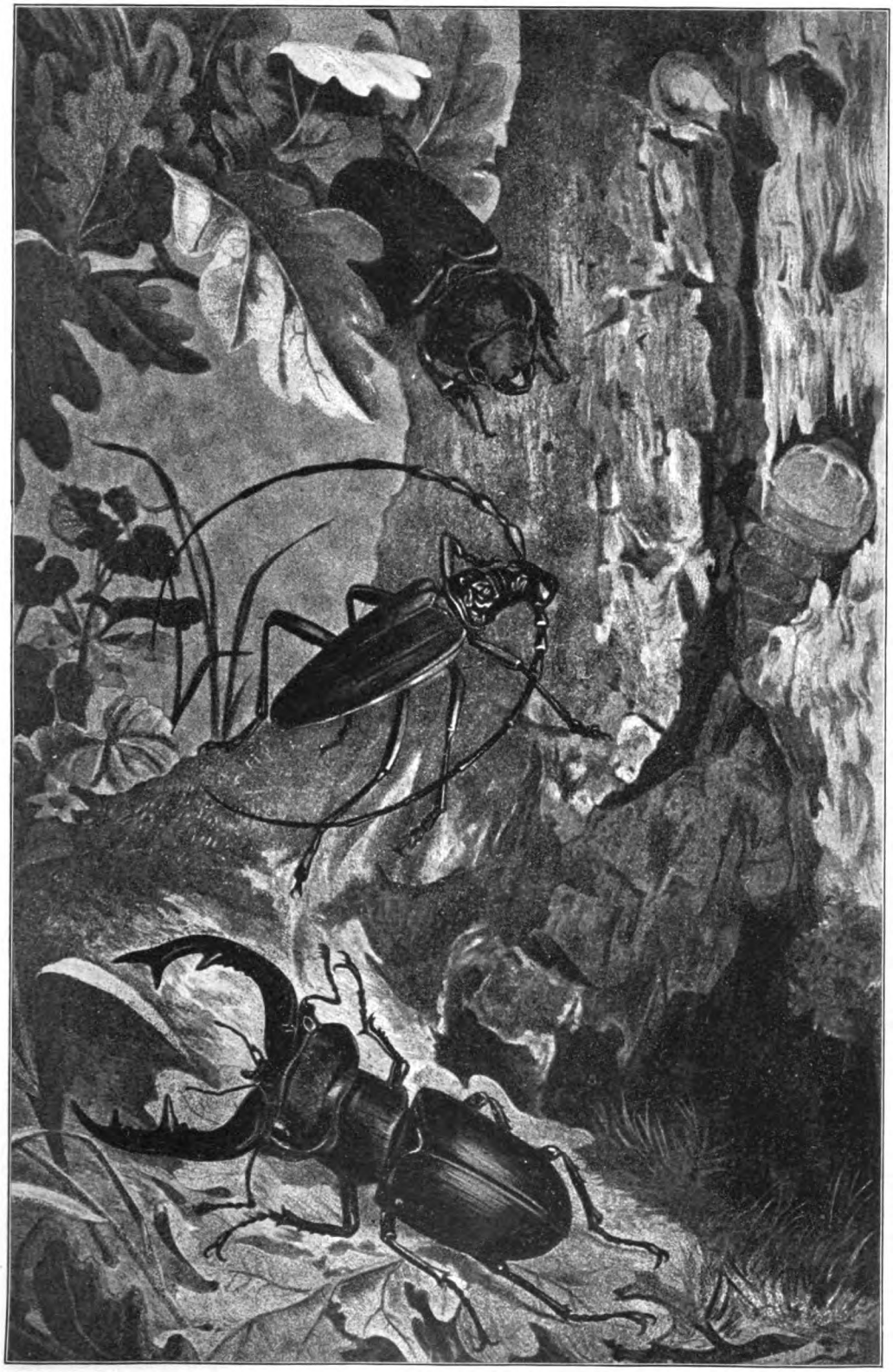
Coleman, John, American clergyman: b. Baltimore, Md., 11 Feb. 1803; d. St. Louis, Mo., 16 Sept. 1869. Until 1834 he was a Methodist. He entered the Protestant Episcopal ministry in 1836, and for 20 years was rector of Trinity Church, Philadelphia. He edited the religious paper Banner of the Cross (Philadelphia); and also edited Faber's 'Difficulties of Romanism' (1840); and Wilmer's 'Episcopal Manual' (1841).

Coleman, Leighton, American Protestant Episcopal bishop: b. Philadelphia 3 May 1837. He was graduated at the General Theological Seminary in 1861, was ordained to the Episcopal ministry in 1862, and after holding important rectorships, was consecrated bishop of Delaware in 1888. He has written 'The Church in America.'

Coleman, Lyman, American clergyman and scholar: b. Middlefield, Mass., 14 June 1796; d. Easton, Pa., 16 March 1882. He graduated at Yale 1817; taught in Hartford, Conn., 1817–20; was tutor in Yale 1820–5, studying theology at the same time. He was pastor of the Congregational Church in Belchertown, Mass., for seven years, when he again took up teaching. He studied in Germany 1842–3, where he formed a close friendship with Neander, and returning, taught German at Princeton and Amherst 1845–6. In 1856 he traveled extensively through the Orient. He was professor of Latin and Greek in Lafayette College from 1861 to 1868, when he was transferred to the chair of Latin, which he held until his death. His writings, which were highly praised and regarded in their day, are: 'Antiquities of the Christian Church' (1841), translated from the German; 'The Apostolical and Primitive Church' (1844); 'Historical Geography of the Bible' (1850); 'Ancient Christianity' (1852); 'Historical Text-Book and Atlas of Biblical Geography' (rev. ed. 1859); 'Prelacy and Ritualism' (1869); and 'Genealogy of the Lyman Family in Great Britain and America' (1872).

Coleman, William Tell, American pioneer: b. Cynthiana, Ky., 29 Feb. 1824; d. San Francisco, Cal., 22 Nov. 1893. In 1849 he made the overland trip to California, and opened several stores for the sale of mining supplies. When in 1851 the famous Vigilance Committee of San Francisco was formed to rid the city of its formidable criminal element, Coleman became one of the most active members. In 1856 the committee was revived in consequence of the murder of James King, an editor of William, Cal. Coleman took charge of the trials, resisted official pressure against interfering with "the people," directed the execution of Casey and the other murderers, and carefully avoided any clash with the United States authorities. From 1857 to 1864 he directed his business from New York, aided in suppressing the draft riot, and contributed liberally to patriotic benefactions. In 1877–8, at the request of the citizens of San Francisco, he organized the Committee of Safety, to fight Dennis Kearney and his sandlots mob, and in this was highly successful. In 1888 his firm failed with liabilities of $2,000,000, but in 1892 he personally paid off his entire indebtedness, more than he was legally bound to pay, with interest.

Colen'so, John William, English clergyman, bishop of Natal: b. Saint Austell, Cornwall, 24 Jan. 1814; d. Bishopstowe, Natal, 20 June 1883. He was educated at St. John's College, Cambridge; was assistant-master at Harrow 1838–42; resided at St. John's College 1842–6, when he was preferred to the rectory of Forncett, St. Mary, Norfolk, and on 20 November 1853 was appointed the first bishop of Natal. His numerous writings extend over a wide field. His treatises on arithmetic and algebra have become text-books in schools and universities. In 1853 he published a collection of 'Village Sermons'; in 1855 'Ten Weeks in Natal' and an edition of the 'Communion Service with Selections from the Writings of the Rev. F. D. Maurice'; in 1861 a 'Translation of the Epistle to the Romans Commented on from a Missionary Point of View.' In the following year public attention was widely attracted by the first part of his work on 'The Pentateuch and Book of Joshua Critically Examined,' in which the historical accuracy and



COLEOPTERA.

Mosaic authorship of those books were called in question. This work was condemned as heretical by slight majorities in both Houses of Convocation of the province of Canterbury in 1864, and Colenso was declared to be deposed from his see by his metropolitan, the bishop of Cape Town. The deposition was, however, declared null and void on appeal to the privy council in March 1865. Notwithstanding this decision the prelates forming the council of the Colonial Bishoprics Fund refused to pay him his income, and he appealed to the court of chancery. The master of the rolls delivered judgment on 6 Oct. 1866, ordering the payment in future of his income, with all arrears and interest, but declaring that if his accusers had refused payment on the ground of heretical teaching he should have felt it his duty to try that issue, an offer which they declined to accept. One of the results of this ecclesiastical quarrel was that the Anglican community of the Cape was divided into two hostile parties; Colenso still remained the only bishop of the Church of England in Natal, but the Rev. W. K. Macrorie was consecrated bishop of Maritzburg for the Church of the province of South Africa 25 June 1869. About the end of 1874 Colenso visited England, and during this visit he pleaded before the secretary for the colonies and other members of the government the cause of Langalibalele, a Zulu chief who had been dispossessed of his territory and imprisoned at Cape Town. From that time forward the humane bishop was foremost in advocating the cause of the aboriginals against the oppression of the Boers and the encroaching policy of the Cape officials supported by Sir Bartle Frere. The captive Cetewayo (see ZULULAND) appealed to Colenso to place his case before the English people, and it was mainly owing to the bishop's efforts that the Zulu king was allowed to go to England to plead his own case with the ministry. In the meantime Colenso continued his literary labors. 'The New Bible Commentary by the Bishops and Other Clergy of the Anglican Church Critically Examined' was published in 1871, the seventh and last part of his work on the Pentateuch in 1879, and 'Lectures on the Pentateuch and Moabite Stone' in 1873. Consult Cox, 'Life of Bishop Colenso' (1888).

Coleop'tera (Gr. *koleos,* a sheath and *pteron,* a wing), an order of insects the species of which are commonly known by the name of beetles. The insects which constitute the order *Coleoptera* may be characterized as having four wings, of which the two superior are not suited to flight, but form a covering and protection to the two inferior, and are of a hard and horny or parchment-like nature, and when closed their inner margins, which are straight, touch, and form a longitudinal suture. The inferior wings, when not in use, are folded transversely under the superior, and are membranous. The appendages of the mouth are well adapted for cutting, and the metamorphosis is complete.

Coler, Bird Sim, American politician: b. Illinois 1868. He removed to New York, and with his father, established the stock-broking firm of W. N. Coler & Company. He became active in Democratic municipal and State politics was elected comptroller in the first administration of Greater New York under the new city charter (1900–1), and was Democratic candidate for governor of the State in 1902. He has written 'Municipal Government, as Illustrated by the Charter, Finances, and Public Charities of New York' (1900).

Coleraine, kōl-rān', Ireland, a town in the county of Londonderry, situated on both sides of the river Bann, about four miles from its mouth, and 47 miles northwest of Belfast. It consists of a central square called the Diamond, and several diverging streets, and has long been celebrated for its fine linens. Its trade, chiefly in agricultural produce, and provisions, is considerable; and it has a valuable salmon fishery. There is regular steam connection with Glasgow. Pop. 6,800.

Coleridge, kōl'rĭj, **Christabel Rose,** English novelist: b. Chelsea, England, 1843. She is a daughter of Derwent Coleridge (q.v.), and for many years assisted Miss Charlotte Mary Yonge (q.v.) in editing 'The Monthly Packet.' She has published: 'Lady Betty' (1869); 'Hanbury Mills' (1872); 'Hugh Crichton's Romance' (1873); 'The Face of Carlyon and Other Stories' (1875); 'The Constant Prince' (1878); 'Kingsworth' (1881); 'An English Squire' (1881); 'The Girls of Flaxby' (1882); 'A Near Relation' (1886); 'A Plunge Into Troubled Waters' (1888); 'Reuben Everett' (1888); 'Amethyst' (1891); 'Waynflete' (1893); 'The Tender Mercies of the Good' (1895); 'The Main Chance' (1897); 'The Thought Rope' (1898); 'Tricks and Trials' (1899); 'The Winds of Cathrigg' (1901); 'Fifty Pounds'; 'The Green Girls of Greythorpe'; 'Life and Letters of Charlotte Mary Yonge' (1903).

Coleridge, Derwent, English clergyman and author: b. Keswick, England, 14 Sept. 1800; d. Torquay, Devonshire, 2 April 1883. He was a son of Samuel Taylor Coleridge (q.v.). He took orders in the Established Church, and engaging in teaching was master of the grammar school in Helston, Cornwall, 1825–40; and principal of Saint Mark's College, Chelsea, 1841–64. He was rector of Hanwell, Middlesex, 1864–80. He published 'The Scriptural Character of the English Church' (1839).

Coleridge, Ernest Hartley, English literary editor: b. 8 Dec. 1846. He is a son of Derwent Coleridge (q.v.) and was educated at Balliol College, Oxford. He engaged in tutoring 1872–93, and besides editing the 'Letters of Samuel Taylor Coleridge' (1895); 'Animæ Poetæ,' selections from unpublished notebooks of S. T. Coleridge (1895), and the 'Poetical Works of Lord Byron' (1898–1902), has published a volume of 'Poems' (1898).

Coleridge, Hartley, English poet: b. Clevedon, near Bristol, 19 Sept. 1796; d. Rydal, Westmoreland, 6 Jan. 1849. He was the eldest son of S. T. Coleridge (q.v.), and upon the elder Coleridge taking up his residence in the Lake district, Hartley and his brother Derwent were placed as day scholars under the charge of a clergyman at Ambleside. In 1815 he became a student at Merton College, Oxford, and having inherited his father's conversational talents, was soon in great request at the wine parties and other festivities of the undergraduates. An unfortunate propensity was thus formed for drinking, which proved even more ruinous than his father's craving for opium. He obtained a fellowship at Oriel College, but

forfeited it for intemperance before the close of his probationary year. He then left Oxford and resided for two years in London, contributing occasionally to the 'London Magazine,' in which his first sonnets appeared. His friends induced him against his will to settle at Ambleside for the reception of pupils, but this scheme, as might have been expected, failed. He continued, however, to reside in the Lake country, and during this period enjoyed the friendship and good offices of Wordsworth, who had taken a paternal interest in him from a child. He likewise employed himself extensively in study and literary composition, contributing to 'Blackwood's Magazine,' and producing a volume of 'Poems,' and 'Worthies of Yorkshire and Lancashire.' Many of his sonnets will rank with the finest in the English language, while the charming vivacity of his biographies leave only room for regret that he had not accomplished more as a prose writer. In 1839 he wrote a life of Massinger for an edition of his works published by Moxon. He was buried in Grasmere churchyard, adjoining the spot where Wordsworth was laid a few months afterward. A memoir, with a collection of poems written by him in his later years, was published after his death by his brother Derwent.

Coleridge, Henry Nelson, English writer: b. Ottery Saint Mary, 19 Sept. 1796; d. 26 Jan. 1843. He was a nephew of S. T. Coleridge (q.v.) and was educated at Eton and King's College, Cambridge. Having accompanied, in 1825, his uncle, the Bishop of Barbadoes, on a voyage to that island, on his return he published an account of his sojourn, under the title of 'Six Months in the West Indies.' He was called to the bar in 1826, and shortly afterward married his cousin Sara, only daughter of Samuel Taylor, and sister to Hartley Coleridge. In 1830 he published an 'Introduction to the Study of the Greek Classic Poets,' and after his uncle's death set himself to the task of committing to writing the reminiscences of Coleridge's conversation, which were published under the title of 'Specimens of the Table-talk of the late Samuel Taylor Coleridge.' He also edited the posthumous writings of his uncle, including three volumes of 'Literary Remains,' published in 1836 and 1838, and 'Confessions of an Inquiring Spirit,' in 1840.

Coleridge, Herbert, English philologist: b. Hampstead, Eng., 7 Oct. 1830; d. London 23 April 1861. He was a son of Henry Nelson Coleridge (q.v.), and was one of the original planners of the dictionary outlined by the Philological Society and which in subsequent years has expanded into the 'New English Dictionary on Historical Principles' in process of preparation from 1884.

Coleridge, John Duke Coleridge, Lord, Lord Chief Justice of England: b. London 3 Dec. 1820; d. 14 June 1894. He was the eldest son of Sir John Taylor Coleridge (q.v.), judge, a nephew of Samuel Taylor Coleridge. He was educated at Eton and Balliol College, Oxford, and was called to the bar at the Middle Temple in 1846. In 1855 he was appointed to the recordership of Portsmouth, six years later he became a queen's counsel, and soon afterward was chosen a bencher of the Middle Temple. From 1865 till 1873 he represented Exeter in the House of Commons as a Liberal, and in 1868 he became solicitor-general under Mr. Gladstone, being knighted at the same time. Three years later he became attorney-general, and in 1873 he was appointed chief justice of the court of common pleas. In the same year he was raised to the peerage as Baron Coleridge of Ottery St. Mary, and in 1880 succeeded Sir Alexander Cockburn as lord chief justice of England. Lord Coleridge distinguished himself very highly when acting as chief counsel for the Tichborne family in the famous trial of 1871–2. He was the first lord chief justice who was granted the office with his present title, instead of the older one of lord chief justice of the court of queen's bench. He visited the United States in 1883 and received much attention, especially from the members of his profession.

Coleridge, Sir John Taylor, English jurist: b. Tiverton, Eng., 1790; d. Ottery Saint Mary 11 Feb. 1876. He was educated at Oxford, where he and Keble became close friends, and was called to the bar of the Middle Temple in 1819. In 1835 he was appointed justice of the king's bench, and was sworn of the privy council in 1858. As a literary critic he took high rank, and besides editing an edition of 'Blackstone's Commentaries' (1825); published a 'Life of John Keble' (1869).

Coleridge, Miss M. E., English novelist: She has published: 'The Seven Sleepers of Ephesus' (1893); 'The King With Two Faces' (1897); 'Non Sequitur' (1900); 'The Fiery Dawn' (1901).

Coleridge, Samuel Taylor, English poet: b. Ottery Saint Mary, Devonshire, 21 Oct. 1772; d. Highgate 25 July 1834. One of his schoolfellows was Charles Lamb, with whom a lasting friendship was formed. While a mere boy Coleridge was remarkable for his wonderful conversational powers. He took little interest in the ordinary sports of childhood, and was noted for a dreamy abstracted manner, though he made considerable progress in classical studies, and acquired great celebrity for the admirable art with which he recited the ancient Greek poets. In 1791 he obtained a presentation to Jesus College, Cambridge. Here he remained for two years, but the only special distinction achieved by him was gaining the prize for a Greek ode. A rationalist at this period in religious, and a Republican in political matters, his ultra views on these subjects attracted the animadversions of his superiors at college. Owing, it is said, to a disappointment in love, he one day suddenly quitted Cambridge, proceeded to London, and after wandering about the streets for some time and giving his last penny to a beggar, enlisted in the 15th Dragoons under the name of Comberbach. In this new sphere his progress was far from brilliant, as he was a very awkward horseman and slow in acquiring a knowledge of military exercises. He is said to have written his comrades' letters, in return for which they would look after his horse and accoutrements. A correction of a Greek quotation which he ventured one day to address to his officer, revealed his real position, and a communication was in consequence established with his friends by which his discharge was effected. He now took up his residence at Bristol with Robert Southey, who had just been obliged to quit Oxford for his Unitarian opinions, and Lovell,

a young Quaker. The three conceived the project of emigrating to America, and establishing a pantisocracy as they termed it, or community in which all should be equal, on the banks of the Susquehanna. This scheme, however, never became anything more than a theory. In 1795 the three friends married three sisters, the Misses Fricker of Bristol. Coleridge about this time started a periodical, the 'Watchman,' which advocated extreme opinions in religion and politics, but did not live beyond the ninth number. In 1796 he took a cottage at Nether Stowey, in Somersetshire, where he was soon joined by Wordsworth and his sister, who came to reside in his neighborhood. The two young poets used to ramble together over Quantock Hills, and arranged together the collection of poems, entitled 'Lyrical Ballads,' which appeared in 1798, and contained Coleridge's 'Ancient Mariner.' He had previously, in 1796, published a collection of juvenile poems in cooperation with Charles Lamb. While residing at Nether Stowey he used to officiate in a Unitarian chapel at Taunton. An acquaintance had been formed by him some time previously with the Wedgewoods, and these friends now bestowed on him an annuity, and furnished him with the means of making a tour to Germany with Wordsworth in 1798–9. He attended the University of Göttingen, and made himself acquainted with the German language and literature. Having returned to England, he obtained literary employment in London, and his translation of Schiller's 'Wallenstein' was published. In 1800 he took up his residence at Keswick, where Southey joined him in a year or two, while Wordsworth lived at Grasmere in the same neighborhood. From this circumstance of the three poets inhabiting the same district, the epithet of the "Lake School" was affixed to them by the Edinburgh and other reviewers. Some time previously Coleridge had contracted the pernicious habit of opium-eating, which seriously impaired his mental and physical powers. About 1804 his health had considerably declined, and with the view of re-establishing it he proceeded to Malta, where he acted for a time as secretary to the governor. In 1808 he delivered a course of lectures on poetry and the fine arts, at the Royal Institution. A periodical, entitled the 'Friend,' was started by him at Penrith in 1809, but only reached the 27th number. His religious and political views had now undergone a great change from those professed by him in younger days, his rationalistic notions being abandoned for orthodox tenets, and his ultra-radicalism for conservative principles. In 1810 he quitted permanently the Lake district, and resided with various friends in London or elsewhere till 1816, when he located himself for the remainder of his life in the house of his friend Mr. Gillman, a surgeon at Highgate. Every attention and kindness was here shown him, and for a time he manifested a good deal of literary activity, publishing his 'Biographia Literaria'; his 'Essay on Church and State,' and his 'Aids to Reflection.' A conversazione used to be held weekly by him in Mr. Gillman's house, when for hours consecutively he would pour forth those unintermitting torrents of wondrous eloquence which enchained all listeners. Some idea may be formed of the variety and extent of his conversational powers from the two volumes of his 'Table-talk,' published after his death. In 1825 he was chosen one of the 10 royal associates on the incorporation of the Royal Society of Literature, and as such received an annuity of 100 guineas out of the king's private purse till the death of George IV.

In person Coleridge is described by Wordsworth as "a noticeable man, with large gray eyes." With an ardent and affectionate nature, his amiable qualities endeared him to the hearts of a large circle of friends, while at the same time his vacillating and irresolute character rendered him in a manner through life the creature of circumstances, and reduced many of his greatest efforts to the condition of magnificent fragments. His poetry eminently exhibits the peculiar characteristics of his mind, dreamy and transcendental, with at times glimpses of the mysterious and unseen, which break upon us like voices from another world. Such are his 'Ancient Mariner,' 'Christabel,' and 'Kubla Khan.' In sublimity of thought and expression even Milton has nothing superior to his 'Hymn at Sunrise in the Vale of Chamouni,' while his 'Genevieve' is an impersonation of tenderness and purity of sentiment. Some passages of his rendering of Schiller's 'Wallenstein' excel, in all the elements of poetic merit, those in the original. His metaphysical prose writings are little else than adaptations from the German Philosophers, whole pages being frequently merely translated from Schelling. As a critic of literature and the fine arts, Coleridge may be said to have schooled the minds of his younger contemporaries. His 'Literary Remains,' as well as specimens of his 'Table-talk,' were edited by his nephew, Henry N. Coleridge. Consult lives by Gillman (1838); Traill (1884); Caine (1887); Dykes Campbell (1894); Brandl, 'Samuel Taylor Coleridge und die Englische Romantik' (1886); Shairp 'Studies in Poetry and Philosophy' (1868).

Coleridge, Sara, English poet: b. Keswick 22 Dec. 1802; d. London 3 May 1852. She was the daughter of S. T. Coleridge (q.v.), and was married to Henry Nelson Coleridge in 1829. She inherited much of her father's genius and is known in the world of letters by her romance of 'Phantasmion,' and her editions of 'Aids to Reflection,' and other works to which she appended valuable disquisitions. She aided her husband materially in editing her father's works, and continued the accomplishment of this labor after his death. She is also the author of 'Pretty Lessons for Little Children,' which passed through several editions. Her 'Memoirs and Letters' appeared in 1873.

Coleridge, Stephen, English author and artist: b. 31 May 1854. He is a son of John Duke Coleridge (q.v.). He was educated at Bradfield College, and Trinity College, Cambridge, and was private secretary to his father 1884–90. He has exhibited pictures at Birmingham, Leeds, and elsewhere, is honorary secretary of the National Anti-vivisection Society, and has published 'Demetrius' (1887); 'The Sanctity of Confession' (1890).

Coleridge-Taylor, Samuel, an Anglo-African composer: b. London 15 Aug. 1875. His father was a native of Sierra Leone and his mother an English woman. He has composed many successful songs and waltzes, and an operetta entitled 'The Dream Lovers.'

Coles, kōlz, **Abraham,** American prose-writer and poet: b. Scotch Plains, N. J., 26 Dec. 1813; d. Monterey, Cal., 3 May 1891. In 1835 he graduated from Jefferson Medical College, Philadelphia. He published 13 original translations of the celebrated hymn 'Dies Iræ' (1859); 'Old Gems in New Settings' (1866); 'The Microcosm'; and 'The Light of the World' (1884).

Coles, Cowper Phipps, English naval architect: b. Hampshire 1819; d. 7 Sept. 1870. He early entered the navy, and became lieutenant in 1846, and captain in 1856. In 1855 he constructed a gun-raft which was favorably reported on; from 1856 he was engaged in experiments, and ultimately produced a form of turret-ship, the general idea of which had probably occurred to him independently, although its development owed much to the invention of John Ericsson (q.v.). A vessel was built from his designs, with little more than six feet of freeboard; it was commissioned as the Captain in 1870, and in September of that year turned bottom upward in a gale, and sank off Cape Finisterre, almost all on board, including Coles, being drowned.

Coleseed, a name commonly given to a variety of cabbage (*Brassica napus*) and its seed, the latter often being made into oil-cake for feeding cattle. See RAPE.

Colet, kŏl'ĕt, **John,** English divine, founder of St. Paul's School, London: b. London 1466; d. there 16 Sept. 1519. His father, Sir Henry Colet, was twice lord mayor of London. About 1493 he set out to make a continental tour, and became acquainted with several of the most eminent men of the time, and more especially with Erasmus. While on the continent, he studied Greek, canon, and civil law, and the writings of the fathers. In 1496 he returned to England, and in the following year he was ordained, took up his residence in Oxford, and lectured in Latin on St. Paul's Epistle to the Romans. He was an ardent advocate of the new learning and an admirable Biblical scholar. Erasmus was one of his audience at a later series of lectures on the First Epistle to the Corinthians, and from this time (1498) the two became warm personal friends. In 1505 Colet was appointed dean of St. Paul's. With Sir Thomas More and others he urgently advocated the reform of certain ecclesiastical abuses, but it is an utter mistake to suppose that he held anything in common with the spirit of the Protestant Reformation. St. Paul's School was founded and endowed in 1512, the earliest school in England in which Greek was a regular part of the curriculum. His writings are not numerous, but gave good evidence of his learning and piety. In 1867–76, J. H. Lupton produced an edition of those of Colet's works not published during the 16th and 17th centuries. The most recent biography is that by Lupton (1887).

Colet, Louise Révoil, loo-ēz rā-vwāl kō-lā, French poet and novelist: b. Aix, France, 15 Sept. 1810; d. Paris 8 March 1876. Four times between 1839 and 1855, poems of hers were crowned by the French Academy. She was a graceful lyrist, and often struck the chord of deep passion with effect. Of her verses, poured forth with marvelous facility, 'The Woman's Poem' is perhaps her best after the four offered to the Academy. Among her numerous novels, 'Bruised Hearts' (1843) may be mentioned. She also wrote several narratives of travel.

Colewort, kōl'wĕrt, a common name for several cultivated varieties of cabbage (q.v.).

Col'fax, Schuyler, American statesman: b. New York 23 March 1823; d. Mankato, Minn., 13 Jan. 1885. He removed in 1836 to Indiana, where in 1845 he acquired a newspaper at South Bend, which he made the most influential Whig journal in the district. He was a delegate to the Whig conventions of 1848 and 1852; was elected to Congress in 1854 by the newly formed Republican party, and re-elected until 1869, being thrice chosen speaker; and in 1868 he was elected vice-president of the United States, in Grant's first term. Implicated, unjustly, as he and his friends claimed, in the Credit Mobilier charges of 1873, he spent the remainder of his life in political retirement, making public appearances only on the lecture platform. He was the founder of the Daughters of Rebekah branch of American Odd Fellowship.

Colfax, Wash., city, county-seat of Whitman County. It is situated on the Palouse River, the line of the Oregon Railroad and Navigation Company, and 80 miles south of Spokane. It is a trade centre for the products of the fertile, surrounding country; grains, lumber, and live stock are the chief exports. Manufactures are increasing. The waterworks are owned by the city. Pop. 2,300.

Col'gate, James Boorman, American philanthropist: b. New York 4 March 1818; d. Yonkers, N. Y., 7 Feb. 1904. He was for some years a member of the dry goods firm of Colgate & Abbe in New York, and in 1852 formed a partnership with J. B. Trevor as dealers in stocks and securities. To Colgate University (q.v.) he gave several buildings and an endowment of $1,000,000, called the Dodge Memorial Fund, and also gave to other institutions.

Colgate, Samuel, American manufacturer: b. New York 22 March 1822; d. Orange, N. J., 23 April 1897. He was a son of William Colgate, founder of the soap and perfumery house of Colgate & Company. Samuel Colgate succeeded his father as head of the firm, and continued his father's generous benefactions to religious, educational, and charitable enterprises. With his brother, he erected Colgate Academy building in Hamilton, N. Y., at a cost of $60,000, and in recognition of their munificent gifts to Madison University, in the same place, the name of that institution was changed to Colgate University. He was a contributor to every charity in Orange, N. J., and at his death bequeathed to Colgate University his valuable collection of Baptist reports and literature, numbering 40,000 titles, in several languages.

Colgate University, an educational institution at Hamilton, N. Y., founded in 1819 as a school for the education of Baptist ministers. The collegiate and preparatory departments were later added. The name was originally Madison University, and was changed in 1890 in honor of the principal benefactors, the Colgate family. At that time James B. Colgate established an endowment fund of $1,000,000 in memory of Ebenezer Dodge, who was president for over 20 years. The theological seminary, which was at first a separate corporation,

was incorporated with the university, the professors being members of the university faculty; the preparatory department (Colgate Academy) is also a part of the university, and its principal a member of the faculty. The college has three distinct courses, leading to the degrees of A.B., Ph.B., and B.S., and provision is made for graduate work for the corresponding masters' degrees. The theological course (three years) leads to the degree of B.D. The library numbers nearly 35,000 bound volumes; besides this there is in the library building the Baptist Historical Collection, of about 60,000 volumes and pamphlets, the bequest of Mr. Samuel Colgate. At the end of 1902, the university reported 35 professors and instructors, 365 students (178 in the college); value of property over $2,100,000; president, George E. Merrill, D.D.

Colic, in pathology, a painful affection of the intestines, especially of the large bowel or colon, whence the name. The pain is due to spasmodic and irregular contractions of the colon, and is felt chiefly in the region of the navel. It is of a severe twisting character, and comes on in paroxysms, occasionally so severe that the patient rolls and twists about, usually doubled up and grasping his abdomen, and not seldom groaning or crying. Constipation of the bowels usually accompanies colic, and the pain may give rise to vomiting. Often, however, severe colicky pains are the forerunner of looseness of the bowels, caused by some food which has disagreed. The pain may be caused by wind, the discharge of which affords great relief. There is no fever with the attack, but the pulse is usually lowered, and the face pale and anxious-looking. In this respect colic differs from inflammatory attacks of the bowels. Pressure on the abdomen generally gives relief in cases of colic, but in cases of inflammation the patient cannot endure pressure. Whether the attack be one of colic or not may readily be learned from the attitude of the sufferer and the fact of his exerting or avoiding pressure. Treatment consists in applying hot cloths or bags of hot salt across the abdomen. Doses of medicine, such as castor-oil, should also be administered, and a large injection of water at a gentle warmth will probably bring relief. In the case of an adult patient 30 drops of laudanum may be given along with the castor-oil, or shortly after it. Magnesia and dill-water are also used as remedies for colic in young children. What is called biliary or renal colic is caused by the passage of gall-stones toward the bowels. It occurs oftener in women than in men.

Coligny, kō-lēn-yē, **Gaspard de,** French soldier: b. Châtillon-sur-Loing 16 Feb. 1517; d. Paris 24 Aug. 1572. After a brilliant military career he was made in 1552 admiral of France. He was distinguished for valor in battle, for strict discipline, and for his conquests over the Spaniards, in particular for his defense of St. Quentin. When St. Quentin was taken by storm, the admiral was made prisoner. After the death of Henry II., the intrigues of Catharine de Medici induced him to place himself at the head of the Calvinists against the Guises. He formed so powerful a party that the Catholic religion in France seemed to be in danger. Condé was more ambitious, enterprising, active; Coligny more considerate, prudent, and more fit to be the leader of a party; equally unfortunate in war with Condé, but skilled in remedying even what appeared irretrievable losses, and more to be feared after a defeat than his enemies after a victory. The first battle between the Huguenots and Catholics (1562, at Dreux) was lost by the admiral, but he saved his army. When the Duke of Guise was murdered at the siege of Orleans, he was accused of being the author of the murder. The civil war re-commenced with increased fury in 1567. Coligny and Condé encountered the Constable Montmorency at St. Denis. This indecisive action was followed by the battle of Jarnac in 1569, which was fatal to the Calvinists. Condé fell, and the whole burden of command devolved on Coligny. An advantageous peace seemingly put a stop to this contest in 1570. Coligny appeared at court, and was, with his adherents, loaded with favors. Charles IX. gave him 100,000 francs as an indemnification for his injuries, together with a seat in the council. From all sides he was warned not to trust to these caresses. As the admiral was leaving the Louvre 22 Aug. 1572 his right hand and left arm were wounded by a shot from a window. One Maurenal had fired at him from a building belonging to the monastery of St. Germain l'Auxerrois, according to the plan of Catharine de Medici, probably with the knowledge of the Duke of Guise. Charles testified the deepest sorrow, caused search to be made for the assassin, and said to Coligny, "My father, you have the wounds, but I the pain." This he said at the moment when the massacre of the Protestants was already prepared. The slaughter began on the night of St. Bartholomew's, 24 Aug. 1572. The Duke of Guise hastened with a numerous suite to the house of the admiral. One Behme, or Besme, at their head, entered with his drawn sword into the chamber of the old man, pierced him with several stabs and threw the body out of the window into the courtyard.

Coliidae. See MOUSEBIRD.

Colima, kō-lē'mä, Mexico, a state in the southwest of the United States of Mexico. It includes the four desert islands, Socorro, Rosa Partida, San Benedicto, and Clarion, which form the Revillagigedo group. The northern section of the state is occupied by the slopes of the Colima volcanoes. The Armeria River flows through the state, and the Coahuayana is on the boundary. There are two lakes, Cuyuthan and Alcuzague. The climate, except in the mountainous region, is hot and unhealthy. Rainfall is abundant, and malaria prevails. Salt, silver, gold, sulphur, and copper are found; about 170 species of trees, including fruit, and trees, the parts of which are useful for tanning, dyeing, clothing, food, and medicine. The chief products are coffee, cacao, tobacco, rice, cotton, indigo, sugarcane, cereal, and luguminous plants. The principal industries are agriculture, stock-raising, and working in the salt sections. Much of the trade is with the other states of Mexico, especially those along the coast, but it has a growing trade with Germany, Hawaii, and the United States cities on the Pacific. Exports are: rice, coffee, rubber, fruits, cabinet and dye woods, corn, hides and skins, and minerals. Imports are: woolen, linen, and silk

goods, foodstuffs, wines and liquors, glass-ware, firearms and ammunition. The Pacific Mail, Red Line, Izaquirre, and the Sinaloa and Durango Railway Company's steamers connect the port of Manzanillo with other ports, foreign and domestic.

Colima, Mexico, capital of the state of Colima. It is situated in a fertile valley, which is irrigated by the Colima River. The principal buildings are the city hall, cathedral, theatre, the station of the Mexican N. R.R., and a new market. It has an electric-lighting system, a street-car line, etc. (See COLIMA, THE STATE OF.) Pop. 18,977.

Colin Clout, kŏl'ĭn klowt, a satire by John Skelton. It was a vigorous pre-Reformation protest against the clergy's lack of learning and piety.

Colise'um, more properly **Colosseum,** a gigantic ruin in Rome, the greatest amphitheatre which Roman magnificence ever erected. It was commenced by Vespasian (reigned 69–79 A.D.), and practically finished by Titus about the year 80 A.D., who dedicated it with shows in which 5,000 animals were killed. It was built to furnish a place for amusements for the Roman people; such as gladiatorial combats, fights with wild beasts, and less harmless athletic sports. In the early days of Christianity it was the scene of the martyrdom of a number of the Christians. It is said to have held 100,000 spectators, of whom about 87,000 were seated. For the greater part it consists of travertine, is elliptical in shape, 1,680 feet in circumference, and 157 feet high, and has three rows of columns, one above the other: the lowest is of the Doric, the second the Ionic, and the highest the Corinthian order. The diameter of the arena from side to side was 182 feet, from end to end 285 feet. Down to the 6th century this monument of ancient grandeur remained almost uninjured, when Theodoric, king of the Goths, caused material to be taken from it for the construction of various buildings; afterward Pope Paul II. took all the stones from it, which were used for the construction of the palace of St. Mark, and in later times some other palaces were erected from its fragments.

Colitis, kō-lī'tĭs, a general term indicating a disorder of the large intestine or colon. Disease or disorders of the colon may be due to a large variety of causes. A simple diarrhœa may persist, becoming chronic, or an enterocolitis (q.v.), or the initial process may have been dysenteric in character and, persisting, may have become a chronic colitis (see DYSENTERY).

Col'lamer, Jacob, American senator: b. Troy, N. Y., 8 Jan. 1791; d. Woodstock, Vt., 9 Nov. 1865. He graduated at the University of Vermont 1810, studied law at Saint Albans, and was admitted to the bar 1813. He became associate justice of the Vermont supreme court 1833–42; representative in Congress 1843–7; was appointed postmaster-general in 1849, but resigned upon the death of President Taylor; was again elected judge of the Vermont supreme court and held that office until 1854, when he was elected United States senator and remained such until his death.

Collar-bone. See CLAVICLE.

Collars and Cuffs, Manufacture of. According to the United States Census of 1900, the manufacture of collars and cuffs is the most extremely localized industry in the country; of the total product, amounting annually to $9,077,700.00, $8,073,271.00, or 89½ per cent., is made at Troy, N. Y., and within the State of New York, 99.4 per cent. The relatively great extent of this localization is manifest when comparison is made with the two next greater localized industries,— oyster canning and preserving in Baltimore; and the manufacture of gloves, in the adjoining cities of Gloversville and Johnstown, N. Y., which are respectively 64.4 and 54.2 per cent. of the totals of the industries named. This localization is accounted for, first,— by the fact that this industry had its origin and development in Troy; second,— by the skill required in certain portions of the manufacture of collars and cuffs on the part of the operators; and third,— by the technical knowledge necessary on the part of the manufacturers. The importance of the industry to the city of Troy is manifest by the fact that the Census of 1900 reports, that of the 21,564 wage earners in the city, 14,822, or 68.7 per cent., are employed in the collar and cuff industry.

The collar trade, the detachable collar, is distinctively a Troy invention, and had its conception about 75 years ago, in the mind of the wife of a blacksmith, who is stated to have made for sale the first detachable collar, cutting it with scissors from a paper pattern. Prior to that time, shirts were made with collars attached. Arthur James Weise, in preparing his history, 'Troy's One Hundred Years,' devoted much time to the investigation of the early history of collar-making, and the credit is due him of rescuing from oblivion the facts regarding the inception of this industry. In 1829, Ebenezer Brown, a retired Methodist clergyman, at that time the proprietor of a small dry goods store, began making collars in quantities, and their manufacture soon became an important part of his business. The collars were known as «String Collars,» were worn with the old fashioned stock tie, and tied around the neck, with a string attached to each end of the collar, the band lapping at the back, and high points extending above the chin, on either side. About 1834, Orlando Montague and Austin Granger, doing business under the firm name of Montague & Granger, began the manufacture of collars, as a separate industry. In 1835, Independence Starks also engaged in the manufacture of collars, and a few years afterward added a laundry to his business, for the laundering of collars of other manufacturers, as well as his own. This was probably the first «Troy Laundry,» a name which has since attained a national reputation. In 1845, the manufacture of detachable cuffs was commenced. In the winter of 1851–52, Nathaniel Wheeler, of the then firm of Wheeler & Wilson, visited Troy to introduce his firm's recently invented sewing machine. Regarding that visit he wrote, «I particularly brought the attention of the manufacturers of collars and cuffs to the machine; most of them shook their heads, doubting the practicability of stitching collars by machinery. Among my visitors was Jefferson Gardner, who, seeming to be less skeptical, patiently examined

the machine and concluded to give one a trial.» In the Spring of 1852, several sewing machines were sent to his factory and their introduction led to the rapid increase of the industry. In 1855, O. W. Edson, of the firm of Bennett & Edson, was the first Troy manufacturer to apply steam power to the operation of sewing machines. In 1875, button-hole sewing machines were introduced, and without this invention the manufacture of collars and cuffs could not have reached its present proportions, for Troy requires annually the making of upwards of 500,000,000 button-holes, and it would not have been possible to obtain sufficient hand button-hole makers to make this vast quantity.

The manufacture of collars and cuffs is attended with great detail. The designing of patterns is a work of an expert, nearly every ply of a collar being cut from a different pattern, with "cut outs" to compensate for the extra thicknesses occasioned by the overlapping of the seams. The work is so classified that a single collar will go through upwards of 25 operations, performed by as many different operators, all especially trained to their particular division of the work. It is difficult to get accurate statistics regarding the collar and cuff industry, as it is of such comparatively recent origin that it did not have a separate classification in the United States Census, until 1900. The data below is taken from the United States Census report of that year, and, while not altogether satisfactory, gives perhaps the only statistical information that has any semblance of accuracy. The figures refer only to the collar and cuff industry, and do not include the shirt industry, which, with many of the larger Troy concerns, is carried on conjointly with the manufacture of collars and cuffs. The following data is for the year ending June 1900:

Total value of collars and cuffs made in the United States	$9,077,700
Total value of collars and cuffs made at Troy, N. Y.	$8,073,271
Total number wage earners in this industry in the United States	17,115
Total number wage earners in this industry at Troy, N. Y	14,822
Total wages paid in this industry in the United States	$5,658,969
Total wages paid in this industry at Troy, N. Y.	$4,956,427
Total number of dozens of collars and cuffs made in the United States	10,086,045
Total number of dozens of collars and cuffs made at Troy, N. Y	8,881,400

E. O. HOUSE,
First Vice-Prest., United Shirt & Collar Co.

Colla'tion. 1. In the canon law of the Anglican Church, the act of a bishop in appointing a clergyman to a benefice (whether rectory, vicarage, canonry, or prebend) when the living is in his own gift through lapse or otherwise. In such a case the combination of the act of presentation and admission or institution constitutes collation. In the Roman Catholic Church the word has much the same meaning when applied to the conferring of a benefice, except that some benefices are conferred by the bishop or some delegated ecclesiastic; others, and in a few cases only by special grant of the Pope, a king or an abbess. In several countries of Europe the right of conferring the higher ecclesiastical dignities is regulated by a concordat between the Holy See and the respective governments.

2. Collation, the name given to the restricted meal, sometimes permitted on fast days, usually food to the amount of about eight ounces or one fourth of an ordinary meal.

Col'lect (*Collecta*) in ecclesiastical language means a collection, as of alms, taken up during the church service; this is of apostolic origin, and St. Paul mentions the collections for the saints taken up on the first day of the week. Used in still another meaning it signified what collect still does in English, a brief prayer pronounced by the priest in celebrating Mass after the Gloria.

Collect or **Collect Pond,** a small lake in old New York. See NEW YORK.

Collec'tivism, a plan of social organization in which the means of production and distribution in a community would belong to the people collectively. The term is also applied to the theory that society should be so organized. In the collectivist commonwealth the people cooperatively organized would have full control of production and distribution. Collectivism does not involve the abolition of all private property, but only of private property in the means of production. Collectivism is considered by Socialists as the natural successor to the present social system, and is the form of organization which they seek to establish; hence the term collectivism is often used as synonymous with Socialism (q.v.).

Collector of the Port. See CUSTOMS.

Colleen Bawn, kŏl'ēn bân, **The,** a noted play by Dion Boucicault. It was based on Gerald Griffin's novel 'The Collegians' (1828) and was first played 10 Sept. 1860. The novel was republished in 1861 as 'Colleen Bawn or the Collegian's Wife.'

College (Latin, *collegium*), in its primary sense, a body of colleagues, a corporation or society of persons invested with certain powers and rights, performing certain duties, or engaged in some common employment. In Great Britain and America some societies of physicians are called colleges. So, also, there are colleges of surgeons, a college of heralds, etc. Colleges of these kinds are usually incorporated or established by the supreme power of the state. The most familiar application of the term college in English is to a society of persons engaged in the pursuits of literature or science, including both professors and students. At first the students of the universities had no common bond of union, except that of study and discipline, and were lodged where they could find it convenient. Then hostels or boarding-houses were provided (principally by the religious orders, for the benefit of those of their own fraternity), in which the scholars lived under a certain superintendence. Charitable persons subsequently endowed these hostels that poor scholars might have free lodgings. The colleges of Oxford and Cambridge are academical institutions of this kind, each endowed with revenues of its own, and having fellows, students, and tutors, who live together under a head, in particular buildings. Each college is regulated by laws framed by its founder, with such modifications as have been deemed necessary to introduce from time to time. According to these laws, the head (variously styled master, principal, warden, rector, etc.), is either chosen by the fellows from their own number, or appointed

by the crown or other authority. The fellows are graduates who receive special emoluments for a term of years, and are generally elected to the position on account of special scholarship; while the scholars, admitted as undergraduates, are either chosen from particular localities, schools, etc., or elected according to merit after free competition. There are also a number of ordinary students, all as a rule occupying chambers belonging to the college. The undergraduates receive their instruction chiefly from tutors, who are generally resident fellows. The colleges are subordinate to the university, and it is the university that confers degrees, and institutes and carries out the necessary examinations. Generally speaking, the term college implies an institution inferior to a university, so far at least as the right of conferring degrees is concerned; but in Scotland, Germany, and elsewhere there are no colleges such as those of Oxford and Cambridge, and the college or colleges in Scotland are simply edifices in which the teaching is carried on. Some modern colleges are called university colleges, either because equipped similarly to a university, or because connected with a university, and able to train students for degrees to be obtained from that university. Institutions for teaching theology are often called colleges, and some schools that train pupils for the universities, or give a good secondary education, are also so called.

In France there are university colleges or *facultés* in all large towns, besides *lycées*, corresponding to what are called, in Germany, *gymnasia*. Other institutions of a similar kind, that is, schools for secondary education, are called *colléges communaux*. These are public establishments aided by the communes, and subject to the direction of the public authorities. Besides these, there is the *Collége de France*, which deserves the name of a university. It was instituted in 1529 by Francis I., and here numerous professors, among whom there are always some of the most distinguished men, lecture publicly and gratuitously.

College, The American. *Its Place and Importance.*— The American college has no exact counterpart in the educational system of any other country, although its elements are derived from European systems, and in particular from Great Britain. And while it is true that the primary form of organization in our earliest colleges, such as Harvard, Yale, and Princeton, was inherited from the English University of Cambridge, still it was subjected to modification at the very beginning, to adapt the college to its community, and afterward it was progressively modified to assure close sympathy with the character of the growing American nation. The result is an institution with derived elements of composition, and in less degree of form, which has developed for itself an organization notably different from the old-world schools.

So the college, from the nature of its development, holds the central place in the historic growth of American higher education. It remains to-day the one repository and shelter of liberal education as distinguished from technical or commercial training, the only available foundation for the erection of universities containing faculties devoted to the maintenance of pure learning, and the only institution which can furnish the preparation which is always desired, even though it is not yet generally exacted, by professional schools. Singularly enough, the relation of directive influence sustained to-day by our colleges to the university problem is not unlike the relation held in the Middle Ages by the inferior faculty of arts at the University of Paris to the affairs of the university as a whole. In both cases the college, or faculty of arts, appears as the preliminary instructor in the essentials of liberal education; this earlier education is recognized as the proper requisite for later study in the professional faculties; and in both cases the inferior faculty contains the germ of the higher university faculty of pure learning, the faculty of arts, sciences, and philosophy. The reason for this similarity is that the American college in this respect perpetuates and develops a fundamental tradition of liberal learning, which found its way from Paris through Oxford to Cambridge, and then from Cambridge to our shores. The parallel of our college history with the old-world history holds good in other important respects. Still, in order to understand the precise nature and unique influence of the college in American education, it is not necessary to trace the story of its development, for in its various forms of present organization it reveals the normal type which has been evolved, survivals of past stages of development, instances of variation and even of degeneration from the type, and interesting present experiments which foreshadow the future.

The Old-fashioned College.—The three commonly accepted divisions of education into primary, secondary and higher stages, while fully recognized in America, are not followed rigorously in organization. Primary education is more clearly separable from secondary than secondary from the higher or university stage. The chief cause for this partial blending of the secondary and higher stages is the college. However illogical and indefensible such a mixture may appear the historical outworking of this partial blending has been compelled by the exigencies of our history and has been fruitful in good results.

The American college, then, as contrasted with European schools, is a composite thing— partly secondary and partly higher in its organization. It consists regularly of a four-year course of study leading to the bachelor's degree. Up to the close of the Civil War (1861–5) it was mainly an institution of secondary education, with some anticipations of university studies toward the end of the course, which, however, were usually taught as rounding out the course of disciplinary education, rather than as subjects of free investigation. The average age of graduation was about 20. The maximum course of preparation in secondary schools was four years. In the better schools they studied Latin and Greek grammar, four books of Cæsar, six books of Virgil's Æneid, six orations of Cicero, three books of Xenophon's Anabasis and two of Homer's Iliad, together with arithmetic, plane geometry (not always complete) and algebra to, or at most through, quadratic equations. This the stronger colleges required for entrance; but many weaker ones were compelled to teach some of these preparatory studies in the first two years of the college course. With few

and unimportant exceptions the four-year course consisted of prescribed studies, including English literature and rhetoric, Latin, Greek, mathematics, natural philosophy, chemistry, the elements of deductive logic, moral philosophy, and political economy, and often a little psychology and metaphysics. Perhaps some ancient or general history was added. French and German were sometimes scantily taught. At graduation the student received the degree of bachelor of arts, and then entered some professional school, or went into business or into teaching in the primary or secondary schools.

The College of To-day.— At the present time things are very different. The old four-year course, consisting entirely of a single set of prescribed studies leading to the one degree of bachelor of arts, has grown and branched in many ways. The better preparation now given in thousands of schools has enabled colleges to ask for somewhat higher entrance requirements and to exact them. The age of entrance has increased. In some quarters the increasing age of the students is shortening the course to three years, in order that young men may not be kept back too long from entering upon their professional studies. A generation ago a young man graduated at 20 or earlier without difficulty, and after two or three years in studying law or medicine he began to earn his living at 22 or 23. But to-day a college student is 22 years old at graduation, and if he studies law or medicine he must wait until he is 25 to begin earning his living. Accordingly boys are now passing in considerable numbers directly from secondary schools, which do not really complete their secondary education, to the professional schools. The problem is an economic one, and it is affecting college courses of study. One solution, to shorten the course to three years, has been advanced by President Eliot of Harvard, and three years is the length of the course in the undergraduate college established in connection with the Johns Hopkins University. Another proposal is to keep the four-year course and allow professional studies in the last year, thus enabling the student to save one year in the professional school. This experiment is being tried at Columbia. A third proposal is to keep the college course free from professional studies, but to give opportunities in the last year or the last two years to pursue liberal courses clearly underlying professional training, thus saving a year of professional study. This is the trend of recent experiments in Yale and Princeton. The one common consideration in favor of all these proposals is that a year is saved. Against the three-year course, it is argued that there is no need to abolish the four-year course in order to save a year. Against the admission of professional studies it is argued that work done in a professional school ought not to count toward two degrees representing two radically different things. Against the proposal to allow the liberal studies which most closely underlie the professions, it is argued that this is a half-way measure, after all.

Alterations in the Course.— The four-year course, however, no longer leads solely to the degree of bachelor of arts, and this old degree has been modified. With the founding of schools of science, aiming to give a modern form of liberal education based mainly on the physical and natural sciences, the degree of bachelor of science came into use. Then intermediate courses were constituted, resting on Latin, the modern languages, history, philosophy, mathematics, and science, and thus the degree of bachelor of letters or bachelor of philosophy came into use. Sometimes the various courses in engineering were made four-year undergraduate courses with their degrees virtually rated as bachelor's degrees. Still other degrees of lesser importance came into vogue here and there to mark the completion of a four-year college course. The dispersing pressure of the newer studies and the practical demands of American life proved too strong to be held in form or to be kept out by the barriers of the old course of purely liberal studies with its single and definite degree, and new degrees were added to represent the attempted organization of newer tendencies. Compared with the old course such courses lack definiteness of structure. They aimed to realize new and imperfectly understood conceptions of education, and were composed of studies whose inner content was changing rapidly, or else were "half-and-half" forms of education, difficult to arrange in a system that promised stability, as in the case of studies leading to the bachelor of letters or bachelor of philosophy. A graver source of trouble was the admission of various engineering and other technical studies as parallel undergraduate courses. This tended to confuse in the minds of students the radical distinction between liberal and utilitarian ideals in education, and by the attractiveness of the "bread-and-butter" courses, to diminish the strength of the liberal studies. When in addition it is remembered that the newer courses, whether liberal, semi-liberal, or technical, exacted less from preparatory schools in actual quantity of school work necessary for entrance into college, it will be seen that the level of preparation for college was really lowered.

The present drift of opinion and action in colleges which offer more than one bachelor's degree is more reassuring than it was some 20 years ago. There is a noticeable and growing tendency to draw a sharp line between liberal and technical education and to retain undergraduate college education in liberal studies as the best foundation for technical studies, thus elevating the latter to a professional dignity comparable with law, medicine, and divinity. The more this conception prevails, the more will college courses in engineering be converted into graduate, or at least partially graduate courses. Independent schools of technology may continue to offer their courses to young students of college age, but where such schools have been associated as parts of colleges or universities the tendency to a clearer separation of technical from liberal studies seems likely to prevail.

Another hopeful tendency gradually gathering strength is to give the various bachelor's degrees more definite significance by making them stand for distinct types of liberal or semi-liberal education. First comes the academic course, attempting a general liberal education, consisting of classical and modern literatures, mathematics, and science, with historical, political and philosophical studies, and leading to the bachelor of arts degree. The second aims to represent a strictly modern culture predomi-

nantly scientific in character, and culminating in the degree of bachelor of science. In this course technical aspects of the sciences taught tended to create a demand for strictly technological instruction. So schools of science do little save produce experts in the various mechanical and chemical arts and industries. Conscious of this difficulty, many schools of science have been giving larger place in the curriculum to some of the more available humanistic studies, especially French, German, and English. Economics, modern history, and even the elements of philosophy have found place. Some improvement has also been effected by increasing the entrance requirements in quantity of school work. But the course still suffers from an inner antagonism between technical and liberal impulses, and until it settles into a strictly technical form, or else comes to represent a strictly modern liberal culture, its stability cannot be regarded as assured. In the independent scientific schools, unassociated with colleges, it seems probable the course will keep or assume a highly technical form. But wherever it exists side by side with other bachelor's courses as a proposed representative of some form of liberal education, it will almost inevitably tend toward the ideal of a modern culture mainly scientific. But the process promises to be slow and difficult. For there is not only a financial risk, but a serious theoretical difficulty in realizing this form of liberal education. The antagonism between the technical and liberal impulses in the course seems very difficult to eliminate completely. For the utilitarian instinct of the time militates against devotion to the intellectual value of modern studies and tends more and more toward technical standards.

The third type of liberal college education is the intermediate course labeled with the degree of bachelor of letters or bachelor of philosophy. It differs from the other courses mainly in its treatment of the classical languages. To placate the practical spirit it drops Greek, but retains Latin both as an aid to general culture and as a help in learning the modern languages. Although indeterminate and intermediate, it serves a valuable end by providing many students, who do not care for the classical languages in their entirety, with a sufficiently liberal form of education to be of great service. Judged from the standpoint of the historical bachelor of arts course, it is a less general but still valuable culture. Judged from the standpoint of the bachelor of science course, it appears to escape the unhappy conflict between the technical and liberal impulses.

But some colleges, following the example of Harvard, have dealt with the bachelor degree very differently. The meaning of the degree has been radically altered, so as to represent the free selections made by the students themselves out of the range of liberal studies. In these colleges it no longer stands for the completion of a definite curriculum composed of a few clearly related central studies constituting a positive type. What it does stand for is not easy to define, because of the variation of practice in different colleges and the wide diversity of selection on the part of the student. In the undergraduate college connected with the Johns Hopkins University at Baltimore choice is regulated by prescribing moderately elastic groups of cognate studies, the student being required to say which group he will choose. In Harvard College the student is allowed to choose what he prefers, subject to such limitations as the priority of elementary to advanced courses in any subject, and the coincidence in time of various courses. A Columbia student in his senior year may pursue his first year's course in law or medicine, and at the same time receive double credit for this work, both toward the degree of bachelor of arts and toward the professional degree of doctor of medicine or bachelor of laws.

Other Phases of Change.— To what extent the undergraduate collegian has become a university student is the real question around which a controversy of vital importance is raging.

The profound change indicated by external symptoms has been in progress since the Civil War, and is still working along toward its consummation. The difficult thing in analyzing this change is not merely to understand the change from a uniform to a multiform mode of life and organization, but to understand what is changing the old-fashioned American college. But even the old-fashioned colleges, while aiming to follow out a single course of study ending in a single degree of single meaning, did not succeed in exhibiting such close individual resemblance to each other as is to be found among the lycées of France, the public schools of England or the gymnasia of Germany. Many colleges really served as preparatory schools for larger and stronger colleges, and many so-called universities did not attain and in fact do not yet attain to the real, though less pretentious dignity of the better colleges. For the sake of simplicity then we discard from our consideration all except the better colleges which, when taken together, exhibit the dominant tendency.

How, then, have these better colleges changed? Speaking generally, they have changed in a way which reflects the diversified progress of the country, and yet they have had an important influence in leading and organizing the national progress. Then, too, the change is not merely a change of form, but of spirit. In the older days scarcely any college had as many as 400 or 500 students, and the range of studies was limited. The faculty of the college exercised a strong paternal anxiety and oversight on behalf of the morals and religion, as well as over the studies of the students. The authority of the president was almost patriarchal in character. Not highly developed insight into the problems of education, but plain common sense in governing students was the condition of a successful presidency. The range of studies has increased. With the strengthening of preparatory courses, the school preparation of students has improved, and at the same time their average age at entrance has risen. The number of professors has multiplied. The old-fashioned college professor, the man of moderate general scholarship and of austere yet kindly interest in the personal welfare of those he taught, still remains; but at his side has appeared the newer type of American college professor, the man of high special learning in some one subject or branch, who considers it his primary duty to investigate, his next duty to teach, and his least duty to exercise a personal care for the individual students. Perhaps the old type will be replaced

by the new. Such a result, however, would not be an unmixed gain, and our finest college professors to-day endeavor to combine high special attainments as scholars with deep interest in the personal well-being of their students. The authority of the faculty is still sufficient, but is exercised differently. Student self-government is the order of the day, and the more this prevails the less is exercise of faculty authority found to be necessary. The presidents of our larger colleges, and even of many of the smaller, are becoming more and more administrative officers and less and less teachers. It is no doubt something of a loss that the students should not have the intimate personal acquaintance with the president enjoyed by students a generation ago, but mere numbers frequently make this impossible. Out-door sports have also entered to modify and improve the spirit of our academic life. They have developed their own evils, but at the same time have done wonders for the physical health of the students, the diminution of student disorders and the fostering of an intense *esprit de corps*. In the reaction from the asceticism of early college life there is little doubt athletics have gone too far. But the abuses of college athletics can be corrected, and are to some extent self-correcting.

Nearly all our colleges are avowedly or impliedly Christian. A respectable minority of them are Roman Catholic. The large majority are under Protestant influences, which are seldom denominational. The student is expected to attend certain religious exercises, such as morning prayers; but often all such attendance is voluntary. The religious life of the undergraduates finds its expression in various societies, which endeavor to promote the Christian fellowship and life of their members. While moral and religious convictions are freer and sometimes laxer than of old the Christian life in our colleges is real and pervasive.

As a rule the student is so absorbed by the scholastic, athletic, and miscellaneous activities of his college that he sees little outside social life. This is particularly true in colleges which enjoy truly academic seclusion amid rural surroundings, for here more than anywhere else is to be seen the natural unperturbed outworking of the undergraduate spirit.

Development of Elective Courses.—The non-scholastic aspects of our present college life are important in that they give tone to the whole picture, but they do not account for the great transformation which has been wrought, for that transformation is distinctly scholastic. It is caused by the increase of students, their better preparation and their greater age. The studies which made up the curriculum leading to the old bachelor of arts degree are now being completed before the end, sometimes by the middle of the college course. There is to-day no reason why a young man of 20 should not know as much as his father knew at 20. But at 20 his father had graduated with the bachelor of arts degree, whereas at 20 the son is only half way through his college course. As this fact forced itself upon the older and stronger colleges, experiments were made in granting a limited amount of elective freedom to students in the latter part of their course; first in the senior year and then in the junior year, until in some instances the whole four-year course is now elective. In some colleges a student may obtain the bachelor of arts degree without studying any science, or he may omit his classics, or he may know nothing of philosophy. To-day the problem of the relation of prescribed to elective studies is a question of constant interest and perpetual readjustment. The solutions offered are many.

The first proposal, which has now scarcely an advocate, is plainly an impossible one. It is to insist on the old-fashioned four-year prescribed course. But the old-fashioned course cannot be restored, because it no longer suits our age. Young men will not go to college and remain there until the age of 22 years without some opportunity to exercise freedom of choice in their studies.

The second proposal is to constitute the undergraduate course entirely, or almost entirely, of elective studies. It is argued that when a young man is 18 or 19 years of age, he is old enough to choose his liberal studies, and that his own choice will be better for him individually than any prescription the wisest college faculty may make. The advocates of this view admit its dangers. They see the perils of incoherency and discontinuity in the choice of studies. They see that many students are influenced, not by the intrinsic value of the studies, but by their liking for this or that instructor, or the companionship of certain students, or for the easiness of certain crowded courses. Yet they argue that the college student must be free at some time, that his sense of responsibility will be developed the sooner he is compelled to choose for himself, and that he will have the stimulating and sobering consciousness that what he does is his own act and not the prescription of others for him. Those who oppose this view argue that the academic freedom here proposed belongs to university rather than to college students; that the American freshman is not a university student in the sense in which that term has been commonly understood in the educated world, because of his much shorter preparatory training, and his mental immaturity as compared with the English and Continental student. If, therefore, he is to be as well educated as they are, some of his time in college, the first two years at least, should be spent in perfecting his properly secondary education before entering upon that elective freedom which has a place, and a large place, in our present undergraduate courses.

A third proposal is a conservative modification of the one just mentioned. It is to prescribe groups of cognate studies with the object of concentrating attention on related subjects in that field which the student may prefer. The advantage claimed for this mode is that it allows the student to choose the field of study he likes, and then safeguards him against incoherency by requiring him to pursue a group of well-related courses in that field. The advocates of wider freedom object to this as fettering spontaneity of choice, as not recognizing the fact that there are many students for whom it is advantageous to choose a study here and there at will, as a piece of side work outside the chosen field of their activity. The objection to this plan of restricted groups and also to the plan of practically unrestricted freedom, is that it offers temptations to pre-

mature specialization at the expense of liberal education.

Still another proposal remains to be considered. Its followers urge that the best type of liberal education is to be found in the historic academic course, which has been the centre and strength of American college life. They concede that other bachelor's courses may give a valuable education to many, provided these courses are consistently organized according to their own ideals. They hold that it is possible to ascertain with sufficient exactness just what studies ought to be prescribed as integral parts of these courses, and that the preliminary training given in these prescribed studies develops maturity in the young student and enables him to choose intelligently his later elective studies. At the present time, in their view, it is not wise to introduce elective studies until about the middle of the college course. These studies should be organized and related in a system, and connected with the underlying system of prescribed studies. The principle of freedom should be introduced gradually, not suddenly. A form of this view which finds a good deal of support is that elective studies should be introduced first of all in the form of extensions of subjects already studied by the student, in order that he may make his first experiment of choice in an area where he is most familiar. According to this view the second stage of elective studies should be the introduction of large general courses in leading subjects, accompanied by special courses for students of exceptional ability in special directions, and finally leading to as high a degree of specialization as the resources of the college will allow.

Modes of Instruction.— Instruction is still mainly conducted by recitation and lecture, the recitation finding its chief place in the earlier and the lecture in the later part of the course. For purposes of recitation the classes are divided into sections of 25 or 30 students, and the exercise is usually based on a definitely allotted portion of some standard text-book. Much has been done to improve the character of this exercise. The correction of mistakes, the attempt to lead the student to discover the cause of his mistakes, and the endeavor to teach the entire class through the performance of each individual, is the aim of the more skilful instructors. The professors most skilled in the art of conducting recitations, rather than those who depend wholly on lectures, leave the most abiding impression. While instruction by recitation continues with effectiveness in the latter part of the course, especially with smaller groups of students, yet instruction by lecture is the rule. The lecturer may have to face a class which enrolls as many students as the whole college contained a generation ago. He delivers his lecture, while those before him take notes, or as they listen, read a printed syllabus prepared for the use of the class, and add such jottings as may seem desirable. In many lecture courses the recitation is employed as an effective auxiliary.

But other forms of instruction find place. In all except elementary courses in science the laboratory plays a most important part, and even in lectures in introductory courses in physics, chemistry, or biology full experimental illustration is the rule. The library serves as a sort of laboratory for the humanistic studies. Students are encouraged to learn the use of the college library as auxiliary to the regular exercises of the curriculum. Certain books are appointed as collateral reading, and the written examination at the end of the term often takes account of this outside reading. That prolonged reading, which gives such wide and assuring acquaintance with the important literature of any subject, is as yet unattempted in a really adequate degree.

The academic year is divided into two (sometimes three) terms. At the end of each term the student is required to pass a fairly rigorous set of written examinations. Oral examinations have largely disappeared. Very rarely a high record of attainment in recitations during the term entitles a student to exemption from examination. In awarding honors the old academic college confined itself almost entirely to general honors. Honors for general eminence still remain in most colleges. The rank list of the class at graduation either arranges the students in ordinal position (in which case the first honor-man still appears) or else divides the class into a series of groups arranged in order of general scholarly merit. In such cases the old first honor-man is one of the select few who constitute the highest group in the class. But special honors in particular studies, while not unknown in the past, are really a development of our time. Undoubtedly they have tended to increase the interest of abler students in their favorite studies. A student trying for special honors is, of course, specializing in some sense, though he is not ordinarily pursuing original research. He is rather enlarging and deepening his acquaintance with some one important subject, such as history or mathematics.

Student Life.— At 18 the typical student of the older eastern college has completed a four-year course in some secondary school. He finds near at hand a local entrance examination conducted by a representative of his intended college. The days and exact hours of examination and the examination papers are the same as for the examination held at the college. His answers are sent on to be marked and estimated. In a week or two he receives notice of his admission to the freshman class.

Having passed his entrance examinations, he is now entitled to secure rooms in one of the dormitories, or else to find quarters outside the college campus in town. In the following autumn his name is enrolled in the matriculation book and his student career begins. His newness and strangeness naturally pick him out for a good deal of notice on the part of the older students, especially those of the sophomore class. But these annoyances soon cease unless he be vain or «very fresh.» The daily round of college exercises demands his attention, and in the class room he begins to pass through a process of attrition more beneficent in its spirit. Under the steady measuring gaze of the instructor, and the unuttered but very real judgment of his classmates who sit about him, he begins to measure himself and to be measured by college standards. He is learning something not down in the books! and what he is thus discovering is well pictured in the words of Prof. Hibben: «There is a fair field to all and no favor. Wealth does not make for a man nor the lack of it against him. The students live their lives

upon one social level. There is a deep-seated intolerance of all snobbishness and pretension. The dictum of the 'varsity field, 'No grandstand playing!' obtains in all quarters of the undergraduate life. It signifies no cant in religion; no pedantry in scholarship; no affectation in manners; no pretense in friendship. This is the first and enduring lesson which the freshman must learn. He learns and he forgets many other lessons, but this must be held in lively remembrance until it has become a second nature." His college comradeship continues and constitutes his social world. Day after day, term after term, they are thrown together in all the relationships of student life. Truly the American collegian is brimful of the "gregarious instinct."

In addition to this ever-present gregarious comradeship which environs and inspires him, our entering freshman finds the deeper intimacies of close individual friendship. As a matter of course he has some one most intimate friend, generally his room-mate or "chum." Side by side they mingle with their fellows. They stand together and, it may be, they fall together, and then rise together. And thus the class is paired off, and yet not to the lessening of the deep class fellowship. Here indeed is a form of communism, temporary and local, but most intense. They freely use things in common, not excepting the property of the college. They are welcome to enter each others' rooms at pleasure and use their friends' tobacco and stationery, or to borrow such articles of furniture and bric-a-brac as will brighten their own rooms for some special occasion. Money, however, stands on a different basis from other valuables. It is freely loaned for an indefinite time, but is strictly repaid. A student who lends his fellow money at interest cannot live in a college community.

Our student, unless he is an unusual recluse, takes some part in athletics. If he is not able to win a place on the football team or baseball nine or crew, which represents his *alma mater* in intercollegiate contests, he is very likely to be found playing ball in some organization improvised for the day, or trying his hand at tennis or golf. The bicycle is a necessity of his life, and on it he rides to recitations and lectures, to his meals and to the athletic field.

He has still other interests outside the curriculum. He may be a member of the voluntary religious society of the students. Perhaps he gets a place on the glee club or dramatic club. He may become one of the editors of the daily college paper or of the monthly literary magazine. Perhaps he is manager or assistant business manager for one or another undergraduate organization. Then there are the whist clubs and time-consuming chess clubs. There are also circles for outside reading and discussion springing up around the course of study, as well as the societies which train in speaking and debating. Perhaps he may win the distinction of representing his college in an intercollegiate debate, and success in intercollegiate debating is highly coveted. The contestants are greatly honored, for debating and athletics form the principal bond of union between the different colleges and give to their participants intercollegiate distinction.

Until the student passes out of freshman year, he is not always free to choose what kind of clothes he will wear. In some colleges freshmen are not allowed to wear the colors, except on rare occasions. But as soon as he becomes a sophomore he is free to do as he likes. Then he and his classmates suddenly appear wearing various hats, picturesque and often grotesque in appearance, and revel particularly in golfing suits. Toward the close of the course their daily dress becomes more conventional, though the universal interest in athletics continues to affect the student mode to the end. He has other amusements besides athletics, and these again are found in the student circle. His briarwood pipe goes with him almost everywhere. In the evening, when the work of the scholastic day is done, he sits with his comrades at an unconventional "smoker," or else they may gather round the table of some restaurant with pipe and "stein"; for the American student who drinks at all prefers beer to either wine or whiskey. At such evening sessions the different phases of student politics are discussed again and again. College songs are sung, the air being carried in that sonorous baritone which is the dominant sound in all our student music. Tales and jests fill out the hour. At the end the college cheer is given as the men start strolling homeward, singing as they go. Arrived on the campus they disperse, and their good-night calls echo from the doors and windows of the different dormitories. And so the day ends where it began; within that closed circle where every student lives in "shouting distance" of the others.

Our former freshman is getting on bravely toward the end of his course. The closing months of senior year pass swiftly. His class procession is preparing to march out into the world, and there take its place as a higher order of freshmen in the long file of the classes of alumni advancing with their thinning ranks toward middle manhood and beyond,—and when commencement is over his undergraduate life is ended.

What has he acquired in the four years? At least some insight into the terms and commonplaces of liberal learning and some discipline in the central categories of knowledge, some moral training acquired in the punctual performance of perhaps unwelcome daily duty and some reverence for things intellectual and spiritual. He is not only a very different man from what he was when he entered, but very different from what he could have become had he not entered. He is wiser socially. He is becoming cosmopolitan. Awkwardness, personal eccentricity, conceit, diffidence, and all that is callow or forward or perverse have been taken from him, so far as the ceaseless attrition of his fellow-students and professors has touched him. He has been unconsciously developed into the genuine collegian. He is still frank and unconventional. But he has become more tolerant, better balanced, more cultivated, and more open-minded, and thus better able to direct himself and others. It is little wonder his student affiliations last. As he goes out to take his place among the thousands of his fellow alumni it is natural that his and their filial devotion to their academic mother should last through life. No matter what university he may subsequently attend, here or abroad, his college allegiance

remains unshaken. It is this which explains the active interest shown by our alumni. In the best sense they advertise their college to the public, and it is to their exertions the recent rapid advancement of many of our colleges is largely due.

Organization and Administration. — The form of government is simple. A college corporation, legally considered, consists of a body of men who have obtained the charter and who hold and administer the property. Where a particular State has established a college or even a university, which regularly includes a college, the members of the corporation are commonly styled regents, and are appointed by the State to hold office for a limited term of years. But most colleges have been established as private corporations. In this case the title is vested in a board of trustees, sometimes composed of members who hold office for life, or else composed of these associated with others who are elected for a term of years. Boards of trustees holding office for life usually constitute a close corporation, electing their own successors as vacancies occur. The two chief functions of such governing bodies, whether known as regents or trustees or by any other name, are to safeguard the intent of the charter and to manage the property. They give stability to our college system. To carry out the main purpose for which the charter was obtained they create a faculty of professors and instructors and entrust the general headship to a president. The president and professors usually hold office for life. In some places provision is made for the retirement of professors on pensions as they grow old. Instructors and sometimes assistant professors are appointed for a limited time, such appointments being subject to renewal or promotion. In the larger colleges the president is assisted in his administrative work by one or more deans. By immemorial tradition the president and faculty are charged with the conduct of the entire instruction and discipline. They have the power to admit and dismiss students. The conferring of degrees belongs to the corporation, but this power is almost invariably exercised according to recommendations made by the faculty. Honorary degrees, however, are sometimes given by the trustees or regents on their own initiative.

In State colleges the income is derived from taxation; in others from endowments, often supplemented by annual subscriptions for special purposes. But the private colleges are cut off from dependence on the State, and have to rely on private gifts. This stream of private liberality flows almost unceasingly. The fact that many colleges are integral parts of real or so-called universities makes it difficult to say how much the specifically collegiate endowments and incomes amount to. But a few significant facts may be mentioned. No college president, unless he is at the same time the president of a university, receives as high a salary as $10,000 annually. He is more likely to receive $4,000, $5,000, or $6,000. While $2,000 is considered a good professor's salary in small colleges, $3,000 is a usual salary in the larger colleges, while few professors receive more than $4,000.

The expenses of individual students vary greatly. In some places there is no charge for tuition; in others they must pay as much as $100 or $150. In little country colleges the total cost for a year often falls within $300; in the larger old eastern colleges, drawing patronage from all parts of the land, the student who must pay all his bills and receives no aid in the form of a scholarship can hardly get along with less than $600 or $700, exclusive of his expenses in the summer vacation. The average expenses in some of the oldest colleges, according to tables prepared by successive senior classes, is higher than this, running up to $800 or $900, or even more. But these institutions afford the student of limited means multiplied opportunities for self-help. Moreover many colleges possess scholarships which are open to able students who need temporary pecuniary help. The young American of narrow means, if he be of fair ability and industry, can almost always manage to find his way through college.

The College is American.— The college lies very close to the people. Distinctions of caste may manifest themselves occasionally, and yet the college is stoutly and we believe permanently democratic. Its relation to the better side of our national life has been profoundly intimate from the beginning. The graduates of Harvard and Yale in New England, of Princeton and Columbia in the Middle States, and of the College of William and Mary in Virginia contributed powerfully to the formation of our republic. Edmund Burke attributed the "intractable spirit" of the Americans to "their education," and by this he meant the college education. "The colleges," wrote President Stiles, of Yale shortly after the Revolution, "have been of signal advantage in the present day. When Great Britain withdrew all her wisdom from America this revolution found above 2,000 in New England only, who had been educated in the colonies, intermingling with the people and communicating knowledge among them." John Adams of Harvard delighted to find in President Witherspoon of Princeton "as high a son of liberty as any in America." Hampden-Sidney College in Virginia, founded about the time of the Revolution, incorporated in its charter the following clause: "In order to preserve in the minds of the students that sacred love and attachment which they should ever bear to the principles of the ever-glorious Revolution, the greatest care and caution shall be used in selecting such professors and masters, to the end that no person shall be so elected unless the uniform tenor of his conduct manifest to the world his sincere affection for the liberty and independence of the United States of America." And from that day to this the collegiate spirit and the national spirit have been at one. Rightly, indeed, did our appreciative French visitor, Baron Pierre de Coubertin, perceive that the place to find "the true Americans" is in our college halls; "*les vrais Americains, la base de la nation, l'espoir de l'avenir.*" Scarcely one in a hundred of our white male youth of college age has gone to college. But this scanty contingent has furnished one half of all the presidents of the United States, most of the justices of the supreme court, not far from one half of the Cabinet and of the national Senate, and almost a third of the House of Representatives. No other single class of equal numbers has been so potent in our national life.

Statistics.— College students are found in greatest numbers in the belt beginning in New

England, passing southwestward through the Middle States, and thence extending broadly across the middle west. These northeastern and north-central portions contain 70 per cent of the college students and 63 per cent of the population of the whole country; 114 colleges, exclusive of colleges for women, enrolling 31,941 students and generally possessing the largest endowments, are under no ecclesiastical control; 59 colleges, enrolling 5,954, are Roman Catholic; 284 are under the control of various Protestant denominations and enroll 29,104. It thus appears that the division of student enrollment between non-sectarian and sectarian colleges is not very uneven, but the non-sectarian colleges show an average enrollment of nearly 300 and the church colleges of about 100.

A little more than half our collegiate undergraduates, who seek any degree, are studying for the degree of bachelor of arts, which still generally means, with some important exceptions, that they have had a classical education. The figures for the bachelor of letters and the bachelor of philosophy may be properly associated in one total as representing the intermediate type, which enrolls a little more than one third of the number studying for the bachelor of arts. The figures for the bachelor of science do not materially differ from the total for the bachelor of philosophy and bachelor of letters.

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College Park, Md., a village in Prince George County, on the Baltimore & O. R.R., about nine miles northeast of Washington, D. C. It is a favorite suburb of Washington, and contains an experiment station and the Maryland Agricultural College. Pop. 325.

College View, Neb., a village in Lancaster County, about four miles southwest of Lincoln. The village is really a cluster of houses, stores, and workshops, built around or near Union College, a Seventh-Day Adventist institution established in 1891. Pupils from several places in Europe are in attendance at this school. Pop. 900.

College of the City of New York, The, originally entitled the Free Academy, was established in 1848, for boys, by the board of education of New York City. In 1854 the legislature of the State passed a law endowing the school with collegiate powers and privileges; and in 1866 the name was changed to that of "The College of the City of New York." The institute possesses all the powers and privileges of a college pursuant to the revised statutes of the State of New York relative to colleges, visitation of regents of the university, granting of degrees, etc. Prior to 1882 one condition for admission was attendance for at least one year at the public schools of the city. In the year 1882 the legislature repealed so much of the statute as related to this condition, and now the college is open to all young men of the city of proper age and preparation. Instruction, the use of text-books, and apparatus are free. The courses of study extend over seven years, three academic or preparatory and four collegiate years. The number of students in attendance in 1903, 2,200; number of graduates, 200; volumes in library, 36,876. Purchases of books are made with the income of the Seth M. Grosvenor fund of $30,000 and the Ephraim Holbrook fund of $5,000. In 1903 plans were perfected for the removal of the institution from 23d Street and Lexington Avenue to Washington Heights, in the upper part of the city. The new buildings already designed will eclipse in size and beauty any like institution in the United States, if not in the world.

Collége de France, kŏl-lăzh dė fräns, a celebrated institution founded by Francis I. in 1530, originally a *Collége de Trois Langues* or a college in which would be taught Greek, Hebrew, and Latin, is a very important educational institution, now giving instruction over a very wide field of literature, history, and science. It is independent of the University of France, is under the direct supervision of the minister of public instruction, and is supported by the government. As in the Sorbonne, the lectures are gratuitous, and for the most part are designed to attract auditors older than ordinary university students. The college comprises two faculties, one literary, one scientific; each has about 20 professors. Among the professors have been some of the most distinguished scholars and scientists in France, such as Laboulaye, Gaston de Paris, Saint-Hilaire, Ramus, Rollin, and many others.

College Fraternities. See GREEK LETTER SOCIETIES.

Colleges for Women, institutions of higher learning, designed to give women practically the same advantages of instruction and research as are afforded to men. They are of three types: independent or separate colleges; coördinate or affiliated colleges, connected more or less closely with an older college for men, and coeducational colleges.

1. Independent colleges for women of the same grade as those for men are peculiar to the United States. The earliest foundation was Mount Holyoke College, opened as a seminary in 1837; reorganized as a college in 1893. It has graduated more than 3,000 students. The first charter for a collegiate institution founded only for women in the United States, was granted Elmira College in 1855. The four colleges, Vassar, opened in 1861; Smith, in 1875; Wellesley, in 1875, and Bryn Mawr, in 1885, are ranked among the 58 leading colleges of the United States in point of endowment and wealth of equipment, number of teachers and students, and variety of courses of study offered. Wells College, founded as a seminary in 1868, chartered a college in 1870, and the Woman's College of Baltimore, opened in 1888, also have good endowments and high standards. The standing of all these institutions is higher than many of the so-called universities of the country, and the degrees conferred are the same as those given in the men's colleges.

2. The affiliated colleges for women are five: Radcliffe College, at Harvard University, opened in 1879; Barnard College, at Columbia University, in 1889; Woman's College, of Brown University, in 1892; College for Women, of Western Reserve University, in 1888; Sophie Newcomb Memorial College, at Tulane University, in 1886. In all these colleges the standards of entrance and graduation are the same as in the men's colleges with which they are affiliated, and usually the instructors are the same.

3. The prevailing system of education in the United States for both men and women, began in Oberlin College, in Ohio, founded in 1833, chartered as a college in 1850, built "for the education of both sexes and all colors." Antioch College, also in Ohio, followed in 1853, by admitting both men and women on equal terms. In 1900 every State university in the country, except those of Virginia, Georgia, and Louisiana, admitted women. Of the 480 colleges for men in the United States enumerated by the commissioner of education, 336, or 70 per cent, admit women, or, omitting Catholic colleges (which do not admit women), 80 per cent. In the list of the 58 leading colleges in the United States there are only 10 to which women are not admitted in some departments.

Many professional schools and colleges have been opened to women in theology, law, medicine, dentistry, pharmacy, schools of technology, and agriculture, and the number of women entering these professions is increasing rapidly.

In 1890–1900 the increase of women students in medicine was 64.2 per cent; in dentistry, 205.7 per cent; in pharmacy, 190 per cent; in technology and agriculture, 194.7 per cent.

There were, in 1900, in the United States, more than 20,000 women college graduates, and the number is growing so rapidly that it may be considered a national movement. In Europe the advance in this direction has been much slower. The first woman's college in Cambridge, England, was begun in 1869. Now Oxford and Cambridge give large opportunities to women, but do not confer upon them their degrees. With these exceptions, all the greater English and Scotch universities and colleges in Great Britain and in her colonies give their degrees to women. Outside of Germany, Austria, and Russia, all European university degrees are open to women. Yet Russia has the distinction of having first given women the opportunity of studying medicine on the same terms with men, and to most of the lecture rooms of German-speaking universities women are admitted by special favor, while every year sees more German universities giving their highest degrees to women.

Other colleges in the United States for women are: Trinity College, Washington, D. C., faculty, 25, nearly all of whom are Sisters of the order of Notre Dame; College de Notre Dame de Maryland, Baltimore, Md., faculty, school Sisters of Notre Dame and seculars; College of St. Agnes, Mount Washington, Md.; St. Elizabeth's College, Convent Station, N. J., faculty 25, 20 Sisters of Charity, and 5 seculars; St. Mary's College, Notre Dame, Ind.; and Notre Dame College, San Francisco, Cal.

ALICE FREEMAN PALMER,
Late President Wellesley College.

Colleges, Land Grant, colleges established and maintained in whole or in part by the Land Grant Act of 2 July 1862. Justin S. Morrill, a representative from Vermont, introduced in Congress the first bill asking that grants of government land be donated for the purpose of aiding in the education of the people, in scientific and technical subjects. This bill, introduced in the lower House 14 Dec. 1857, authorized the establishment of colleges of agriculture and mechanical arts in all States, and provided for the support of said colleges, 20,000 acres of land for each senator and representative. The bill passed both Houses but was vetoed by President Buchanan. In December 1861 Mr. Morrill introduced a new bill, bestowing 30,000 acres of land for each member of Congress for the establishment and maintenance of industrial colleges. Ben Wade, of Ohio, introduced the bill in the Senate. The House committee on public lands made an adverse report, but the bill passed both Houses and was approved by President Lincoln 2 July 1862. This act gave to the cause of industrial education 30,000 acres of land for each senator and representative in Congress to which the States were entitled by apportionment of the census of 1860, or in all, about 13,000,000 acres of land for educational purposes. The act was entitled "An act donating public lands to the several States and Territories who may provide colleges for the benefit of agriculture and mechanical arts." The object of the act is expressed as follows:

"The endowment, support and maintenance of at least one college where the leading objects shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and mechanic arts, in such manner as the legislatures of the States may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life."

In 1889 Mr. Morrill and others began to form plans to secure another appropriation, and Mr. Morrill introduced another bill in Congress, providing that there shall be appropriated annually to each State out of the funds arising from the sale of public lands, the sum of $15,000 for the year ending 30 June 1890, and an annual increase by the additional sum of $1,000 to such appropriation for 10 years thereafter until the appropriation shall become $25,000, at which figure it shall remain fixed.

The bill passed both Houses and was approved by President Harrison 30 Aug. 1890. The act says that this appropriation shall be applied "only to instruction in agriculture, the mechanic arts, the English language, and the various branches of mathematical, physical, natural and economic science, with special reference to their applications to the industries of life, and to the facilities for such instruction." Provision was made at this time for separate institutions for white and colored students in such States as desired to make this arrangement.

The reports for the year ending 30 June 1901, received by the Commissioner of Education from the presidents of the land grant colleges, show that the States have received 10,320,843 acres of land, of which 1,030,572 acres remain unsold. The invested funds from the sale of the land amount to $10,806,780, yielding an income of 6.3 per cent. Unsold lands are held by 17 States.

The total number of students in the agricultural and mechanical departments was 29,950, of which number 23,872 were men and 6,978 women. (For information in detail about each land grant college, consult 'Report of Commissioner of Education,' Vol. II. 1901.)

Colleges for Teachers, or colleges in which are special departments for the study of the history of education, psychology as applied

to teaching, pedagogy, and all subjects bearing upon methods of instruction.

To the English schoolmaster, Richard Mulcaster, is given the credit of being one of the first, if not the first, to propose a college for the training of teachers. He classified his chief reasons for desiring the establishment of such a school under four heads: (1) Importance of the work, it will make or mar the State; (2) The great numbers who are to teach and be taught; (3) Need of the profession of teaching, professors must be trained; (4) That teachers may acquire wisdom in arranging and presenting subjects, in economizing time, and that they may attain staidness of demeanor.

Instruction in the science and art of teaching was included in the university scheme that was proposed for Columbia College in 1858, but then without avail. Again President Barnard urged the same plan, which he now worked out much more fully, upon the trustees of the same college in 1881 and 1882. The next step forward was the organization in New York, in 1888, of Teachers' College, which was chartered the following year. While this college was organized outside of the Columbia system, it was still under the control, in great part, of Columbia men, and was loosely affiliated with the college. The last step in the evolution came in 1898, when Teachers' College was made an integral part of the educational system of Columbia University. The president of Columbia is president also of the college, and the university professors of philosophy and education and of psychology are members of its faculty, while the college is represented in the university council by its dean and an elected representative. The college, however, continues its own separate organization, having its own independent board of trustees, which is charged with the sole financial responsibility of its management.

Teachers' College is the professional school of Columbia University for the study of education and the training of teachers, ranking with the schools of law, medicine, and applied science. The university accepts courses in education as part of the requirement for the degrees of A.B., A.M., and Ph.D.; while graduate students who prefer to devote their entire time to professional study may become candidates for the higher diploma of the college. The college diploma is conferred upon students who have successfully completed some one of the general courses, and a departmental diploma upon those who have fitted themselves for particular branches of school work. Undergraduate students of Columbia and Barnard colleges may, if they desire, obtain the diploma of Teachers' College at the same time that they receive the degree of bachelor of arts. The Horace Mann school, fully equipped with kindergarten, elementary, and secondary classes, is maintained by Teachers' College as a school of observation and practice.

These are the undergraduate courses: Secondary course leading to the degree of A.B. and the college diploma; general course leading to the college diploma in elementary teaching; general course leading to the college diploma in kindergarten teaching. Then there are several courses leading to the college diploma in art, domestic art, domestic science, and manual training. Candidates for the first of these courses must be either college graduates or candidates for the degree of A.B. in Columbia University. There is a combined course of study prescribed for the degree of A.B. in Columbia University and the diploma of Teachers' College; but particulars must here be omitted. Graduate work is also well developed. For the year 1898-9 the teaching staff counted more than 60 persons.

New York University School of Pedagogy, established in 1890, aims to furnish graduate work equal in range to other professional schools. The school is an organic part of the university, having its own dean and faculty. More definitely, its aim is declared to be to furnish thorough and complete professional training for teachers. The plan of the school places it upon the same basis as that of the best schools of law, medicine, and theology. The work is of distinctively university grade, and graduates of colleges and normal schools, and others of equal experience and maturity, may find in this school opportunity for the thorough study of higher pedagogy. In 1898-9, the instruction was distributed in four major and eight minor courses, namely, history of education; physiological and experimental psychology; analytical psychology; history of philosophy; physiological pedagogics; elements of pedagogy; comparative study of national school systems; æsthetics in relation to education; sociology in relation to education; institutes of pedagogy, ethics, school organization, management, and administration. Special facilities for research are offered to the seminaries. The degree of master of pedagogy is conferred upon candidates who have completed five of the foregoing courses, three of them majors; the degree of doctor of pedagogy, upon candidates who have completed the four major and five of the minor courses. The school does not attempt undergraduate work. There is no practice teaching, but opportunity is given for the critical observation of selected schools. The staff includes 10 persons.

Clark University, opened in 1889, has given much attention to education from the first, and the subject has now been made a sub-department in the department of psychology, in which a minor may be taken for the degree of doctor of philosophy. The work is intended to meet the needs of those intending to teach some other specialty than education, but who wish a general survey of the history, present state, methods, and recent advances in the field of university, professional, and technical education, and of those who desire to become professors of pedagogy, or heads of instruction in normal schools, superintendents, or to become professional experts in the work of education. The program for the year 1899 included (1) child study, educational psychology, and school hygiene; (2) principles of education, history of education and reforms, methods, devices, apparatus, etc.; (3) organization of schools in different countries, typical schools and special foundations, motor education, including manual training, physical education, etc., moral education, and ideals. Great stress is placed on original investigation. The president, Dr. G. Stanley Hall, has been from the first the leader of the child study movement in the United States. 'The Pedagogical Seminary,' edited

by him, is the organ of the educational department of the university. It is an international record of educational research and literature, institutions, and progress, and is devoted to the highest interests of education of all grades. One of its most valuable features is its digests of meritorious contributions to educational literature.

The department of pedagogy in the University of Chicago has as its primary aim to train competent specialists for the broad and scientific treatment of educational problems. The courses fall under three heads: Psychology and related work, educational theory, and the best methods of teaching the various branches. Stress is laid upon the relation of pedagogy to other subjects, and courses are offered in the proper departments in which the methodology of such subjects is employed. For the year 1898–9 such courses were offered in history, sociology, and anthropology, in the English, German, and Latin languages and literatures, in mathematics, and in geology. The courses in educational theory are preceded by the introductory courses in psychology, ethics, and logic, given in the department of philosophy.

The University of Chicago has also established a college for teachers on a somewhat novel plan. This institution, which was founded in October 1898, is an outgrowth of the class study department of the extension division of the university. It is a "downtown" college, and aims to provide instruction of high grade for busy people; or, more definitely, "for any and all persons qualified to do the work, who are so engaged by other imperative duties as to make continuous attendance at the other colleges of the university impracticable." The work of the new college is of the same grades as that of the other colleges of the university. Students may take much or little, according to their ability and wishes, but when the requirements have been met, the work is crowned with a degree. The school aims at scientific, cultural, and disciplinary results. It distinctly denies that it is in any sense a normal school. Moreover, while it is not exclusively a teachers' school, the college, nevertheless, emphasizes instruction suitable to the special needs of teachers sufficiently to justify its name. The distinctively pedagogical teaching, like all the teaching, looks to knowledge and scientific training rather than to practical applications. At the close of its first year of life the outlook is an encouraging one. See UNIVERSITY OF CHICAGO.

The University of Wisconsin school of education is an expansion of the former department of education. The four main lines of instruction are the history, the philosophy, the science, and the practice of education. The school aims to afford practical and healthful instruction to intending teachers, professors, principals, and superintendents, and to those students who desire to pursue studies and investigations in the science of education.

Collegeville, Minn., village in Stearns County, on the Great N. R.R., nine miles northwest of St. Cloud. St. John's Abbey and St. John's University, in charge of members of the order of St. Benedict, are the chief parts of the village. The university was opened in 1867. The number of students is greater than the number of inhabitants of the village.

Collegeville, Pa., a borough in Montgomery County. It is situated on the Perkimon River, the Philadelphia & R. R.R., and is 27 miles northwest of Philadelphia. Ursinus College, established in 1870, is an institution belonging to the German Reformed Church. The manufactures are iron machinery and boilermaking. Pop. 700.

Collegians, The, a novel by Gerald Griffin (1828). The incidents of the book are founded on fact, having occurred near Limerick, Ireland. Like most other novels of its period, it is diffuse and over-sentimental; but it is likely to live for its faithful delineation of Irish character at its best — and worst. See COLLEEN BAWN.

Collembola, kŏl-lĕm'bō-la, a group of wingless insects called springtails. Formerly associated with the *Thysanura* or bristletails, they are now regarded as constituting a distinct order. Compare BRISTLETAIL.

Colles, kŏlz, **Christopher,** American philosophic adventurer: b. Ireland about 1738; d. New York 1821. In 1765 he set out, a wanderer from his native land, and we find him in Philadelphia in 1772, delivering lectures upon pneumatics, illustrated "by a variety of curious and entertaining experiments in an air pump lately invented by him." He is reported to have been the first individual who undertook to build a steam engine in this country. In April 1774 he proposed to erect a reservoir for the purpose of conveying water through the several streets of the city of New York. His proposals were "read and referred." In 1775 he delivered lectures on gunnery, and was further employed in giving instruction to the artillery department of the American army in the principles of projectiles. He was selected from time to time by detachments of the artillery corps in different stations to give them lessons on the momentum and direction of the cannon ball, continuing in this employment until the arrival of Baron Steuben in 1777. Colles was the first person who suggested canals and improvements to connect Lake Ontario with the Hudson. According to the records of the assembly of New York, in November 1784 he presented a memorial on the subject, and in April following a favorable report was made thereon. As the War of the Revolution arrested the progress of his measures for supplying the city by his reservoir, which he designed to be erected, with other works, between Pearl and White streets, we find his name again recorded as an applicant for a contract to convey water through the city by means of pipes. Dr. Brown recommended to the common council the Bronx River for that purpose, and this, it is affirmed, is the first indication on record that a supply was to be looked for from without the city. Doubtless the original suggestion of the Bronx came from Colles. In 1808 Colles published an elaborate pamphlet on the interests of the United New York, and in 1789 published a book of roads through New York. The constitution of the United States being adopted, and the duties on spirits established by Congress, both the hydrostatics and the chemistry of Colles were called into requisition, and he was appointed to test the specific gravity of imported liquors. He was never idle. His devices to secure an "honest livelihood" were

almost countless. His various knowledge was admitted, his science was considered real, yet he seemed to be perpetually appropriating it to merely conjectural measures. The victim of penury, his integrity was never questioned. His long career proved useful to his adopted country in that early state of the arts when wooden axe handles were imported. Clinton included him among the earliest and prominent instigators of the canal policy, and Hosack has recorded his services. Humble as was his condition, Hamilton paid him marked deference, and often visited him. Jefferson corresponded with him. Jarvis painted his portrait. When the great celebration in November 1825 took place, on the completion of the canal, the effigy of Colles was borne among the emblems which characterized that vast procession.

Collet, kŏl'lĕt, **Jakobine** (yä'kō-bēn) Camilla, Norwegian novelist: b. Christiansand 23 Jan. 1813; d. Christiana 7 March 1895. Her works, in many of which she champions the political emancipation of women, have had very wide circulation. Among them are: 'In the Long Nights' (1863); 'A Bright Picture in a Dark Frame'; 'Against the Current' (1879); 'The Magistrate's Daughters' (1885).

Col'lie, the domestic sheep-tending dog developed in Scotland, and for a long time bred there exclusively, but now known in all parts of the world. It is one of the most beautiful, and perhaps the most intelligent of all dogs, and many anecdotes are told illustrative of its sagacity. Collies have for hundreds of years aided the Scotch shepherds in caring for their flocks, under all conditions and in all sorts of weather. To meet the inclemency of stormy days and cold nights, these dogs have acquired an outer coat of thick, rough hair, black or black-and-tan in color. It has an undercoat so close and soft that, even when it is parted, one can scarcely see the dog's skin. The chief points of these dogs are: long, sharp heads; bright, keen eyes, set rather close together; small ears, drooping at the tips; a full ruff of hair around the neck; strong, wiry frames; and rounded feet. Their intelligence is remarkable — almost human; and their affection so constant that they have been known to die of grief after the death of a master.

The collie measures from 22 to 24 inches at the shoulder, and weighs generally from 45 to 60 pounds. He is as alert as a fox, and as fleet as a deer. In fact, no dog, except the greyhound can excel him in speed and grace of movement, and it is safe to state that no dog is so faithful and trustworthy a companion to man, for the collie gives implicit obedience and unfaltering loyalty to his master, and will yield his life rather than desert his master's charge. This it is that makes him invaluable as a sheep-dog. Detailed information in regard to the collie may be found in most books relating to dogs (q.v.), and special books treating of him from the point of view of both the shepherd and the fancier are accessible. Consult Lee, 'Collie or Sheep-Dog'; and Wickham, 'Practical Training of the Shepherd Dog.'

Collier, kŏl'yĕr, **Ada Langworthy,** American writer of verse: b. Iowa 1843. Her principal work is 'Lilith, the Legend of the First Woman' (1885).

Collier, Arthur, English philosopher: b. Langford Steeple, Wiltshire, 12 Oct. 1680; d. there 1732. He was educated at Pembroke and Balliol colleges, Oxford, and in 1704 became rector of Langford, a living which had belonged successively to his great-grandfather, grandfather, and father, and which he retained till his death. In 1713 he published a work entitled 'Clavis Universalis,' in which he maintained both the non-existence and the impossibility of the existence of any objects external to the mind. Berkeley had three years before advanced incidentally his theory of the negation of an external world, but the two philosophers appear to have had no knowledge of each other, and it is certain that Collier meditated upon his opinion for 10 years before promulgating it. Though they developed simultaneously the first systematic scheme of absolute idealism, and though Collier was inferior to his contemporary rather in the graces of composition than in acuteness or method, yet the 'Clavis Universalis' attracted not the slightest attention in England. In Germany a copious and able abstract of its contents was given in 1717, in a supplemental volume of the 'Acta Eruditorum,' and it was quoted by Wolf, Bilfinger, and others. In 1756 a complete translation of it into German was made by Eschenbach. Thus rendered accessible in Germany, Collier has enjoyed among the thinkers of that country high repute for talent and originality, and the best comparative view of his doctrines and those of Berkeley is that given by Tennemann. Other publications of Collier were the 'Specimen of True Philosophy' (1713); and 'Logology' (1732). In religion he was an Arian, and also a high churchman on grounds which his associates could not understand.

Collier, H. Price, American writer: b. 25 May 1860. He is a son of R. L. Collier (q.v.) and was educated at Harvard. Entering the Unitarian ministry, he was for nine years in charge of churches in Hingham, Mass., and elsewhere, and during the Spanish-American war served as a naval officer. He has published 'Essays'; 'Mr. Picket Pin and His Friends'; 'America and the Americans from a French Point of View,' issued at first anonymously.

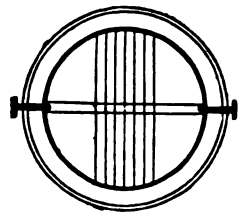
Collier, Jeremy, English bishop: b. Stow Qui, Cambridgeshire, 23 Sept. 1650; d. London 26 April 1726. He was educated at Caius College, Cambridge, entered the Anglican Church in 1677, and was rector of Ampton, Suffolk in 1679. The revolution of 1688 found in him a most zealous opponent, and he not only refused to take the oaths to the government of William and Mary, but came boldly forward in defense of his nonjuring principles, and subjected himself to repeated imprisonment, both for writings and other overt acts, which a more tyrannical government might easily have construed into treason. His political writings have almost been forgotten; but he wrote two other works, which have preserved his name, and prove him to have been a writer of distinguished ability. The one entitled 'Essays Upon Several Moral Subjects' (1697), is distinguished by learning and wit, and an easy flowing style; the other, entitled 'Short View of the Immorality and Profaneness of the English Stage' (1698), is unquestionably a masterpiece, and is still perhaps the best work written on

the subject. It enjoyed great popularity, notwithstanding the fierce opposition it encountered, especially from Congreve and Vanbrugh, and is said to have had the effect of greatly purifying both the sentiments and the language of the theatre. The only other work of Collier deserving of special notice is his 'Ecclesiastical History of Great Britain to the End of the Reign of Charles II.' (1708 and 1714). It cost him many years of labor, and displays much ability, but is strongly tinctured with his nonjuring views.

Collier, John Payne, Shakespearean critic: b. London 11 Jan. 1789; d. Maidenhead 17 Sept. 1883. He wrote many critical articles in periodicals, published in 1820 his 'Poetical Decameron,' and thenceforward continued his editions of poems and plays, notably those of the less-known Elizabethan writers. His 'History of English Dramatic Poetry' appeared in 1831. He took great interest in and edited many publications for the Camden, Percy, and Shakespeare societies, and completed in 1844 an eight-volume edition of Shakespeare. In 1852 he professed to have discovered, on the margins of a copy of the second folio Shakespeare, bought from a second-hand bookseller, manuscript notes and emendations written in a 17th century hand. When these notes and emendations were published they became the subject of eager discussion by the critics, the best of whom were not disposed to set a high value on them, and in 1859 an examination of the volume convinced the British Museum authorities that the marginal notes were forgeries. Collier published a weak and inconclusive reply, in which he maintained their genuineness, and thenceforward he maintained complete silence on the matter. He continued to produce editions of English writers, among them Spenser, and also critical and autobiographical works. Among his papers were found indisputable proofs of a long series of literary forgeries. As a consequence suspicion has rested on all his work, and has obscured the real services he indisputably did to English literature.

Collier, Robert Laird, American Unitarian clergyman and writer: b. Salisbury, Md., 7 Aug. 1837; d. near Salisbury, England, 27 July, 1890. Starting in life as an itinerant Methodist preacher, he held prominent Unitarian pulpits in Chicago and Boston, and became noted as a preacher and lecturer. In later life he was London correspondent of the New York *Herald*. Besides religious writings he published 'Henry Irving, a Sketch and a Criticism'; 'English Home Life' (1885).

Collima'tion, Line of. In a measuring telescope there is placed at the focus of the eyepiece a system of spider-threads. In a transit instrument there are seven vertical and two horizontal "wires," as shown in the diagram. In taking an observation the time at which the star passes behind each wire is noted. Taking the mean of these times, we obtain what is called the time for the "mean wire," an imaginary wire which would, if the adjustments were perfect, coincide with the middle vertical wire. The mean of these observations gives a better result than if only one central wire were used. The line of collimation is defined to be the straight line that joins the centre of the object-glass with the point of this imaginary vertical wire midway between the two horizontal wires. A definition similar to that here given applies in other cases, in the case of the mural circle, for example, and in the case of instruments for terrestrial surveying. The proper adjustment of the line of collimation of these instruments is the most important of all the adjustments. In the case of the transit instrument, for instance, in observing the passage of a star, what is noted is practically the instant, according to the observatory clock, when the line joining the eye and the star coincides with the line of collimation. The following is one of the conditions to be satisfied when the instrument is in perfect adjustment. The line of collimation must be perpendicular to the geometrical axis on which the telescope revolves, and will then describe a great circle. The framework that carries the spider-lines admits of several small movements for their adjustment. After the adjustment has been carefully made, however, there always remains a slight error, which is determined and allowed for in calculations under the name of the collimation error. Adjustments and corrections are similarly made in the other telescopes for measuring. See TRANSIT INSTRUMENT.



COLLIMATION.

Collination. See MERIDIAN CIRCLE; TRANSIT INSTRUMENT.

Collin, Heinrich Joseph von, hīn'rĭh yō'sĕf fŏn kŏl'lĭn, Austrian dramatist and lyrist: b. Vienna 1771; d. 1811. He wrote several tragedies, mostly on antique themes; of these 'Regulus,' the first of the series, is the best. His powerful 'Songs for the Militia' (1809) gave him a high rank among the balladists of the war of liberation. Of his historical ballads, 'Kaiser Max on the Walls of St. Martin's' is best known.

Collin, Louis Joseph Raphael, loo ē zhō zĕf rä-fā-ĕl kŏl lăn, French figure and portrait painter: b. Paris. He studied under Cabanel, obtained a second-class medal in the Paris Salon in 1873, and the medal of the Legion of Honor in 1884. His 'Idyl' is one of his most admired works.

Collin d'Harleville, Jean François, zhŏn fräṅ-swä kŏl lăṅ därl-vēl, French dramatist: b. 30 May 1755; d. 24 Feb. 1806. He worked a genuine vein of comedy, yet never slighted the moral side of conduct, and some of his plays still keep the stage. Notable among his works are 'The Old Bachelor,' his masterpiece (1793); and 'Castles in Spain' (1806).

Col'lingwood, Cuthbert, LORD, English admiral: b. Newcastle-upon-Tyne 26 Sept. 1750; d. at sea near Minorca 7 March 1810. He entered the royal navy in 1761, gradually rose in service, and became a close friend of Nelson. In 1799 he was made rear-admiral of the white. His most distinguished service was the part he bore in the great victory of Trafalgar, in which his gallant manner of bringing his ship (the 'Royal Sovereign') into action, and the skill and resolution with which he fought her, excited the personal admiration of Nelson himself, upon whose fall the command of the fleet devolved upon Collingwood as senior offi-

cer. He was promoted to be vice-admiral of the red, continued in his command of the fleet, and elevated to the peerage with the title of Baron Collingwood. He was distinguished for zeal, courage, humanity, circumspection, and strictness of discipline, though averse to flogging.

Collingwood, William Gershom, English writer and artist: b. 1854. He was educated at Liverpool College, and University College, Oxford. He first exhibited at the Royal Academy in 1880, while from 1881 to 1890 he was secretary to John Ruskin. He has published 'Limestone Alps of Savoy'; 'Art Teaching of Ruskin'; 'Life of Ruskin'; 'Thorstein of the Mere'; 'The Bondwoman'; 'Book of Coniston'; 'Saga-steads of Iceland'; 'Coniston Tales'; 'Early Sculptured Monuments of the Diocese of Carlisle.'

Col'lingswood, Australia, a suburb of Melbourne, lying at the northeast of that city. Pop. 33,000.

Col'lingwood, Canada, a port of Simcoe County, Ontario, situated on the south shore of Georgian Bay, and on the Breton & C., and the Medford branches of the Grand T. R.R., 75 miles northwest of Toronto. It has steamboat connections and a large trade. Among the manufactures are leather, lumber, and flour. Pop. 6,000.

Col'lins, Anthony, English theologian: b. Heston, Middlesex, 21 June 1676; d. London 13 Dec. 1729. He was educated at Eton and at Cambridge, and devoted himself to general literature. During the years 1703–4 a correspondence was carried on between him and Locke, who regarded him as having «as much of the love of truth for truth's sake as he had ever met with in anybody.» Among his numerous writings, all published anonymously, the one most commonly associated with his name is entitled a 'Discourse on Freethinking.' It attracted considerable notice at the time, and was answered, among others, by Bentley, under the assumed name of *Philelcutherus Lipsiensis.* Another work, entitled 'Philosophical Inquiry Concerning Liberty and Necessity,' was answered by Samuel Clarke. His benevolent and tolerant spirit gained the respect of many who widely differed from him on theological questions.

Collins, Edward K., American shipowner: b. Truro, Mass., 5 Aug. 1802; d. New York 22 Jan. 1878. He early entered the shipping business, and after serving as superintendent of a packet line, established in 1836 the Dramatic Packet Line, from New York to Liverpool. In 1849 the Collins line between the same ports was inaugurated. The Arctic and the Pacific of this line are memorable in the history of marine disasters. The government having withdrawn mail subsidies, the line ceased operations in 1858.

Collins, John, English poet and actor: b. Bath 1742; d. Birmingham 2 May 1808. He was a stay-maker, turned actor; and his poetic fame rests upon 'Scripscrapologia,' a collection of poems, among which 'To-morrow' is especially readable.

Collins, Joseph William, American ichthyologist: b. Isleboro, Maine, 8 Aug. 1839. His boyhood was spent on fishing schooners and he was entirely self-taught. He made the statistical inquiry into New England fisheries for the 10th United States census 1879–80, and for the United States Fish Commission, with which he remained connected until 1892. He was an official of the International Fisheries Expositions at Berlin 1880; London 1883; chief of the Fish and Fisheries department at the Chicago World's Fair 1893; and organized the section of Naval Architecture in the United States National Museum. He was a contributor to the 'Century Dictionary'; edited the 'Fishing Gazette' 1893–4; and has written many papers and reports on his specialty.

Collins, Mabel. See COOK, MABEL COLLINS.

Collins, Mortimer, English novelist and poet: b. Plymouth 29 June 1827; d. Knowl Hill, Berkshire, 28 July, 1876. He was for a time mathematical master in Queen Elizabeth's College, Guernsey, but resigned in 1856 in order to devote himself wholly to literature. His works include examples of many different styles, ranging from playful verses to political articles. The chief are the books of verse entitled 'Summer Songs' (1860); 'Idyls and Rhymes' (1865); and 'The Inn of Strange Meetings and Other Poems' (1871); and the novels, 'Sweet Anne Page' (1868), partly autobiographical; 'The Vivian Romance' (1870); 'The Marquis and Merchant' (1871); 'Two Plunges for a Pearl (1872); 'Miranda, a Midsummer Madness' (1873); 'Mr. Carington' (1873); 'Transmigration' (1874); 'Frances' (1874); 'Sweet and Twenty' (1875); 'From Midnight to Midnight' (1875); 'Fight With Fortune' (1876); 'The Village Comedy' (1876); and 'You Play Me False' (1878); in some of which his second wife, Frances Cotton, collaborated. His most successful book was the series of essays, 'The Secret of Long Life' (1871), published anonymously.

Collins, Patrick Andrew, American politician: b. Fermoy, Ireland, 12 March 1844. He came to the United States when four years old, went to the public schools until he was 16, became an upholsterer, saved money, and graduated at Harvard Law School in 1871. He served in the Massachusetts Legislature from 1869 to 1871, and was a delegate to the Democratic national conventions of 1876, 1880, 1884, 1888, and 1892. From 1882 to 1888 he sat in Congress and from 1893 to 1897 was consul-general at London. He has been prominent in the Fenian movement, the Land League, and other Irish organizations. He served as mayor of Boston 1902–3.

Collins, William, English poet: b. Chichester, England, 25 Dec. 1721; d. there 12 June 1759. He was educated at Winchester school and at Oxford, and while at college wrote his 'Oriental Eclogues', printed in 1742. Their success was moderate, and in 1744 the author went to London as a literary adventurer. In 1746 he gave his 'Odes, Descriptive and Allegorical', to the public; but the sale did not pay for the printing, and the poet burned all the unsold copies. Yet among these odes were many pieces which at present rank with the finest lyrics in the language. His best known poems are 'The Ode on the Passions,' those to Mercy and Evening, 'The Dirge in Cymbeline,' and the famous 'How Sleep the Brave.'

His odes are now almost universally regarded as among the best productions of the kind in English for vigor of conception, boldness and variety of personification, and genuine warmth of feeling. Originally too laxly strung, disappointment, distress, and irregularity disorganized his nervous system and he was confined for some time in a lunatic asylum.

Collins, William, English painter of landscapes and domestic scenes: b. London 18 Sept. 1787; d. there 17 Feb. 1847. His picture of the 'Young Fifer', exhibited in 1811, was purchased for 80 guineas, and in 1813 he at once raised himself to a position of eminence by his 'Sale of the Pet Lamb', so well known by engravings. In 1820 he was elected a Royal Academician. For his picture of the 'Fisherman's Departure,' painted in 1826, he received 350 guineas. Other noted works of his are 'Rustic Hospitality,' 'Sunday Morning,' and 'Happy as a King.' Two sacred pictures, 'Our Saviour with the Doctors in the Temple,' and 'The Two Disciples at Emmaus,' were exhibited in 1840 and 1841. A life of him was published by his son, Wilkie Collins (q.v.)

Collins, Sir William Job, English surgeon: b. London 9 May 1859. His medical training was obtained at Saint Bartholemew's Hospital, London, and he has since held various professional positions of importance. He has published 'Specificity and Evolution in Disease' (1884-90); 'Pathology of Cataract' (1897); 'Spinoza' (1889); 'Rationalism in Medicine' (1890). He was raised to knighthood in 1902.

Collins, William Wilkie, English novelist: b. London 8 Jan. 1824; d. there 23 Sept. 1889. He was a son of William Collins (q.v.). After a short time spent with a firm in the tea trade he adopted the profession of the law, and was a student at Lincoln's Inn when his father died. He wrote a biography of his father in 1848, and from that time made literature his profession. His first novel was printed in 1850, and was called 'Antonina; or, the Fall of Rome, a Romance of the Fifth Century.' 'Rambles Beyond Railways; or Notes in Cornwall Taken Afoot' (1851) was his next work, followed by 'Basil, a Story of Modern Life' (1852); 'Mr. Wray's Cash Box'; 'Hide and Seek' (1854). At about the same time he became a contributor to the magazine 'Household Words,' in which 'After Dark' and one of his most successful works, 'The Dead Secret,' were originally published. Several of his novels, including 'The Woman in White' and 'No Name,' were published originally in 'All the Year Round.' 'Armadale' and many of his subsequent stories were printed in American magazines before appearing in book form, and he is said to have received enormous prices for some of these. 'The Moonstone,' 'Man and Wife,' 'The New Magdalen,' 'The Law and the Lady' and 'Poor Miss Finch' (1872) are other works of his that have wide circulation. His unfinished novel, 'Blind Love,' was completed by Walter Besant. His principal books passed through many editions, both in England and the United States, and have also been translated into French, Italian, German, Dutch, Danish, and Russian. The works of very few modern writers have had greater circulation or acquired more general popularity than his. He also made occasional incursions into the field of dramatic writing, but in this direction he never achieved marked success. As a novelist Wilkie Collins may be said to have been deficient in the power to give a sense of reality to his creations; but in the skill to evolve and sustain a wide web of intricate plot he was altogether unrivalled.

Col'linson, Peter, English botanist: b. Hugall Hall, Westmoreland, 1693; d. 1768. A merchant in London, he yet found time for studies in natural history, which gained him the acquaintance and correspondence of the most eminent naturalists of the time. He was the means of first drawing Franklin's attention to electricity, and one of the objects of Linnæus in visiting England in 1736 was to make his personal acquaintance. He gave especial attention to botany, and to the naturalization of plants and trees in regions remote from their original habitats. He sent over to Maryland, Pennsylvania, and other Atlantic States, many foreign ornamental shrubs, which found in America a congenial soil and climate; and he introduced into England many American forest trees. He was one of the first to suggest the culture of the grape in Virginia. A genus of labiate plants is named *Collinsonia* from him.

Colli'sion, in navigation, the shock of two ships coming into violent contact, whereby one or both may suffer more or less injury. The American rules in regard to the prevention of such accidents are based upon the same principles as the British, with which they are substantially identical. The leading doctrines of the English law on this subject are thus stated by Lord Stowell: "In the first place, collision may happen without blame being imputable to either party, as where the loss is occasioned by a storm or any other *vis major,* in which case the misfortune must be borne by the party on whom it happens to light. Secondly, a misfortune of this kind may arise where both parties are to blame — where there has been a want of due diligence or skill on both sides; in such case the loss must be apportioned between them, as having been occasioned by the fault of both of them. Thirdly it may happen by the misconduct of the suffering party only, and then the rule is that the sufferer must bear his own burden. Lastly, it may have been the fault of the ship which ran the other down, and in that case the injured party would be entitled to an entire compensation from the other. In a court of common law the same rule holds in the first, third, and fourth cases; but in the second (where both parties are to blame) the rule is, that if the negligence of both substantially contributed to the mishap, neither has an action against the other; but if one of them, by exercising ordinary care, might have avoided the consequence of the other's negligence, the former is liable for any injury sustained by the latter." In pursuance of the Merchant Shipping Amendment Act (1862), orders were issued in 1863, 1879, 1884, and 1885, giving regulations for preventing collisions. These contain rules concerning lights and fog-signals, and sailing and steering rules. With respect to lights it is enacted that steamers shall, when under way, carry a white mast-head light, on the starboard side a green, and on the port a red light; when towing other vessels they must

carry two mast-head lights, placed vertically. Sailing vessels shall carry only the side lights; fishing and other open boats are not required to carry side lights, but may use a lantern with a red slide on the one side and a green slide on the other, and such lantern must be exhibited in sufficient time to prevent collision, and so that the green light shall not be seen on the port side nor the red light on the starboard side. Ships at anchor in a roadstead must exhibit a white light where it can best be seen, but not 20 feet above the hull, in a globular lantern eight inches in diameter, showing at a distance of a mile all round. The sailing and steering rules demand that if two sailing ships are approaching each other end on, or nearly so, the helms of both must be put to port, so that each may pass on the port side of the other; in crossing so as to involve risk of collision the sailing ship with the wind on the port side shall keep out of the way of the ship with the wind on the starboard, but if they have both the wind on the same side the ship which is to windward shall keep out of the way of the one that has it to leeward. If a steamship and a sailing ship are approaching so as to involve collision, the former must keep out of the way of the latter. The rules for two steamships passing or crossing are nearly the same as for sailing ships. If one vessel is overtaking another she must keep out of the way of the last-named vessel. When, according to the rules, one of the ships keeps out of the other's way, that other shall generally be understood to keep her course. See NAVIGATION LAWS; RULES OF THE ROAD.

Collo'dion (Gr. *κολλώδης*, "like glue"), a solution, in mixed alcohol and ether, of soluble pyroxylene (or "gun-cotton"). It is colorless, and very inflammable. The gun-cotton that is used in its manufacture is commonly prepared by the action of a mixture of nitric and sulphuric acids upon cotton-wool that has been boiled in a solution of sodium carbonate (to remove all greasy and resinous matters), and afterward thoroughly washed and dried. The following details are recommended for the subsequent operations: Three fluid ounces of strong nitric acid are diluted with two fluid ounces of water, and nine fluid ounces of strong sulphuric acid are added. When the mixture has cooled to about 140° F., 100 grains of the cotton-wool are added in tufts weighing about 10 grains each. At the end of 8 or 10 minutes the acid is poured off, and the cotton is subjected to gentle pressure to expel the greater part of the fluid that its fibres have retained. The cotton is next thoroughly washed with water (or weak solution of sodium carbonate) until the acid has been entirely eliminated, after which it is allowed to dry. The product is "soluble gun-cotton." It does not differ materially, in appearance, from the orignal cotton; but if the operations to which it has been subjected have been correctly carried out, it will be found that the cotton has become soluble in a mixture of equal parts of alcohol and ether. Commercial collodion contains about 60 grains of gun-cotton to each 10 ounces of the solvent. Before the advent of the dry-plate process, collodion was greatly used in photography for the preparation of sensitive plates; and at the present day it is used to some extent in this way, especially in certain branches of photo-engraving. In the preparation of these plates the collodion is first iodized or brominized by the addition of the iodides and bromides of cadmium and ammonium, and is then poured over a carefully cleansed glass plate. The volatile solvent evaporates rapidly, leaving a film of iodized gun-cotton upon the glass. Immediately before the exposure is made, the coated plate is immersed in a solution of nitrate of silver, with the result that a deposit of iodide and bromide of silver, sensitive to light, is formed in the gun-cotton layer. The plate is next exposed in the camera, and afterward developed in the usual way. Collodion is used in the place of adhesive plaster, in the case of trivial injuries, to afford protection from the air, and from pyogenic and other objectionable germs. When applied to the injured spot it quickly dries, leaving a tough, elastic coating which is impervious to moisture. It was first employed in surgery by Dr. J. Parker Maynard, of Boston, Mass., in 1847. It is also medicated in various ways, one of the best-known varieties of this sort being blistering collodion, which contains cantharides, and is applied to the skin for the purpose of producing a blister. Medicated collodion is also largely used in chiropody.

Col'loids (Gr. *κολλώδης*, "glue-like"), substances, such as albumin and silicic acid, which, when combined with water in certain proportions, exhibit a gelatinous consistency. The word does not imply that there is any chemical resemblance among the bodies to which it is applied, the distinction between colloids and non-colloids being wholly physical. The term "colloid" was proposed by Thomas Graham, in 1861, to designate substances that are practically incapable of diffusion through porous membranes. Substances such as salt, sugar, and the mineral acids, which diffuse readily through such membranes, were called by him "crystalloids." The distinction is a convenient one, and has been universally adopted by chemists and physicists. It is probable that colloidal substances do not combine with water to produce true solutions. Quincke, for example, says:

> I believe gelatinous substances, such as glue and other jellies, should be regarded as fluids in which there are numerous invisible thin partitions of firm or fluid lamellæ,— the structure of a colloidal substance being likened by him, in other words, to that of a sponge filled with water.

Similar views have also been held by other competent authorities. For a discussion of the phenomena exhibited by colloids and crystalloids in solution (or apparent solution) see DIFFUSION.

Colloph'anite (Gr. *κόλλα*, "glue" + *φαίνειν*, "to appear" = "glue-like"), a native amorphous phosphate of calcium, having the formula $Ca_3P_2O + H_2O$, and found principally on the island of Sombrero, the phosphoric acid that it contains being derived from the guano deposits there. Collophanite is white or nearly so, with a specific gravity of 2.7 and a hardness of from 2 to 2.5. The name is given on account of the glue-like appearance of the mineral.

Collop Monday, the Monday after Quinquagesima Sunday and preceding Shrove Tuesday. It was so named because on that day the faithful ceased eating flesh, meat, or collops.

Collot, d'Herbois, Jean Marie, zhŏn mä rē kō-lō dār-bwä, French revolutionary leader:

b. Paris 1750; d. Cayenne, South America, 8 Jan. 1796. He was an actor, who adopted the name of D'Herbois. On the breaking out of the French Revolution he zealously espoused the views of the ultra-party, and published his 'Almanach du Père Gérard,' which gave him much influence with the most violent revolutionists. After the events of 10 August he became a member of the Municipal Council of Paris, and a few days after the horrors of September was chosen deputy to the national assembly. He afterward became an active leader of the Mountain against the Girondists. He was sent by Robespierre along with Fouché to Lyons, in 1793, with almost unlimited powers, and was guilty of the most flagrant enormities. Declaring that he found the guillotine too tedious and formal, he introduced the method of executing wholesale by the sword and by discharges of musketry. On his return from Paris he became a determined opponent of Robespierre, and being chosen president of the convention (19 July 1794), contributed powerfully to his fall. A few weeks after his own downfall followed. On the motion of Merlin he was expelled from the assembly and banished to Cayenne.

Col'lotype Process, a method of reproducing engravings, photographs, etc., allied to photo-lithography (q.v.). It is worked universally, and is known by a variety of names: the Germans call it "Lichtdruck," the French "Phototypie," the Americans "Phototype," and the English have given it the titles of "Photo-print," "Heliotype," "Autotype," "Photophane," "Photo-mezzo-type," "Graphotone," etc.

The process is based on the well-known action of light on bichromatized gelatine. It differs from photo-lithography in that in collotype the exposed image in gelatine is employed for the actual printing surface, and not only can line subjects be printed from it, but copies of photographs, paintings, and drawings. It renders half-tones so accurately that when prints by collotype process are made on highly glazed paper with a suitable ink there is scarely any perceptible difference between them and ordinary silver prints; platinotype and bromide prints can also be closely imitated. The process is largely used for the production of view books, fac-simile copies of engravings, copies of paintings, portrait work, and for commercial illustrations. When a film of bichromate mixed with gelatine is exposed to light under a negative, then washed and dried, it will when treated like a lithographic stone absorb water where the gelatine film was protected from light by the dense portions of the negative, and will take ink and form a printing surface in the places where light has obtained access to the film through the negative. A collotype plate will not only take ink where absolutely clear glass occurs in the negative, but it will take ink in the half-tone in exact gradations corresponding to the amount of light passing through the negative. This property is most valuable, and, as a matter of fact, constitutes the process.

The preparation of collotype plates is not difficult. The printing plate is formed of a piece of plate glass of about half an inch in thickness, ground on the printing side to give a better hold to the gelatine. In order that the film may withstand the heavy pressure of the printing press, it is found necessary to coat the plates first with a substance containing albumen, water-glass, and water. This solution is spread over the cleaned glass in a thin coating and dried. The sensitizing solution for collotype printing is composed of Coignet's gelatine, 3 ounces; albumen, 1 ounce; water, 25 ounces; and bichromate of potash, ½ ounce. The exact proportions are not arbitrary, and different operators modify their solution as experience guides. The sensitizing solution is carefully filtered through flannel, and, while warm, is poured over the surface of the "substratumed" glass plate in a fairly thick film; the coated plate is then placed on accurately leveled supports in a drying-chamber or box, and heat is applied to the bottom of the box, which is made of sheet iron. Considerable heat is required to dry the plates, and the grain or texture of the plate is affected by the speed of the drying; about four hours is the usual time occupied. When the plate is dry and cool it is ready for exposure under the negative; the qualities necessary in a collotype negative are that it must be reversed, and be of full printing strength. A negative that would render a full rich print by any silver printing process is the proper standard for collotype. The margins of the negative are masked with thin opaque paper or tinfoil, so as to permit of the picture being printed with a clean edge on paper with proper margins. The time required for the exposure under ordinary conditions as regards light is from 20 minutes to half an hour, but this is a matter which can only be fixed by experience. The image on the plate cannot be examined during exposure, and an actinometer scale is used for gauging the amount of light. After exposure the plate is taken into a room lighted a dull or yellow light, and washed in running water for about half an hour in order that all the soluble unacted-upon bichromate may be removed from the film, after which the plate is allowed to dry spontaneously, when it is ready for printing.

The printing may be performed in an ordinary press used for letterpress printing, or in a lithographic press. For rapid printing, or for long runs, special steam-driven presses are constructed, with cylinder pressure, on which it is possible to print two or three hundred copies per hour.

When the plate is fixed in position in the press, it is first wetted all over with a sponge and water, or with a solution of common salt, glycerine, and water, which, after being allowed to act on the gelatine for 10 or 15 minutes, is sponged off, and the plate is rolled up with ink. If the printing is being done on a hand press, a coating of ink is applied first with a leather roller, which inks up the shadows and stronger parts of the picture. This inking is then followed by another with a gelatine roller, which inks up the half-tones and details of the subject. A sheet of ordinary printing paper is now placed over the inked surface, and pressure applied. The result is a permanent ink print on paper of the negative used. If the printing is done on a steam press, the operations are, of course, more mechanical, but the finished result is practically the same. Large plates can be successfully dealt with, and pictures on paper up to 40 by 30 inches can be printed.

The collotype process has had a long and successful career, and the beauty and delicacy of its results, when properly printed, are fully equal to that of any other photo-mechanical process, but of late years the advances made in half-tone blocks, and more especially in the machinery constructed for printing them, has to some extent covered the ground hitherto occupied by collotype illustrations alone; and though the half-tone block can never oust or replace collotype for many kinds of illustration, yet it is sufficiently a rival to restrict its expansion and scope from a commercial point of view.

Collusion, kŏl-lū'zhŏn (Lat. *collusio,* "a playing together"), a secret agreement between opposing litigants to obtain a particular judicial decision on a preconcerted statement of facts, whether true or false, to the injury of a third party. Collusion, when proved to exist, nullifies the judgment obtained through it.

Collyer, kŏl'yėr, Robert, American clergyman: b. Keighley, Yorkshire, Eng., 8 Dec. 1823. He came to the United States in 1849, being then a Wesleyan preacher and a blacksmith, but became a Unitarian, and preached some years in Chicago, where he founded Unity Church in 1860 and was its pastor 1860–79. He was made pastor of the Church of the Messiah, New York, in September 1879, and pastor emeritus in 1896. Included in his publications are: 'Nature and Life' (1864); 'The Life That Now Is' (1871); 'The Simple Truth' (1878); 'A History of the Town and Parish of Ilkley' (England, 1886, written with Horsefall Turner); 'Talks to Young Men' (1888); 'Things New and Old' (1893); 'A Man in Earnest.'

Collyridians, kŏl-ĭ-rĭd'ĭ-ąnz (Gr. *kollyridia,* "little cakes"), a sect toward the close of the fourth century, so denominated from the little cakes which they offered to the Virgin Mary. The sect consisted chiefly of Arabian women, who, out of an extravagant devotion to the Virgin, met on a certain day of the year to celebrate a solemn feast, and to render divine honors to her as to a goddess, eating the cakes which they offered in her name. It is said that the members of this sect were not native Arabs, but immigrants from Thrace and Scythia. While pagans they had been accustomed to offer similar cakes to Venus or Astarte.

Colman, kōl'mąn, Benjamin, American clergyman: b. Boston, Mass., 19 Oct. 1673; d. there 29 Aug. 1747. He graduated at Harvard in 1692, began preaching, sailed for England 1695, was captured by a French privateer, and after a short imprisonment, reached England. He received ordination in London, and returned to take charge of the Brattle Street Church, Boston, remaining with that society until his death. He was for many years one of the leading clergymen of New England, exerting a strong influence on civil affairs that frequently drew censure upon him. He procured considerable benefactions for Harvard and Yale, and was offered, but declined, the presidency of the former, in 1724. His collected sermons were printed at Boston 1707–22, and his 'Life' was written by his son-in-law, Rev. E. Turell (1749).

Colman, George ("The Elder"), English dramatist: b. Florence 28 April 1733; d. London 14 Aug. 1794. He wrote in 1760–1 the comedies of 'Polly Honeycombe' and the 'Jealous Wife.' 'The Clandestine Marriage' we owe to him and Garrick. This was left unfinished, and it has never been ascertained to which of the authors most credit is due for one of the best pieces in our theatrical repertory. 'The English Merchant,' the 'Oxonian in Town,' and other pieces, followed the foregoing. In 1777 he purchased the little theatre in the Haymarket, and continued in the personal superintendence of it till the year 1790.

Colman, George ("The Younger"), English dramatist, son of the preceding: b. London 21 Oct. 1762; d. there 26 Oct. 1836. He was entered as a student in the Temple, but soon left legal studies for dramatic and general literature. He assisted his father as director of the Haymarket Theatre, and succeeded him as its patentee. After selling his interest in the theatre he was appointed examiner of plays, the duties of which he performed with a severe purism, hardly to have been expected in a man who wrote with almost licentious freedom himself. Most of his dramas were well received, and some of them still keep the stage; as 'John Bull'; the 'Heir-at-law'; 'Poor Gentleman'; and 'Love Laughs at Locksmiths.'

Colman, Norman J., American office holder: b. Richfield Springs, N. Y., 16 May 1827. He settled in St. Louis, Mo., and adopted the legal profession. In 1874 he was elected lieutenant-governor, and was commissioner of agriculture in President Cleveland's first administration 1885–9. Shortly before his term of office ended, Congress enacted the law raising the Department of Agriculture to the rank of an executive department, with its chief a Cabinet officer, 11 Feb. 1889.

Colman, Samuel, American landscape painter: b. Portland, Maine, 4 March 1832. He studied in Europe 1860–2; was elected a member of the National Academy in 1862; and first president (1866–71) of the American Society of Painters in Water Colors. He has traveled extensively, and his pictures include scenes from Algeria, Germany, France, Italy, and Holland.

Colmar. See Kolmar.

Colne, kōln, England, a municipal borough in the county of Lancaster, and 31 miles southeast of the town of Lancaster. The most remarkable edifice is the Piece Hall, in the Elizabethan style. The chief manufactures are cotton goods. Colne was one of the earliest seats of the woolen and cotton manufacture in England, but woolens are no longer made there. Pop. (1901) 23,000.

Colocasia. See Cocco.

Colocollo, kō-lō-kŏl'lō, a wild cat (*Felis colocollo*) found in Guiana and Chile. It is somewhat larger than the domestic cat, is whitish-gray in color, with elongated black markings on the back and sides.

Colocynth, kŏl'ō-sĭnth, the fruit of *Citrullus Colocynthus,* deprived of its rind. The plant, one of the *Cucurbitaceæ,* or melon family, is widely distributed over waste lands in Arabia and adjacent countries, the Mediterranean islands, Cape of Good Hope, Java, southern Spain, and Europe. It is also extensively cultivated. It is collected when the fruit is nearly ripe and peeled while fresh. The fruit subse-

quently contracts somewhat, is whitish in lustre, and very porous and light. As found in the market colocynth occurs as light, yellowish white balls, from one to three inches in diameter, that are very porous and fragile. It contains a large number of whitish seeds in six compartments. On breaking, the fruit splits irregularly, although there may be a tendency to dehisce in threes. The active principles are a resin and a bitter glycoside, colocynthin ($C_{56}H_{43}O_{23}$ Walz). Colocynth is an active drastic purgative and is rarely administered alone because of its harsh action, but in small doses in combination with other drugs, it is widely used as a laxative and purge. The compound cathartic pill and the vegetable pill are the chief vehicles that contain colocynth. The compound extract, made of colocynth, aloes, scammony, soap, and cardamom, is widely employed in other preparations. Colocynthin is recommended as a rectal cathartic in doses of ⅛ to ½ grain. Colocynth itself can be given in doses up to five grains.

Cologne, kō-lōn' (German, *Köln*), Germany, a strongly fortified city of Prussia, in the Rhine province, on the left bank of the Rhine. It stands upon the river in the form of a crescent, and is connected with Deutz, on the opposite side and forming part of it, by a bridge of boats and an iron bridge. Till recently it was surrounded by fortifications dating from the Middle Ages, but these have been cleared away, their site built upon, and a wider circuit of works constructed. Until the middle of the 19th century a great part of the city bore the impress of the Middle Ages, the streets being dark, narrow, and filthy; but now the municipality has paid great attention to the appearance and sanitary condition of the town generally by opening up thoroughfares, widening and paving the streets, etc. Among the principal buildings are the townhouse, a remarkably fine Gothic building, partly of the 14th century; the Gürzenich (1441–52), a splendid Gothic building, used for public festivities, and also accommodating the exchange; the Tempelhaus, a fine Romanesque building of the 12th or 13th century, occupied as the Chamber of Commerce; the government buildings, courthouse, postoffice, Imperial Bank, and railway station. But the object of greatest interest in the town is the cathedral, begun in 1248, one of the finest and purest Gothic monuments in Europe. It is in the form of a cross; its entire length is 490 feet; its breadth, 231 feet; the roof rests on 100 columns, of which the four centre ones are 30 feet in circumference. The choir was long the only part finished; it is 161 feet high, and, with its pillars, arches, chapels, and its superb painted glass windows, presents one of the finest sights conceivable. In 1842 the completion of this magnificent edifice was begun, after designs by Zwirner; the works were vigorously prosecuted from that time onward, and were completed in 1880. The two western towers are each 511 feet high, and are among the highest edifices in the world. The other remarkable churches are those of St. Peter, in which is an altar-piece of the crucifixion of that saint, by Rubens, who presented it to this church, in which he was baptized; St. Mary, on the capitol, occupying the site of the capitol of the ancient Roman city, and dating from about the year 1,000, with some good stained glass windows; the Apostles' church, in the Neumarkt, built about the year 1200, a perfect specimen of the Romanesque style, having a singularly elegant and picturesque exterior; the church of St. Ursula, filled with the bones of the 11,000 British virgins, who, according to the legend, were destroyed here on their return to Britain, under the guidance of St. Ursula; the church of the Jesuits, or Maria Himmelsfahrt, dating from 1636, overloaded with gorgeous decorations of marble sculpture, etc.; and St. Gereon's, which, like the church of St. Ursula, is lined with bones, not, however, of virgins, but of the Theban legion of martyrs, slain, according to tradition, during the reign of Diocletian; this is one of the finest and oldest churches in the city. The city contains several gymnasia and other high-class institutions; a technical school; an observatory, and botanical garden; a normal school, a public library, a theatre, several hospitals, a school of design, a museum, etc. The manufactures are very extensive and varied, embracing sugar, chocolate, tobacco and cigars, glue, liqueurs, mineral waters, starch, vinegar, soap, candles, velvet, silk, woolen and cotton goods, India-rubber, and gutta-percha wares, machinery and metal goods, etc., and the celebrated eau de Cologne, of which there are a great many different manufacturers. Its commerce is considerable; it has a good port on the Rhine, and an extensive railway communication with the interior of Germany and with Belgium and Holland. It is the principal entrepôt of the corn, wine, and oil trade on the river, and has active commercial relations with the Netherlands, Germany, Belgium, and Switzerland.

Cologne is of ancient origin, and was originally called *Oppidum Ubiorum,* being the chief town of the Ubii, a German nation. The Romans made it a colony 51 A.D., and called it *Colonia Agrippina.* It was annexed to the German empire in 870, and became one of the most powerful and wealthy cities of the Hanseatic league, its population then amounting to 150,000. As early as the 11th century Cologne carried on an extensive trade with foreign countries, including England, in the produce of the country — wine, corn, flour, malt, beer, etc. The arts and sciences also flourished, and its university was one of the most famous in Germany. Intestine divisions, and other causes, finally effected its ruin, and in 1792 it ceased to be a free city. It was taken by the French in 1794, ceded to them by the Treaty of Luneville in 1801, and restored to Prussia in 1814. Duns Scotus died in Cologne in 1308, and was interred in the chapel of the Minorites; and Rubens was born here in 1577, in the same house in which Mary of Medicis died, in 1642. Pop. (1900) 372,229.

Cologne. See EAU DE COLOGNE.

Cologne Earth, a kind of ochre, of a deep-brown color, transparent, and durable in water-color painting. It is an earthy variety of lignite or partially fossilized wood.

Cologne Yellow, a pigment consisting of two parts yellow chromate of lead, one of sulphate of lead, and seven of sulphate of lime or gypsum. It is prepared by precipitating a mixture of nitrate of lead and nitrate of lime with sulphate of soda and chromate of potash. See CHROME YELLOW.

Colomb, kō-lōm′, Sir **John Charles Ready,** English military writer. He was educated at the Royal Naval College and entered the Royal Marine Artillery in 1854, retiring in 1869 with the rank of captain. He was member of Parliament for Bow and Bromley 1886–90, and was knighted in 1888. He has published 'Protection of Commerce in War' (1867); 'Imperial Strategy' (1868); 'The Distribution of Our War Forces' (1869); 'Colonial Defense and Colonial Opinions' (1873); 'The Defense of Great and Greater Britain' (1879); 'Naval Intelligence and Protection of Commerce' (1881); 'The Use and Application of Marine Forces' (1883); 'Imperial Federation: Naval and Military' (1886); 'British Defense' (1900); 'British Dangers'; 'Our Ships, Colonies, and Commerce in War' (1902).

Colomba, kō-lôṅ-bä, a romance by Prosper Mérimee, published 1830. It is the story of a Corsican vendetta, followed up to the end by the heroine, with a wild ferocity tempered with a strange piety. The story has an ethical significance of a rather unfortunate kind, for the author's belief in the dogma of fatalism underlies the whole of it,— that circumstances control the human will, and whether a man is a brigand or a philanthropist depends purely on chance, crime and virtue being mere accidents.

Colombia, The Republic of, a country of South America; bounded on the north and northwest by the Caribbean Sea and the Republic of Panama; on the east by Venezuela and Brazil; on the south by Brazil, Peru, and Ecuador; on the west by the Pacific Ocean. Its area cannot be stated precisely, estimates ranging between 424,000 and 482,000 square miles; official estimate, 472,202 square miles. The boundary lines between it and three of the neighboring countries are in dispute. The republic is divided into eight departments as follows: Two on the Caribbean coast, Bolivar, and Magdalena; one with coasts upon both oceans, Cauca; and five in the interior, Tolima, Antioquia, Boyacá, Cundinamarca, and Santander. The capital and largest city of the country is Bogotá (q.v.). Others of importance are: Vélez, Bucaramanga, San José de Cúcuta, Neiva, Medellin, Manizales, Pasto, Cali, Cartagena (q.v.) Barranquilla, and La Mesa.

Physical Features.— The Andes of Colombia are divided into three ranges — the Cordillera Oriental, Cordillera Central, and Cordillera Occidental — with intervening uplands of great extent, which are habitable and fertile, but as yet rather inaccessible. Of the three ranges mentioned, the western Cordillera is the least impressive, though it extends farther toward the north than the others. The central Cordillera has the greatest number of snow-clad summits. Some of the altitudes are: Sierra Nevada, estimated 23,779 feet; Alto del Viejo, 12,965 feet; Boca del Monte, 12,735 feet. The highest snow-peak of the central Cordillera is the volcano called Huila. The volcanos of Sotará (extinct), Pasto, Chiles, Puracé, and Azufral are well known, but the ordinary demonstrations of volcanic energy are earthquakes. See Cordilleras. There are four river systems in the republic: (1) The western system, comprising the streams which flow from the western Cordillera into the Pacific Ocean; (2) the river Cauca and its affluents; (3) the Magdalena River with its affluents; (4) the streams of the eastern slope of the eastern Cordillera, including the upper Orinoco and upper Amazon, and some of the tributaries of those great rivers. Important harbors on the Caribbean coast are: El Portete of Rio Hacha, Santa Marta, Sabanilla (the active port of Barranquilla), Cartagena, etc. On the Pacific coast line are the Bay of Malaga, with the harbors of Guapi and Izcuandé; the bays of Pasacaballos and Buenaventura; the harbors of Tumaco and Trinidad, and the gulfs of Montijo, David, and Dulce.

Climate.— The coast and some interior valleys are intensely hot and insalubrious. On the elevated plateaus the temperature is that of perpetual spring. The lowest average temperature in any inhabited part of the mountainous country is 20° F. The peaks of the Cordilleras are covered with snow always. In spite of the equatorial situation of Colombia, the Andes make temperature merely a question of altitude. At Bogotá the thermometer ranges from 55° to 70 F. Alternating periods of dry weather and rainy weather, each generally of three months' duration, are Colombia's «summer» and «winter.»

Resources, Flora and Fauna.— Gold is found in Antioquia; in the Chocó region, department of Cauca; in Santander and Tolima, etc. Silver mines are especially productive in Antioquia, Cauca, and Tolima. Aggregate annual output of these metals, about $4,100,000. Iron is found in Cundinamarca and Antioquia; copper in Boyacá and Magdalena; platinum, sulphur, salt, emeralds, lime, nitre, chalk, marble, petroleum, asphaltum, alum, magnesia, amethysts, lead, tin, manganese, mercury, and cinnabar in various parts of the country. Emeralds valued at $100,000 were produced annually at the Muzo and Coscuez mines up to 1899. The low and torrid regions (coasts and valleys) produce coffee, sugarcane, bananas, cacao, yucca, cotton, tobacco, indigo, vanilla, rice, and many kinds of tropical fruits. The temperate middle region of the Andes is suited to the cultivation of wheat, barley, etc., but these grains are not produced in very large quantities, owing to the lack of means of transportation. Vast tracts of forest remain to be explored. It is assumed that rare botanical treasures will be found in their recesses; and with good reason, since the known varieties of Colombian flora are of exceptional interest. Building, cabinet, and dyewoods are plentiful; the rubber-tree, the cinchona, wax-palms, cedar, balsam of tolu, lignum vitæ, and mahogany flourish especially. In the southeast are great plains suitable for grazing, but as yet unappropriated. The total number of cattle in the republic is only about 3,500,000, with an equal number of sheep, goats, and swine. There are some excellent horses and mules of Andalusian stock. Wild animals of the intertropical or higher regions are: the puma, bear (two species), jagua, alligator, sloth, armadillo, tapir, deer, cavy, opossum, guagua, and 17 distinct species of monkeys. Serpents (the boa constrictor, yaruma, etc.), are not found at a greater height than about 5,000 feet above the sea, though they are very numerous in the lowlands. Characteristic birds are: parrots (many varieties), paroquets, cockatoos, lorries, cranes, storks, the condor, and sol-y-luna.

Commerce, etc.— The average export trade of Colombia before the secession of Panamá, amounted to about $15,000,000 annually. Imports during the five years immediately preceding the outbreak of hostilities in 1899 averaged about 14,000,000 pesos (gold). Exports to the United States during the fiscal year ending 30 June 1901 were valued at $3,230,625, as against $4,307,814 in 1900. Imports from the United States were valued at $3,142,052 for 1901, as against $2,710,688 for the preceding 12 months. The United States took about 27 per cent in value of Colombia's total exports; Great Britain 25 per cent; France 17 per cent; Germany 16 per cent. The articles exported are: coffee, quinine, emeralds, cacao, sarsaparilla, tobacco, indigo, ivory nuts, dyes, balsams, resins, straw hats, orchids, cattle, hides and skins, rubber, gold, and silver. The principal imports are: cloths of wool, cotton, linen, and silk, shoes, ready-made clothing, furniture, paper, machines, haberdashery, watches, drugs, books, flour, liquors, pottery, and iron. Duties are levied on exports as well as on imports.

Manufactures.— Sugar, molasses, articles of iron, ordinary cotton and woolen cloths, sole-leather, saddles, shoes, furniture, hats, jewels, books, pottery, varnishes, mats, bags, cigars, cigarettes, liquors, carpets of maguey thread, hammocks, hempen sacks, and household utensils are manufactured on a very small scale, partially supplying home consumption.

Transportation and Communication.— At the beginning of the year 1901, according to official information, there were in the republic 605 kilometres (376 miles) of railways; and before the events of November, 1903, eleven lines of steamships plied between the ports of Colombia and those of Europe and the United States. England had five lines, France two, Germany two, Italy one, and Spain one. There was not a single line of American steamers running to Colombian ports at that time. Inland traffic on the Magdalena River employs 42 small steamers. In some recent years the post-office has carried only about 2,600,000 letters, postal cards, newspapers, and parcels. The telegraph system has suffered especially. The total length of its lines in 1898 was given as 8,600 miles; the principal cities being connected with each other, and with the systems of Venezuela and Ecuador, as well as (by cable) with the United States. All the telegraph lines are owned by the government.

Coins.— Silver is the standard; the peso (value in United States gold or silver, $0.361) is the unit. The gold coins are the condor ($9.647) and double condor; silver coins, the peso and divisions. Paper money was issued during the war in such quantities that it became practically valueless.

Weights and Measures.— The kilogram (kilo), equivalent to 2.2046 pounds avoirdupois; carga = 125 kilos; quintal = 50 kilos; arroba (dry) = 12½ kilos; libra = 1.102 pounds avoirdupois. In liquid measure the French litre is the standard. Measure of length, the vara = 80 centimeters.

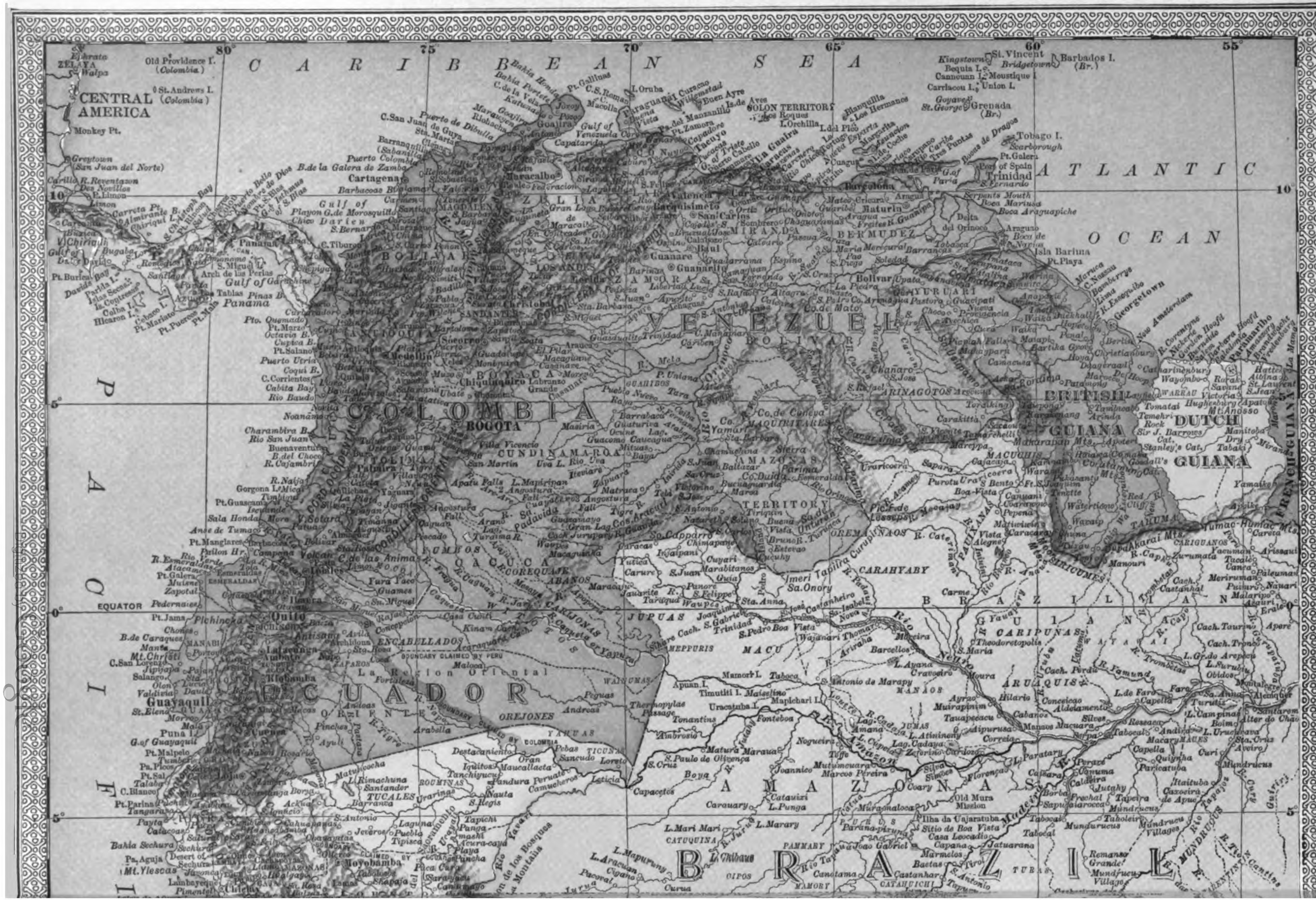
Federal Government.— The president is chosen (by electoral colleges) for a term of six years. His cabinet, though nominally composed of six secretaries, in recent practice has been limited to four, namely, state and interior, war, finance, and foreign affairs. As in Chile, the secretaries are responsible to congress. A council of state (7 members) is also prescribed by the constitution for the assistance of the executive branch. When for any reason the president ceases to exercise the functions of his office, temporarily or finally, during his term, the vice-president takes his place; failing both, the vacancy is filled by a substitute elected by congress for a term of two years. In time of peace congress meets at Bogotá every two years on 20 July. It is composed of the senate (27 members; 3 from each department) and the house of representatives (one member for every 50,000 inhabitants; term, 4 years; elected directly by citizens — whereas the senators are chosen by departmental assemblies). Judicial authority is exercised by the supreme court (seven magistrates), the district courts, circuit judges, and municipal judges.

Revenue and Debt.— The revenue of the government is mainly derived from the customs, as may be exemplified, thus: Estimated government revenue for 1901–2 (in paper pesos), 28,983,640; estimated amount of customs duties in the same years, 21,450,640 paper pesos. Minor sources of revenue are the government monopolies — the salt mines near Bogotá, the slaughtering of cattle, and the sale of meat. Estimated expenditures for 1901–2 exceeded the estimated revenues for the same years by more than 11,000,000 paper pesos. In 1901 the government offered for sale or lease its emerald mines (Muzo and Coscuez). The exploitation of coal mines and other deposits of minerals in the republic was undertaken in the same year by Swiss capitalists and a mining company organized in the United States. The sale of monopolies supplies the departmental governments with a large portion of their revenues. The total external debt of the nation in 1901 amounted to more than $14,000,000, the arrears of interest being about $506,000. The internal debt, two months before the war began, had reached a total of 11,359,074 pesos.

Army and Navy.— In time of war the president's powers are so greatly enlarged by constitutional provision that they become those of a dictator. He has then, among other privileges, the right to claim the military service of every able-bodied male citizen, the age limits being disregarded in practice. In time of peace congress determines the strength of the army at each biennial session. The regular army in former years was usually maintained on a peace footing of 5,500, the reserve being estimated at 120,000 men. The government maintains only two or three small war vessels.

Population and Classes.— Uncivilized Indians to the number of 150,000 or more are found in the territories or districts outside of the departmental limits. Largely mixed with the whites of the lower classes are the numerous descendants of the aborigines in Cundinamarca, Cauca, and Boyacá. Negroes abound in Bolívar, and the Cauca valley, but are rare in the interior departments. The population of Antioquia (570,000) is chiefly white. Members of the ruling class, almost exclusively of European descent, preserve the language and literary traditions of Spain. The total population was about 4,000,000 when the war of 1899–1902 began.

Education.— Primary education is not compulsory, but public schools and colleges maintained at the expense of the departments were



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ATLANTIC OCEAN
PACIFIC
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COLOMBIA
BOGOTA
VENEZUELA
BRITISH GUIANA
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FRENCH GUIANA
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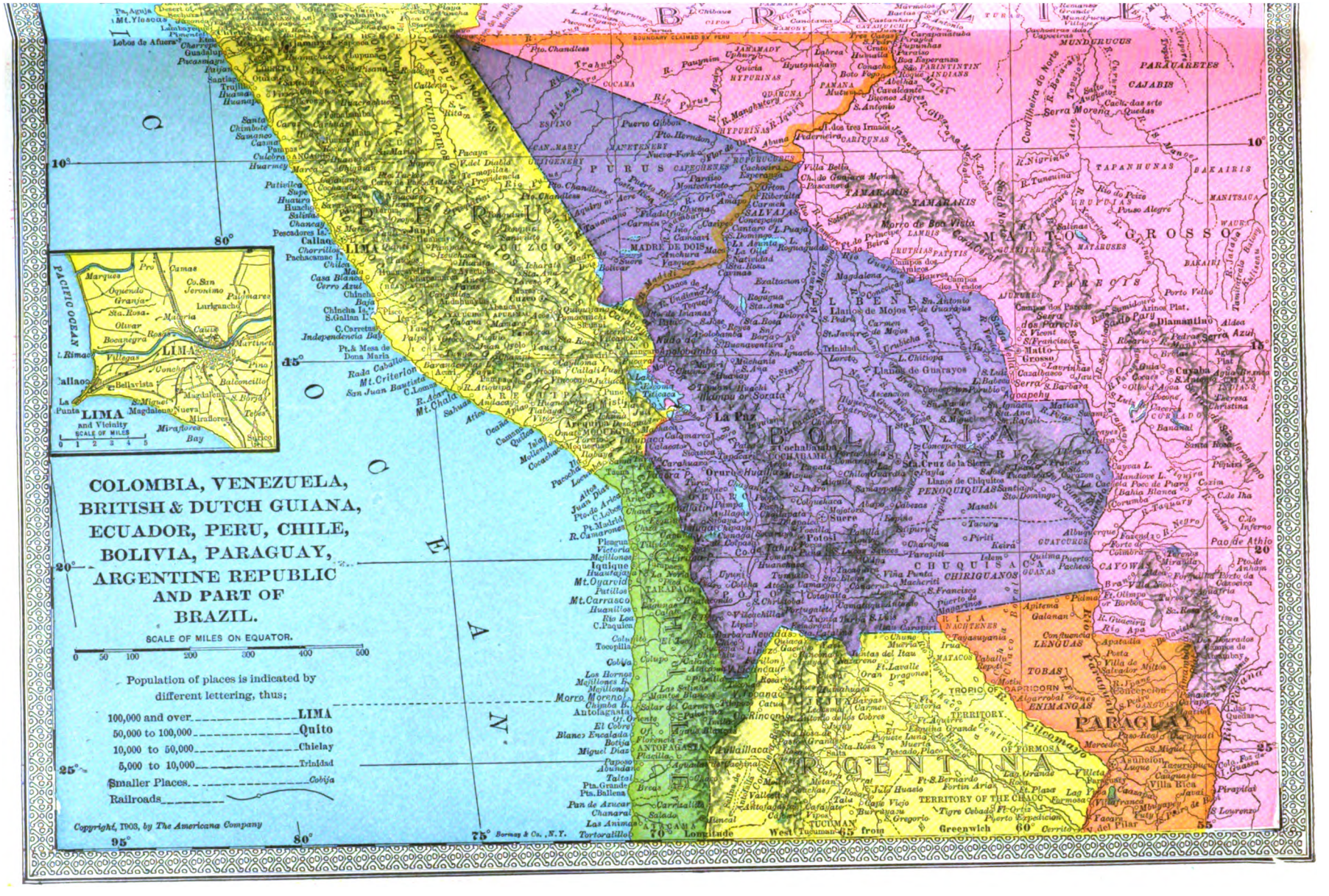

attended in 1897 by 143,076 pupils. The federal government maintains a national university that has faculties of philosophy and letters, jurisprudence, medicine and natural sciences, and mathematics and engineering. Between 1,500 and 1,600 students are usually enrolled at this institution. Schools of secondary education, normal schools, an artisans' institute, an academy of music, and an institute of the fine arts are also supported by the nation. In addition to these there are many private schools, and several colleges relying wholly upon their own revenues. Before the civil war of 1899 an increase was noted in the provision for the free instruction of the people.

Local Government.— In each of the departments there is a legislative body, known as the departmental assembly, composed of deputies elected directly by the citizens in the ratio of one deputy for each 12,000 inhabitants. These assemblies regulate local affairs and expenditures, and choose members of the national senate. Governors of departments, being appointed by the president, and removed at his discretion, are regarded as local agents of the national administration, and at the same time chiefs of the departmental administrations. The municipal districts are controlled by alcaldes who are agents of the governors.

History.— The earliest voyages to the Colombian coast are mentioned in DISCOVERIES. In 1508 the Spanish crown granted to Ojeda the district between Cape Vela and the Gulf of Darien, and to Nicuesa the country from the Gulf of Darien to Cape Gracias á Dios. The two territories were united in 1514. Balboa's discovery of the "Southern Sea" was followed by the removal of colonists to the Pacific coast and the founding of the city of Panamá. (See BALBOA, DABAIBA, DARIEN, ELDORADO, and DAVILA.) Starting from Santa Marta 6 Aug. 1536, Gonzalo Jiménez de Quesada led 700 infantry and 80 horsemen into the mountains of New Granada (now Colombia), and took the Indian capital. Colonies were established in the table-lands and along the coasts. The city of Medina was founded in 1670 by Fray Alonzo Ronquillo of the order of Preaching Friars. In 1719 the natives destroyed the Spanish colonies on the Pacific slope. New Granada became a viceroyalty in 1740, having been administered previously as a simple presidency, except in 1718–19. In 1810 an insurrection against the government of Spain began. In 1819 New Granada and Venezuela were united, Ecuador joining the union two years later. The country thus formed was called the Republic of Colombia. (See BOLIVAR.) The efforts of Spain to retain these colonies ceased in 1824. Six years later the Colombian union was dissolved, Venezuela and Ecuador having withdrawn; and the republic of New Granada was established in 1831, its territory corresponding to that of the present republic of Colombia.

New Granada was at first divided into five departments, namely: Boyacá, Cauca, Cundinamarca, the Isthmus, and Magdalena. Lack of coherence caused a civil war in 1840; Panamá and Veragua unsuccessfully sought independence in 1841. From 1849 to 1857 the Liberal party controlled the government. In 1853 the right was granted to the departments to elect their governors by popular vote, and the powers of the provincial legislative bodies were increased. New political divisions were organized soon afterward — Panamá, etc. These claimed, and taught the older departments to claim, the privileges of semi-independent states. A civil war, beginning in 1859, resulted in a triumph for the liberal (States' Rights) party. Under the constitution of 1863 the name Colombia was reverted to, the official title being United States of Colombia. Nine sovereign states were formed, each authorized to maintain its own military forces without restriction, and to nullify the federal laws. Insurrections made steady progress impossible until a reasonable degree of federal control was asserted. In 1880, Rafael Nuñez became president. His influence secured to the national government the right to use its forces for the suppression of insurrections in the several states. A national (government) bank was incorporated; diplomatic relations were established with Spain; the question of the boundary between Colombia and Venezuela was submitted to arbitration. Nuñez held the same office, which he made important, again in 1884 and 1886. In 1891 he was elected for the fourth time, but allowed Vice-President Caro to assume his duties.

A new constitution, which is still in force, was adopted in 1886. By this the states were reduced to departments, with governors appointed by the president of the republic, and legislative assemblies elected by the people. The president's term of office was extended from two to six years. Colombia passed from the extreme of a loose federation to that of a centralized republic. Subsequent revolutions have shown the desire of the Liberals to return to the old irresponsibility. In 1892 subsidies were granted for the construction of several important railways, and new cable lines along the coast and telegraph lines in the interior were authorized. Two years later a law was passed providing for the free coinage of gold and the redemption of the paper currency. Very little progress was made, however; on the contrary the means of communication and transportation, as well as the medium of exchange, have gone from bad to worse in the last few years. The rebellion of 1895 was suppressed in 45 days, but a civil war which broke out 17 Oct. 1899, proved to be more ruinous than any preceding conflict. The Liberals attempted by force of arms to drive the Conservatives from power. An issue which, in a republic, should be settled at the polls, cost the lives of 50,000 soldiers, while among the wretched non-combatants the number of deaths from privation and disease was vastly greater. As usual, the department of Panamá was a centre of disturbance. American marines were landed to guard the stations and railway at Colón and Panamá, in accordance with the treaty of 1846 between the United States and New Granada, by the terms of which the United States guaranteed the neutrality of the isthmus and assumed the obligation to protect free transit between the ports mentioned.

Toward the end of 1902 the flame of civil war finally went out. The government was almost destitute of money; it could neither pay interest on the national debt nor meet current expenses. Congressional elections were held throughout the country. The most important matter to come before that Congress was the question of ratifying a convention concluded at Washington 22 Jan. 1903, between the secretary of state of the United States of America and the chargé d'affaires of Colombia, for the con-

struction of a ship canal to connect the Atlantic and Pacific oceans. The French Panama Company, formed in 1881, had suspended operations in 1889, and in 1894 a new company had been organized, securing a concession for 10 years, which term was subsequently extended by six years. (See ISTHMIAN CANALS, AMERICAN.) The board of this company had offered (4 Jan. 1902) to sell all its property and rights to the United States for $40,000,000 The Panamá route had been approved by the United States Isthmian Canal Commission. After a long discussion in the United States Senate, the convention was submitted to the Colombian Congress, the Constitution of 1886 providing that ratification by both Houses is requisite for the validity of such an agreement as that relating to the Panamá Canal.

The convention just referred to, commonly known as the Hay-Herrán treaty, was defeated at Bogotá, 24 members of the Senate voting on 12 Aug. 1903 to reject it. A counter-proposition prepared by a commission (29 Aug.) was debated for a while, but not adopted. The adjournment of the Colombian Congress on 31 Oct. was followed almost immediately by the outbreak of a carefully planned «Separatist» movement in Panamá. Independence was proclaimed 3 Nov., and the Colombian army and navy officers in the principal city of that department were imprisoned. A provisional government was organized. American warships were ordered to the Isthmus; marines landed at Colón; and the Colombian troops withdrew from that town. On 6 Nov. the government of the United States entered into relations with the government of the Republic of Panamá, and on 13 Nov. M. Philippe Bunau-Varilla was formally received by President Roosevelt as minister of the new country. At that time hostile demonstrations against the Colombian government occurred at Bogotá, and another revolution seemed imminent.

Arbitration.— While political factions have continued to resort to arms for the settlement of differences of opinion within the nation's boundaries, the better sentiment of an increasing class of educated people has begun to make itself felt in the disputes with neighboring republics touching the location of those boundaries. Arbitration has repeatedly been chosen in place of foreign wars. The award by the queen regent of Spain, 16 March 1891, defined the frontier on the Venezuelan side. An agreement was made 15 Dec. 1894 for submitting to arbitration the question as to the southern line between Colombia and Ecuador and Peru. President Loubet of France acted as arbitrator of the boundary dispute with Costa Rica, rendering a decision 11 Sept. 1900.

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MARRION WILCOX.

Colombo, kō-lōm′bō, Ceylon, the capital, a seaport on the southwest coast, near the mouth of the Kelani River, and about 70 miles southwest of Kandy, the principal place on the island. It is a handsome town, and a portion of it, comprising most of the best houses, is within the walls of its very extensive fort, which occupies a projecting point of land, and embraces a circumference of nearly one and a fourth miles. The houses of the Europeans outside the town are very beautifully situated, especially those near the sea. There are several bazaars or market-places. The public buildings comprise the government offices, government house, hall of the supreme court, the valuable museum, etc. Some of the noted buildings are an old Dutch church, Presbyterian, Anglican, and Roman Catholic churches, hotels, orphan asylum, military hospital, and barracks, the town-hall, the railway station, the Colombo Royal College, St. Thomas' College, and Wesley college. The Moors have two handsome mosques with minarets; the Hindus also have their temples, rudely sculptured. Water is brought from a distance of 30 miles to the town, and there are extensive gas-works. The harbor was formerly capable of receiving small vessels only, and large ships had to cast anchor upward of a mile from the shore, exposed to the southwest monsoon; but a breakwater now gives complete shelter, and Colombo is the regular calling station for the large steamers bound for Bombay, Madras, Calcutta, the Straits, China, Australia, etc. It is the chief port of Ceylon, its exports and imports including the great bulk of the goods sent from and brought to the island. Pop. (1901) 154,556.

Colon, sometimes called **Aspinwall,** Panamá, a town of 5,000 inhabitants on the northern side of the Isthmus of Panamá, connected with the city of Panamá by a railway 49 miles in length. During the civil war in 1885 it was partly burned, but has been rebuilt. It stands upon an island which divides an inlet of the sea into the ports called Manzanillo and Naos, or Newbay. American marines and sailors were landed there during the revolutions which began in 1885, 1899, and 1903, in accordance with the treaty by which the United States guarantees to preserve from interruption free transit across the isthmus.

Colón, kō-lōn′, Cuba, a town and district of the province of Matanzas. Area of the district 114 square miles. Area cultivated, 245.03 caballerias. (This was 498.91 caballerias in 1895.) Races, occupation, etc., for the district: Native whites, 5,706; foreign whites, 824; negroes, 2,856; mixed, 2,432; Chinese, 377; persons 10 years of age or over who can neither read nor write, 5,467; engaged in agriculture or mining, 2,741; in trade and transportation, 600; manufacturing and mechanical industries, 576; professional service, 61; domestic and personal service, 984; without gainful occupation, 7,233; number of occupied dwellings, 2,199; number of families, 2,624; persons to a family, 4.7. The following statistics are from the United States War Department census of 1899: Population of the town, 7,175; of the district, 12,195 in 1899, as against 16,679 in 1887.

Colón, Venezuela, a federal territory embracing the Venezuelan islands in the Caribbean Sea, except those belonging to the state of Rivas. The islands forming the territory are: Blanquilla, Los Hermanos, Frailes, Sola, Testigos, Venados, Esmeraldas, Caracas, Picudas, Chimanas, Borracha, Arapos, Monos, Piritu, Farallón, Ocumare, Orchila, Los Roques, Aves, Los Monjes, and several smaller ones. The natural products are phosphate of lime, guano, lime, woods, and fish. Large quantities of the plant called orchila are exported for industrial purposes. There are salt deposits in Los Roques. Gran Roque is the capital. Nearly all of the islands are uninhabited. The territory is directly dependent upon the national government, and, like the territory of Amazonas, is governed by special laws.

Co'lon, that part of the intestine that extends from the ileo-cæcal valve to the rectum, practically the entire large intestine. Its position in the abdomen is at first vertical, on the the right side,—the ascending colon; then horizontal, the transverse colon, situated just beneath and behind the liver and stomach, going from right to left. It then descends, on the left side, to the sigmoid flexure in the left flank, and then bends abruptly inward and backward to end in the rectum, just in front of the spinal column. It is about four feet in length, and two inches in diameter, is made up of the same kinds of tissue as the intestine, but is rougher and more sacculated. In the large intestine the fecal matter loses its surplus water, and is molded slowly into form for final discharge through the rectum and anus. See ABDOMEN; INTESTINE.

Colon Bacillus, a very common bacterium (*Bacillus coli communis*), of the intestinal canal of many animals, including man, in which place it seems to serve some useful functions in the breaking down of food-stuffs, although, for lower animals at least, it is not indispensable for proper digestive processes. It is a short motile bacillus and closely resembles the typhoid organism, from which it is separated only by careful bacterial technic. While a normal inhabitant of the intestines of man, it may in abnormal situations be a cause of disease-processes. Its presence or absence in potable waters is of service in determining the presence of contamination of a water supply by animal fecal matter. See TYPHOID BACILLUS.

Colonel, kėr-nēl, the commander of a regiment, whether of horse, foot, or artillery. Any rank above a colonel constitutes the bearer of it a general officer. In the British service the rank of colonel is honorary, and is usually bestowed upon officers of superior rank and princes of the blood, who receive the emoluments of it in addition to those of their regular rank. The actual commander of the regiment is the lieutenant-colonel. In some of the Continental armies also the colonelcy is an honorary post held by persons of rank in the army or the state. In the United States army and the State militias the title of colonel is not honorary, but entails actual service as commander of his regiment.

Colonia Bolívar, kō-lōn'-yā bō-lē'vär, Venezuela, in the Sucre district of the old state of Miranda, about 30 miles from Caracas and five miles from Guatire. It is one of the two colonies which were established in 1874 with the design of encouraging immigration. The main products are coffee and starch. The principal town is Araira. The Araira River and several other streams irrigate the soil.

Colonia Catalana, kā-ta-lā'nā, Paraguay, situated in the department of Villa del Rosario. Cultivated area, 58 cuadras.

Colonia Cosme, kŏz'mā, Paraguay, in the department of Caazapá, a colony recently founded by Australians, who have already a school, several stores, a carpenter shop, a shoe factory, a saw-mill, a tannery, and 65 cuadras under cultivation.

Colonia Independencia, ēn"dā-pān-dān"-sē-a, Venezuela, in the Altagracie district of the old state of Miranda, about 70 miles from Caracas. Its area is 555 square kilometers; its altitude 5,400 feet above sea-level; Taguacita is its principal town, and its agricultural products are coffee, sugarcane, yucca, and cacao. There are extensive forests and two rivers. The colony was founded in 1874. See COLONIA BOLIVAR.

Colonia Nacional, nā-thē-ō-nāl', Paraguay, formerly called "President Gonzalez's Colony," situated in the department of Caazapá. It covers an area of 12 square leagues, crossed by the railway from Asunción to Villa Encarnación. The ground is hilly, well watered, and covered with fine timber. Maize (harvested as often as three times a year), sugarcane, tobacco, wheat, potatoes, coffee, vines, rice, and lucerne, all grow readily in the valleys or on the hillsides. The export trade in 1901 was valued at $245,971. Pop. 847. For other colonies, see PARAGUAY.

Colonia, Uruguay, a department on the Plata, below the Uruguay River. The uplands are barren, but in the fertile valleys and plains are numerous European colonies, engaged in agriculture and stock raising. The capital, Colonia del Sacramento, on the Plata, about 100 miles above Montevideo, has a good harbor, a dock for vessels of 1,000 tons, ruined fortifications, and some 1,500 inhabitants. Area of the department 2,192 square miles; pop. 50,300.

Colonial, or Compound Animals, organisms which cannot be fairly regarded as unities, but consist of numerous more or less similar individuals united in a common life. Among the usually single-celled simplest animals or *Protozoa,* loose colonies not unfrequently occur, and are of not a little importance as suggestions of the bridge between the single-celled and many-celled animals. Such colonies arise when the original cell instead of reproducing discontinuously, retains its daughter-cells in union with itself or with one another, much like the segments of the egg-cell of a higher animal. By sacrifice of individuality at the time of reproduction, a higher unity is formed. In the same way a simple cup-shaped sponge, by continuous budding, forms a colony of similar forms, which may possess more or less distinct individuality. The common fresh-water *Hydra,* to mount a step higher, buds off daughter *Hydræ,* which remain for a while connected with the parent organism, and make it temporarily colonial.

Many marine hydroids retain their polyps permanently as constituents of such a complex organism, and, as a differentiation of these into

nutritive and reproductive, and often into still other kinds, takes place, a higher order of more complex individuality arises; the polyp life is in part subordinated to the colony life. Among the most perfectly organized of such colonies are the floating *Siphonophora* (such as the Portuguese man-of-war), in which five or six perfectly differentiated and specialized kinds of zooids act together in mutual interdependence to support the whole. In most cases such zooids are incapable of performing any but the one function, or set of functions, to which they are adapted, and consequently cannot sustain independent life. This is one way of approaching the questions of individuality and of organization of the higher *Metazoa*. See COMPARATIVE ANATOMY.

For social communities or colonies composed of numerous free individuals all working together for mutual benefit, and how new colonies are founded, see ANT; BEE; WASP; WHITE-ANT, etc.

Colonial Dames of America, The National Society of, an ancestral and patriotic organization of American women, founded 19 May 1892; and composed of one Colonial Society from each of the 13 original States, one society from the District of Columbia, and one associate society from each of the non-colonial States. The objects of the National Society are: to preserve colonial history, traditions, manuscripts, records, relics, and buildings; to perpetuate the brave deeds, and glorious memory of the colonists, and to engender and encourage patriotism. To be eligible to membership, a woman must be descended from some worthy ancestor, who rendered valuable service to the colonies, and who became a resident of America previous to 1750. Memberships are obtained only upon invitation from those already enrolled, and must be procured through admittance into the Colonial Society, of the ancestral State, where the service of the ancestor was rendered. The work of the society has been patriotic. During the Cuban war nurses and supplies for the sick were supplied; at the close of the war a splendid monument, in Arlington cemetery, Washington, D. C., "to the memory of the soldiers and sailors, who gave up their lives in the late war with Spain," was erected by the society "in the name of the Women of the Nation." One of the most valuable and interesting collections of colonial relics and furnishings is under the control of the New York Society at the old Van Cortlandt manor house in Van Cortlandt Park. Churches and colonial houses of historical importance have been restored; historical sites marked with tablets; prizes awarded for essays on patriotic and historical subjects, to pupils of public schools and colleges. A complete list of the soldiers and sailors, who fell in the Cuban campaign, form the contents of a Record Book, compiled by the society. Great credit is due this organization for preserving many historical places which otherwise might have been destroyed. The society numbers (1903) 4,000 members.

Colonial Office, the English government office where business connected with the government of the colonies is carried on. A secretary of state for the colonies was first appointed in 1768. In 1782 the title was abolished again and the colonies were placed under the home secretary. In 1801 the jurisdiction was transferred to the secretary for war. In 1854 the original arrangement was reverted to, and there have been colonial secretaries ever since.

Colonial System. See COLONIES AND COLONIZATION.

Colonial Wars in America. A résumé of the colonial wars in America must of necessity omit many local disturbances which were of importance historically and which the student can find graphically described in many of the volumes included in the bibliography at the close of this article. Some of the most important are here chronologically presented.

1607. Jamestown, Va.—Although Capt. Gabrill Archer and a sailor were severely wounded by arrows tipped with deer's-horn and sharp stones, the night the English landed in Virginia, the first real conflict in American colonial history came two weeks after the Jamestown settlement, at the end of May, 1607, 200 Indians being repulsed by the settlers under Capt. Edward-Maria Wingfield. English casualties, one killed; 11 wounded. From this encounter to the battle of Lexington (q.v.), April 19, 1775, scarcely a generation in the several colonies reached manhood, without knowing the horrors of war.

1620. Plymouth, Mass.—The Pilgrims of New England had their first encounter with the dusky Nausite tribe, whose arrows were headed with hart's-horn, eagle's-claws, and brass, Dec. 8, 1620, and for over half a century the warfare continued with exacerbations of varying ferocity.

1622. Virginia.—Two years later their kinspeople at Jamestown escaped annihilation by the warning of a converted Indian. March 22, at midday, 347 men, women, and children were slain, by supposedly friendly savages, among the scattered hamlets along both banks of the river.

1633–7, Pequot War.—The Pequot Indians, in 1633, killed several English traders who came to their Connecticut River territory; 1634 found the Pequots at war with the Narragansett tribe, and hostile to the Dutch as well. Then the New England colonists prepared for the inevitable encounter. Sassacus reigned as Pequot chief. About this time John Oldham and two young lads were slain by the savages at Block Island. Governor Endicott promptly sent a force which destroyed the major part of this band. The Pequots then tried to enlist the cooperation of the Narragansetts, but this failed, owing to the influence exerted by Roger Williams over this tribe. The murder of 30 men and women followed. Connecticut, in May, 1637, placed John Mason in command of troops contributed from Massachusetts and Plymouth under Capt. John Underhill, allies being Mohegans, Uncas their sachem, and 400 Narragansetts and Nyantics. The desperate battle of Pequot Hill, Groton, Conn., was fought May 26, 1637. Mason says: "Most courageously these Pequeats behaved themselves"; but, "such a dreadful Terror did the Almighty let fall upon their Spirits that they would fly from us and run into the very Flames, where many of them perished." Nearly 800 Indians were slain in an hour; only two English were killed, and 20 wounded. Activities ceased in August, and the

next year a treaty was concluded between the colonies and the tribes.

1642–7. Ingle's Rebellion.— Indians began to molest Europeans in Maryland in 1642, and following these attacks came Ingle's Rebellion, July, 1643, aided by Clayborne, and which caused internal discord in the colony until peace was declared between contending parties in 1647.

1643–7. Kieft's War.— Kieft was appointed governor of New Netherlands in 1638. In the winter of 1643 he made war on the Mohawks, causing an outburst of hostilities among the Algonquin tribes. Massacres and conflagrations continued through the winter and following summer. John Underhill of Connecticut commanded the troops, and successfully routed the Long Island tribes. In March, 1644, Underhill, with 150 Dutch soldiers, landed at Greenwich, Conn., attacked an Indian village of 700, slew 180 in an hour, then set fire to the village, causing the death of 500 Indians by fire and sword. Kieft proclaimed a public thanksgiving for this victory. Nearly all Dutch farms and 1,600 Indians had been destroyed when Peter Stuyvesant succeeded Kieft in 1647, and peace was established.

1644. Virginia.— On Holy Thursday, 1644, Opechancanough and his warriors killed 500 white settlers in Virginia. Vigorous measures were taken by settlers, and the Indians were dispersed, their villages and the Powhatan confederacy (embracing nearly 50 petty tribes) destroyed, their chief captured and shot.

1648–56. New Sweden.— In April 1638 Peter Minuit, with his colony of Swedes, reached Delaware Bay. The colony was unusually prosperous, while Dutch interests there waned. Disputes arose as to titles of land; in 1648 the Dutch tried to erect a fort and houses on the Schuylkill, but were repulsed by the Swedes. Continued friction between the two races resulted, although Stuyvesant of New Netherlands and Printz of New Sweden agreed to be, and for three years were, allies. First one side would capture a fort, then the other; until, in 1656, after discussion by the States-General and Sweden (which came to naught), the city of Amsterdam bought the West India Company's interest on the South River (Delaware), and the colony of New Amstel was launched, while the authority of New Netherlands ceased.

1660. Bacon's Rebellion.— See BACON'S REBELLION.

1664–73. New Netherlands.— England seized New Netherlands Sept. 8, 1664, and war was formally declared in March, 1665. England suffered greatly at hands of Holland in 1666, but continued to hold her American conquests. August 8, 1673, a Dutch fleet of 23 vessels, with 1,600 men, arrived off Staten Island, and on the 9th anchored off the fort. The Dutch commander, Evertsen, at length opened fire, which the fort returned, but the fort surrendered and the Dutch flag was raised.

1666. French and Iroquois.— The French waged war with the Iroquois and other tribes for 60 years, coming down from Canada, invading and destroying their villages. As a result, peaceful white settlers suffered from Indian retaliation.

1675. King Philip's War.— John Sassamon or Sausaman, secretary and interpreter of the Wampanoags' chief (he had been a pupil of the apostle Eliot) heard of plot to exterminate the English, and reported it to the Plymouth authorities. King Philip, second son of Massasoit, who had been chief sachem of tribes between Charles River and Narragansett Bay, was summoned and examined by the authorities. Learning of the informer, he caused his death, Jan. 29, 1675. His slayers were, in turn, executed by the authorities. Then followed a series of Indian retaliations; eight or nine whites were killed at Swansy; in June, companies from Massachusetts and Plymouth drove Pokanokets from Mount Hope; Philip fled to Nipmucks, who killed Capt. Hutchinson and 16 others; Brookfield was burned; Deerfield and Northfield attacked; Capt. Beers and 20 men from Hadley slain; Capt. Lathrop and 80 men killed at Bloody Brook, near Deerfield, which was then burned; and Springfield and Hatfield were attacked. War continued through the summer, and in October, fearing an attack from the Narragansetts, Governor Winslow with 1,000 men marched against them. All troops were assembled December 18, and on the 19th began the memorable battle, which ended in the complete rout of the once powerful Narragansetts. On Feb. 10, 1676, occurred the Lancaster massacre by the Nipmucks; and this, taken with the series of calamities at Medfield, Worcester, Marlborough, Mendon, Groton, Weymouth, Sudbury, Chelmsford, Springfield, Wrentham, Hatfield, Hadley, North Hampton, Andover, and Bridgewater, makes an appalling list of horrors. War was actively waged by Canonchet, son of Miantonomo, until his capture by Capt. Dennison and the Connecticut troops, and subsequent death at hands of Mohegans. August 12 King Philip was killed at Bristol and the war was at an end.

1680. Port Royal, S. C.— The Spaniards from Florida attacked the Scotch settlement at Port Royal, S. C., in 1680, completely destroying it. A force of 400 men was raised to retaliate, but this plan was forbidden by the proprietors, inasmuch as the colonists were supposed to be not wholly blameless.

1687–9. French and Senecas: Montreal.— The French waged war with Senecas 1687, defeating them. Indians then destroyed Fort Frontenac. In 1689 the Iroquois attacked Montreal causing great devastation and loss of about 1,000 French.

1689–91. Leisler's Rebellion.— See LEISLER'S REBELLION.

1690. First Intercolonial War: King William's War: Quebec.— War between England and France was declared in 1689. The French in Canada planned an attack on Boston and New York. They came down from Canada with Indian allies; attacked Schenectady Feb. 8, 1690; Salmon Falls, March 27; horrible massacres ensued, and the colonies were aroused. March 19 the General Court of Massachusetts proposed a congress, at which measures for their protection should be arranged. The several colonial bodies were notified. Representatives from Massachusetts, Plymouth, Connecticut, and New York met at New York. On May 1 they signed an agreement to send 855 men for the support of Albany and, "by the help of Almighty God, subduing the French and Indian Enemies." Attempts to conquer Acadia and so move on Quebec, together with a plan to secure Montreal *via* Lake Champlain,

followed. Acadia and Port Royal were captured by New England men under Sir William Phipps; then the force pressed on to Quebec, but not securing the desired support of Major Fitz John Winthrop, their object was not accomplished.

1696. Frontenac's Expedition.— Frontenac's expedition against Iroquois, Oneida, and Onondaga tribes, occurred in 1696, when he was 74 years of age. The tribes were humbled by him, but not subdued.

1702–10. Second Intercolonial War: Queen Anne's War.— War was declared May 15, 1702. In August, 1703, the French and Indians attacked Wells, Saco, and Casco. Deerfield and Lancaster also suffered. In May, 1704, Col. Benjamin Church, with troops, sailed from Boston, against Acadian settlements. In 1705 French and Indians destroyed Petit Havre and St. John's, N. F. In 1709 Haverhill was attacked by French and Indians; Oct. 16, 1710, Port Royal captured by the English under Nicholson, and renamed Annapolis, in honor of the queen. Varying degrees of Indian hostility were experienced along the coast to the Kennebec River, until 1725, when peace prevailed.

1703–15. Southern Wars: Charlestown.— On Jan. 15, 1703, a battle was fought between Carolina troops under Col. Moore and the Spanish forces under Don Juan Mexia, and 800 of the latter were killed. In August, 1706, Charlestown was attacked by a Spanish fleet, with small loss to either side.

1711. Tuscarora War.— September 22, 1711, Tuscaroras and Corees slaughtered inhabitants along the Roanoke River and Pamplico Sound. During several days they killed the whites along Albemarle Sound. Col. John Barnwell, with South Carolina troops and Indian allies, guided an expedition which made several attempts to drive them away; finally captured 800 in a fort; fought a severe battle Jan. 28, 1712, and killed 400 warriors. The remaining hostile Tuscaroras migrated to Oneida Lake, joining the Iroquois confederacy.

1714–15. Yemassee War.— The Yemassee war was instigated, so it is claimed, by the Spaniards. A series of Indian outbreaks occurred in 1714–15, in one encounter 400 South Carolinians being killed. The Yemassees were driven out of Carolina into Florida, but disastrous warfare continued, hundreds suffering brutally at hands of savages.

1739–48. War with Spaniards in Florida: War of Jenkins' Ear: Carthagena.— The English South Sea Company, under the Treaty of Utrecht, was permitted to supply slaves to Spanish colonies. A smuggling-trade developed, which a Spanish fleet (*guarda costas*) tried to discourage. England and her colonies heard of terrible severities imposed by Spaniards on suspects captured. Runaway slaves from South Carolina made their way to Florida, were well received, protected, and given grants of land by the Spaniards, who declined to return slaves. In 1738 Oglethorpe, appointed military commander of Georgia and South Carolina, returned from England with a regiment. The same year, Capt. Jenkins, skipper of the ship Rebecca, was examined in the House of Commons. He described how, having unjustly accused him of smuggling, the Spaniards first hung him at the yardarm, then lowered him, and cut off his ear, telling him to take it to his king. Public clamor caused Walpole to declare war Oct. 23, 1739. An English fleet under Admiral Vernon visited the Isthmus of Darien, and captured Porto Bello. Oglethorpe, having perfected a treaty with the Creek Indians, called on them and South Carolina for aid. Although an expedition captured Fort Picolata (thus preserving navigation of St. John's River, and preventing Spaniards communicating with posts at St. Mark's and Pensacola), Oglethorpe found the 1,200 men under his command unable to make any impression on St. Augustine, and gave up the siege of that place after heavy loss to his Highland regiment, and desertion of Indians and some Carolina troops. In the spring of 1741 Admiral Vernon, co-operating with land forces under Gen. Wentworth, failed in an assault on Carthagena. A fleet under Commodore Anson secured several valuable Spanish prizes. The Peruvian town of Paita was destroyed. In 1742 a Spanish fleet of 56 vessels, carrying 7,000 or 8,000 men, fitted out at Havana, and appeared off the Georgia coast at the end of June. Its attempts to capture the island of Amelia and forts at Frederica were frustrated by Gen. Oglethorpe. July 7, 1743, the Spaniards lost heavily at the battle of Bloody Marsh; July 24 Oglethorpe proclaimed a general thanksgiving for the end of the invasion.

The following reproduction of the governor's speech to the General Assembly of his Majesty's colony of New York is of interest. It is for the first time reproduced from the only known copy, in possession of the New York Historical Society, and bears upon this period of martial activity, giving an idea of the style of appeal from king to colonists.

JOURNAL OF THE NOTES AND PROCEEDINGS OF THE GENERAL ASSEMBLY OF HIS MAJESTY'S COLONY OF NEW YORK, 30TH DAY OF JUNE 1740.

Gentlemen: His Majesty having been called upon, by repeated Provocations, to declare War against Spain, and being determined, by God's Assistance in so just a Cause to Vindicate the Honor of His Imperial Crown, to Revenge the Injuries done to His Subjects, to Assert their undoubted Rights of Navigation, and by all possible Means, to Attack, Annoy, and Distress a Nation that has treated His People with such Insolence and Barbarity, has given Orders for the Equipping and setting forth an Expedition against the Territories of the Catholic King in the West-Indies, which will consist of a large Squadron of Ships of War, and of a considerable Body of Land Forces, with a suitable Train of Artillery, Store-ships, and all Things requisite: and has likewise given Orders to raise the Body of Troops in His Majesty's Colonies on the Continent of North America, to join those to be sent from England, at a particular Rendezvous. I have, in Obedience to His Majesty's Commands, taken the best Measures in my power, to invite and encourage in His Majesty's faithful Subjects in this Province, chearfully to enlist in His Majesty's Service for this Expedition: But it is in your Power to do much more, by giving a Bounty to every Man who inlists in this Service. And I am perswaded it will be such as will shew the World, that you will not be behind the most Zealous of His Majesty's Subjects, in promoting this Glorious Enterprise. Now, although by the Success of this Expedition, the Commerce and Navigation of this Province, to and from the West-Indies, will not only be secured, but greatly increased by the large Possessions which, by the blessing of God on His Majesty's Arms, will fall into his Majesty's hands. And although by such acquisitions a Door will be opened for a larger Consumption of Provisions (the Staple of this Province) whereby the Farmer, as well as the Merchant, may be greatly enriched, Yet, it is but little that His Majesty expects from his Dutiful and Loyal Subjects of this Province, towards the Expense of this Expedition. And I am commanded by His Majesty, to Recommend it to you, in His Name, as I do most earnestly, That you provide Victuals, Transports, and all other Necessaries for the Troops

to be raised in this Province, except Cloathes, Tents, Arms, Ammunition and Pay till their arrival at the general Rendezvous in the West-Indies from which Time the Said Transports are to enter into His Majesty's Pay. In the doing whereof, I hope you will loose no Time, that the Expedition may not be retarded. His Majesty's Expectations are so just and reasonable, and the Prospect of Advantage to the Province so clear, that I perswade myself, you will chearfully and immediately provide for the Expence of what is recommended to you. These Things being Matter of the highest Importance, I will not now take off your Attention, by Recommending anything else to your Consideration, hoping you will give this Business the utmost Dispatch, wherein you will, in a very particular manner, Recommend yourselves and your Country to His Majesty, Whom God long Preserve.

GEORGE CLARK.

A bill covering the above passed the assembly July 10, 1740, and Cols. Morris and Philipse carried the same to the council for its concurrence. It was passed by the council July 11, and signed by the lieutenant-governor July 12.

1744–48. Third Intercolonial War: King George's War.— May 13, 1744, Governor Duquesnel of Cape Breton captured an English settlement at the island of Canso, near Nova Scotia; destroyed the fort, removing all prisoners to Louisburg; but was unsuccessful in an attempt against Annapolis, N. S., and Placentia, N. F. New England colonists declared war on Nova Scotia Indians, who attacked Annapolis and planned the capture of Louisburg. Men, money, and supplies were contributed by Pennsylvania, New Jersey, New York, Connecticut, Rhode Island, and New Hampshire, but the chief burden was imposed on Massachusetts. Command of the forces (some 4,000 men) was given to William Pepperell, who left Boston in April, 1745, Commodore Warren, commanding in the West Indies, furnishing ships of convoy. Five assaults were made on an island battery protecting the harbor before the French surrendered, June 17. For this success Pepperell was made a baronet. An expedition the following year proved unsuccessful, and Louisburg was returned to the French by the Treaty of Aix-la-Chapelle, Oct. 7, 1748.

1754. Great Meadows.— In December, 1753, George Washington carried a request from Gov. Dinwiddie of Virginia to the French commander of Forts Vernango (confluence of French Creek and Allegheny River, now Franklin, Pa.) and Le Bœuf (west fork of French Creek, now Waterford, Pa.) that he retire from territory claimed by the English; request was refused. Gov. Dinwiddie then ordered a fort constructed at the forks of the Ohio, and while work was in progress the French appeared and the English retired. A regiment organized under Col. Joshua Fry, with Washington second in command, pushed on with 150 men. May 28, 1754, when near Great Meadows, the French were met in a glen. In ensuing hostilities the French commander, Jumonville, was killed, and those under him captured. Washington retired to Great Meadows and threw up intrenchments, awaiting Col. Fry's force, which finally arrived. Col. Fry had died suddenly. Washington made a second advance, which proved ineffectual against a French force of 700, and he retired with the honors of war, July 3, 1754.

The same month Benjamin Franklin, Thomas Penn, and others assembled at Albany by request of the "Lords of Trade" (a standing committee of England's privy council), hoping to make an agreement with the chiefs of the Six Nations for protection in the event of further hostilities with France. Franklin's plan was unanimously approved at this congress, but the several assemblies failed to ratify it. Had his plan been adopted, it is said, the several colonies would have been united and strong enough to withstand attacks from enemies without England's assistance and the later pretense for unjust taxation. Thus the Revolutionary struggle might have been averted.

1755–63. Seven Years' War: French and Indian Wars: Braddock's Defeat.— The English government, in 1755, placed Gen. Braddock over a force intended to drive the French from the Ohio Valley. Washington was on his staff. Braddock planned the capture of Fort Du-Quesne, at the confluence of the Allegheny and Monongahela rivers. Untrained in methods of frontier warfare, having seen no enemy on his tedious march (April 2 to July 9), Braddock scoffed at the employment of scouts as he approached the immediate vicinity of the enemy, with the result that when his command was attacked it was completely defeated; half his 1,600 men killed or wounded, and he himself died from a wound received in the onslaught. His papers were captured by the French, who found therein all the English plans.

1755. Battle of Lake George.— At a council of war, called by Gen. Johnson at early morning Sept. 8, 1755, it was proposed to send 500 men to Fort Edward. The noted Indian King Hendrick, when consulted about this number, said: "If they are to fight they are too few; if to be killed, they are too many." The force was doubled. Johnson then proposed dividing it into three parties. Hendrick took several arrows, handed one of them to Johnson, requesting that he break it, which the general did; Hendrick then placed three arrows in the general's hand, saying: "Put them together and you can't break them: take them one by one and you will break them easily." This argument was conclusive. Col. Ephraim Williams led; Lieut.-Col. Whiting had second division; King Hendrick, with 250 Mohawks, was in advance of the Provincials. Rocky Brook was reached; here the enemy was in ambush; but for friendly warning from Senecas, troops would have perished. Col. Williams and King Hendrick lost their lives; Gen. Johnson was wounded; Lieut.-Col. Whiting conducted a successful retreat, followed by the French and Indian allies. Lieut.-Col. Cole, with 300 men, came from Lake George; a brilliant dash was made on the enemy, driving them and capturing Baron Dieskau. Col. Blanchard advanced from Fort Edward, where the firing had been heard, with 250 men; discovered 300 Indians resting at Rocky Brook; slew most of them. Among 500 lost by the French was Le Gardeur de St. Pierre, whom Washington had met the year before at Great Meadows.

1756–7. Forts Oswego, Ontario, George, and William Henry.— England declared war against France May 18, 1756. Gov. Shirley was commander-in-chief of colonial forces; Marquis de Montcalm general of French. Shirley slowly matured plans of attack on Crown Point and Fort Duquesne; meanwhile Montcalm destroyed three forts, Oswego, Ontario, and George. This activity of the enemy cost Shirley his position;

the Earl of Loudon taking his place, Gen. Abercrombie second in command. In 1757 Montcalm attacked Fort William Henry, at head of Lake George, garrisoned by 2,264 regulars, under Col. Munroe. The attack lasted from August 3 to August 9, when a capitulation was signed.

1758. Louisburg: Ticonderoga: Crown Point: DuQuesne.— Three expeditions were proposed for 1758: the first against Louisburg; the second against Ticonderoga and Crown Point; the third against Fort DuQuesne. May, 1758, found Admiral Boscawen at Halifax with a fleet of 157 vessels (23 ships of the line, 18 frigates and transports). There were 12,000 men under Jeffery Amherst to co-operate with him. The attack on Louisburg began June 9, and lasted until July 26, when the garrison capitulated, becoming prisoners of war. Vast quantities of ammunition and stores, 218 cannon, and 18 mortars fell into the hands of the English.

Gen. Abercrombie led a force of 15,000 men against Ticonderoga, embarking on Lake George July 5; advanced toward the fort; experienced many difficulties, including a skirmish in which Lord Howe was killed, and finally had to retreat. He lost about 2,000 men.

Lieut.-Col. John Bradstreet proposed an attack on Fort Frontenac (now Kingston, Canada); Abercrombie consented and gave him 3,000 men. This was successful toward the close of August; Bradstreet captured quantities of stores, ammunition, and cannon.

DuQuesne.— Early in July Gen. Forbes left Philadelphia en route to Fort DuQuesne, with Cherokee allies; Col. Bouquet was at Raystown; in September Col. Washington joined Forbes; late in November Fort DuQuesne was in possession of colonial forces, receiving the name of Pittsburg in honor of the elder William Pitt.

1759. Quebec.— Maj.-Gen. James Wolfe was appointed to proceed against Quebec. He had ten battalions of infantry, six companies of rangers, artillery, engineers, and the Louisburg Grenadier Corps. Under Admiral Saunders were 22 ships of the line, 5 frigates, and several transports; Wolfe had, as brigadier-generals, Monckton, Townshend, and Murray; Col. Guy Carlton commanding the grenadiers, and Lieut.-Col. William Howe (brother of Lord Howe) the light infantry. At Quebec were more troops than the English had, under Montcalm, who placed them along the north shore, below the city, from St. Charles River to the Falls of Montmorency. Wolfe placed batteries within cannon-shot of Quebec at the west point of the Isle of Orleans, and at Point Levi. The lower town was destroyed; conflagrations occurring in the upper town by red-hot balls and shells. July 9 Wolfe crossed from the Isle of Orleans to the north branch of the St. Lawrence, camping below the Montmorency; July 18 he made a successful reconnoitre. His attack on redoubts at the ford was unsuccessful, with a loss of 400 men and two vessels. While ill, and awaiting the arrival of Gen. Amherst, he called a council of war; and it was decided to draw Montcalm into the open field. Camp was broken and the troops moved to Point Levi.

De Bourgainville, with 1,500 French, guarded the north shore to prevent landing. The English admiral deceived the French by moving his vessels below the real landing-place (Wolfe's Cove, near Cape Diamond). Ascent was made to the Plains of Abraham; the memorable battle was fought, Wolfe and Montcalm both dying from wounds therein received; and the citadel surrendered September 17 to Gen. Townshend.

Fort Niagara.— Soldiers under Prideaux landed July 1, 1759, within six miles of Fort Niagara. A sally was made July 11. Prideaux was killed by a bursting shell July 19; Amherst appointed Gen. Gage to succeed him; until his arrival Gen. Johnson carried on a siege; the fort surrendered July 25.

Presqu' Isle: Venango: Le Bœuf: Ticonderoga.— Col. Bouquet captured with ease Presqu' Isle, Venango, and LeBœuf. Gen. Amherst had 11,000 men for an attack on Ticonderoga, which he took late in July (the French having withdrawn), only losing 75 men in a skirmish. He also took Crown Point. The English now fortified these places.

1759–60. Cherokee War.— While the above events were transpiring trouble arose with the Cherokees, who had accompanied Gen. Forbes against Fort DuQuesne the previous year. On the return of the Cherokees numerous instances of loss of life occurred between Indians, Virginians, and Carolinians. Gov. Littleton, with 1,500 men, marched against the Cherokees, demanding surrender of the murderers; he received 22 Indian hostages as security for peace, and retired from the field owing to disease and insubordination in his command. The Cherokees attempted to take Fort Prince George, at the head of the Savannah. Hostages were placed in irons through fear of an effort to release them; one of them wounded a soldier, and his friends promptly killed all the Indians. This enraged the Cherokees, and war-parties were sent out in every direction and laid siege to the fort; the South Carolina assembly offered £25 for each Indian scalp, and voted to raise 1,000 men. Gen. Amherst sent 1,000 Scotch Highlanders under Col. Montgomery, who raised the blockade at Fort Prince George, and met Indians in June 1760. Victory was claimed by both sides. Montgomery retired to Charlestown, prepared to return north, by order of Gen. Amherst. Lieut.-Gov. Bull now ordered 400 regulars for frontier protection. Upper Cherokees besieged Fort Loudon so successfully that the garrison lived on horse-flesh until it surrendered under promise of protection to the settlement; the promise was broken, many lives lost, and many taken prisoners. In June, 1761, the Highland regiment returned and defeated the Cherokees with great slaughter. They sued for peace, which eventually was concluded.

1760. Quebec.— The delay caused in rebuilding and strengthening Ticonderoga and Crown Point prevented Amherst from moving on Montreal. The French had time to rally under De Levis, who succeeded Montcalm, and planned retaking Quebec. The plan was put in operation April 17, 1760. De Levis, with 10,000 men went down the river to Quebec, where Murray was in control. De Levis camped three miles from the city. On April 28 an attack was made, in which Murray lost 1,000 men and a train of artillery. The French loss was estimated at 300. De Levis built trenches about the city, preparing for a long siege. May 15 Swanton arrived and destroyed all the French ships at Quebec. The siege was raised May 17,

and on Sept. 8, 1760, the English flag was raised in Montreal.

1762. Martinique: Havana.— Gen. Robert Monckton sailed from New York late in 1761 with two line-of-battle ships, 100 transports, and 12,000 regulars and colonials; in February, 1762, he captured Martinique; next, Fort Royal, St. Pierre, St. Vincent, Grenada, and St. Lucia surrendered; the French fleet was destroyed; on Aug. 12, 1762, Havana was captured by forces under the Duke of Albemarle, after a fierce struggle of 44 days, and great loss of life.

1763–4. Pontiac's War.— Pontiac, chief of the Mohawks, posed as friend of the English after their victories; in secret he was plotting against them with Algonquins, Wyandots, Senecas, and others. He planned simultaneous attacks on western posts in the spring of 1763. Major Gladwin, commanding at Detroit, was forewarned, and when Pontiac and his 60 chiefs appeared on May 6, they found the garrison under arms. The fort was unsuccessfully attacked for two months; then relief came from Fort Niagara. Capt. Ecuyer at Fort Pitt (Pittsburg, Pa.) was also prepared. At the first attack, June 22, the Indians were repulsed. The second attack, July 26, lasted four days, and the Indians were defeated. Gen. Amherst sent Col. Bouquet with 500 men to its relief; while en route, 25 miles east of the fort, he fought a stiff battle with Indians at Bushy Run, coming off victorious. In September, 1764, Col. Bouquet was again at Fort Pitt. Toward the close of November the Delawares and Shawnees returned 200 captive whites. This border war had caused much distress, and the following forts had been lost before Sir Wiliam Johnson and Bradstreet successfully treated with 2,000 representatives of the Ottawas, Ojibways, Iroquois, and Wyandots at Fort Niagara, and Pontiac's war was over:

May 16, 1763, Fort Sandusky.

May 25, Fort St. Joseph (at the mouth of St. Joseph River, Mich.).

May 31, Fort Onatanon (on the Wabash, Lafayette, Ind.).

June 2, Fort Michillimackinac (Mackinaw, Mich.).

June 17, Fort Presqu' Isle (Erie, Pa.).

June 18, Forts Le Bœuf (Erie County, Pa.), Venango (Venango County), and forts at Carlisle and Bedford, Pa.

1774. Lord Dunmore's War.— When Lord Dunmore was royal governor of Virginia in 1774, dissension as to boundary lines arose between Virginia and Pennsylvania, as well as to ways and means of dealing with Indians. Virginia wished to possess their lands; Pennsylvania desired their trade; as whites encroached more and more on lands, Indians became angered; outrages followed, perpetrated by Shawnees, Mingos, Cherokees, Wyandots, and Delawares. In the spring of 1774 a ruffian borderer, Greathouse, killed nine kinsmen of the Iroquois Logan. This caused continued hostilities until the battle of Great Kanawha, or battle of Point Pleasant, in October. The effect of this battle kept the northwest Indians submissive during the early years of the Revolution, and at the same time permitted settlement of the Kentucky region.

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Colonial Wars, Society of. The Society of Colonial Wars in the State of New York was incorporated 18 Oct. 1892. It is essentially a patriotic organization, keenly alive to the necessity, in these modern days of whirl and rush, of perpetuating the names and valor of those participating in the warfare of American colonial history. Eligibility to membership consists in the applicant being 21 years of age, of good moral standing, and having a line of descent from an ancestor: (1) who served as a military or naval officer, or as a soldier, sailor, or marine, or as privateersman, under authority of the colonies which afterward formed the United States, or in the forces of Great Britain which participated with those of the said colonies in any wars in which the said colonies were engaged, or in which they enrolled men, from the settlement of Jamestown 13 May 1607, to the battle of Lexington 19 April 1775; or (2) who held office in any of the colonies between the dates above mentioned, either as (*a*) director-general, vice-director-general, or member of the council, in the colony of New Netherlands; (*b*) governor, lieutenant or deputy governor, lord proprietor, member of the king's or governor's council, in the colonies of New York, New Jersey, Virginia, Pennsylvania, and Delaware; (*c*) lord proprietor, governor, deputy governor, or a member of the council, in Maryland and the Carolinas; (*d*) governor, deputy governor, governor's assistant, or commissioner to the United Colonies of New England, or body of assistants in any of the New England colonies.

Membership is hereditary in the male line of the present members of the society and of those who may hereafter be elected, up to the limit that the society may hereafter determine upon, subject to the vote of the council upon the moral qualification of the person who may be the heir at any time to such membership. The membership in the New York Society is limited to 1,000, exclusive of descendants of members, members of State societies who may be transferred to this society, and members of the army and navy and marine corps on active service.

In 1903 there were 26 co-ordinate State societies united in the general society, with a membership approaching 6,000. In New York "business courts" are held in March and November; a "general court," for the annual election of officers, in December. At these courts papers are read dealing with the colonial period. An annual banquet is held in honor of the founding of New Amsterdam. A "general assembly" of the general society meets once in three years at such time and place as the preceding assembly designated. These general assemblies are composed of the members of the general council, together with five delegates chosen by each of the State councils.

The society has erected commemorative bronze tablets at Fort Oswego and Ticonderoga, and one of marble to Gen. Forbes. An oil portrait of Gen. Bouquet has been presented to the city of Philadelphia, and adorns Independence Hall. Many members of the society participated actively, either in the army or the navy, during the Spanish-American war, many thousands of dollars being contributed by the several State societies, from Maine to California, in equipping State regiments, caring for the sick and wounded, and for hospital supplies, flags, band instruments, etc. The year-books of the society contain valuable historical and genealogical data.

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Colonies and Colonization. In the older and stricter sense, a colony is a body of people who, having migrated and settled beyond the borders of their native country, retain a political connection with the parent state. Since, however, the colonists may be mingled in any proportion with the natives, it is impossible to maintain a firm distinction between colony and dependency. It has therefore become customary to apply the term "colony" to an outlying possession of a national state the administration of which is carried on under a system distinct from but subordinate to, the government of the national territory. According as the dominant feature is the exploitation of a dependent population, the settlement of immigrants from the mother country, or the investment of capital, colonies may be divided into possessions, settlement colonies, and investment colonies.

The Greek colony was formed in a natural way by the swarming off of surplus population, and was usually independent from the beginning. The bond between the mother state and the colony was sentimental, not political, and the former seldom expected any advantage from the founding of the colony save relief from the pressure of population. The Roman colonies formed part of an elaborate scheme for extending Roman dominion. They were instituted by the state, and were its chief instrument in confirming its conquests. In their origin they were little more than garrisons in conquered, fortified places, where land was allotted to the soldiers instead of pay and provisions.

When the discovery of America occurred, Europe was not overpeopled, and there was for a long time little spontaneous outflow of substantial elements to create new communities. The conquest of large and industrious populations, settled upon rich lands, tempted the cupidity of rulers, and gave rise to the conception of the colony as a possession, an estate to be mined or worked by the state or its favorites for purposes of revenue. Says Seeley: "A native population reduced to serfdom, in some parts driven to compulsory labor by caçiques turned into state officials, in other parts exterminated by overwork and then replaced by negroes; an imperious mother country drawing from the colony a steady revenue and ruling it through an artful mechanism of division, by which the settlers were held in check by the priesthood, and by a serf population treated paternally, that it might be available for that purpose; such was the typical colonial system."

The exploitation of subject populations by such means as tribute, serfdom, forced labor on public works and government plantations, or

the maintenance of crown or company monopolies, has come to be generally recognized as short-sighted, and no longer commends itself to enlightened nations. The old, harsh policy has, moreover, become more difficult with every step toward popular government in the dominant country, and every increase in the power of public opinion. The idea that the dependency is an estate, to be worked for the benefit of the owner, is, however, by no means dead. A disguised and slanting exploitation is still effected by tariff discriminations which insure the dominant country a monopoly of colonial trade, by the granting to favored citizens of lucrative concessions and contracts, by the imposition of a highly paid civil service from which the natives are excluded, and by the saddling of colonial taxes upon the natives while the proceeds are expended in the neighborhood and for the benefit of the European settlements.

Entirely different from the type just described is the settlement colony, which grows up in desirable temperate regions, vacant or sparsely peopled by savages. Although the love of adventure, the crusading spirit, and the desire to escape political, religious, or racial oppression are by no means to be overlooked, it is chiefly the economic motive that leads to the founding of settlement colonies. A stationary population enjoying rapid industrial expansion yields few colonists, but a clogged labor market, a narrowing circle of opportunities, and a darkening prospect stimulate large numbers to face the unknown in the hope of bettering their condition. Not only is a population stimulated to its utmost capacity, provided it remains in vitalizing touch with the mother country, but the mixture of races results frequently in a beneficial crossing of stocks, and the severe struggle in a new and untamed environment accelerates the improvement of the race by natural selection. The growth of numbers, changing constantly the relation between population and opportunities, carries a colony through well-defined stages. First comes the appropriation of natural wealth, hunting, trapping, and mining; then follows pastoralism; then agriculture, to which in time is added manufacturing. During the earlier stages, when the colony is complementary to the mother country, each finds in the other a convenient vent for its surplus products. The volume of exchanges is relatively large, and their trade reaches its maximum importance. But as population thickens and wealth accumulates, the colony, acquiring home manufactures and home markets, becomes an integral, self-sufficing community, and evinces a growing disposition to assert its independence of the mother country, formerly its complement, but now its competitor.

The granting of large entailed estates may lend a colony a semi-feudal character. But if the land system is popular, landed property will be diffused, the proceeds of labor will go to the producer, and the colony will contain few persons living on incomes derived exclusively from ownership. Moreover, being more favorable to production than to consumption, the colony will draw to itself adult males from the industrial population of the mother country, but will attract few members of the less active classes. Since the reward of industry is greater than in older societies, and the community is but little differentiated, economically or socially, manhood rather than property controls the body politic, the temper is individualistic and liberty-loving, and the conditions favor the germination and rootage of democratic ideas. Despite its social and political radicalism, the colonial society is conservative in its moral and religious ideals. Unless non-economic motives have presided over the beginnings of the colony, the pursuit of wealth is the chief interest of the settlers, and there is little room for speculative thought. The lack of cities, of intercourse, and of leisure is unfavorable to the cultivation of the sciences or the fine arts. During the early life of the colony the preoccupation with private affairs leaves little margin for public life. If the mother country is wise enough to establish security without interfering vexatiously with private interests, the administration of affairs of general concern is turned over to it without regret. A dependence upon the richer and riper culture of the parent state may indeed cause the political connection to continue long after the colony is ready for self-government. Lands thickly peopled by non-European races, and tropical regions where the climate is such that white men will not settle there with their families, do not develop into settlement colonies. Unfit to serve as an outlet for the surplus population of the temperate zone, they can be legitimately utilized by the more advanced races only as a field for the employment of commercial or industrial capital.

The commercial type of the investment colony is best seen in the early establishments of Portugal, Holland, and England, for trade with the East Indian and African peoples. When colonial enterprise is dominated by the commercial motive, penetration of the interior of a new region is not required. Trade is conducted from the decks of merchantmen, from hulks anchored at the mouth of streams, or from fortified stations situated on the seacoast or on the banks of navigable rivers. Settlements of traders and soldiers spring up, but there is little motive to extend political control over large inland regions. A chartered commercial company has at first no occasion to clash with the natives. Its armament is chiefly directed against envious rivals, eager to share in its lucrative trade. Later, when in its eagerness for an exorbitant profit, it attempts to dictate to the natives or limit their production of the staples of trade, it comes to blows with them, and squanders its resources in profitless wars. The earlier commercial colony was valued as a source of tropical products, such as sugar, coffee, and spices, which could be resold in Europe at a large advance. Since the advent of machine industry, however, the commercial colony is valued rather as a market for surplus manufactures. The recent revival of protective tariffs accentuates the struggle for outlets, and impels each of the industrial countries to extend, so far as possible, its control over Oriental and tropical populations, in order to develop in them a taste for its own goods and thus build up an important trade. The old maxim that "trade follows the flag" has taken on a new significance since protectionist nations have adopted the policy of extending their own tariff walls about their territorial acquisitions so as to exclude their commercial rivals.

The chief means of relieving the superabundance of capital that threatens to lower the rate

of profits in the advanced countries is the application of capital in the industrial development of the more backward regions. Tropical lands under native systems are almost invariably underexploited from the point of view of modern industry. The forest and mineral wealth is largely untouched, and even the area under intensive native cultivation, lacking as it does the best facilities for irrigation, tillage, and transportation, produces by no means the value it might yield. Owing to ignorance, to unstable conditions, or to the lack of accumulated wealth, industry is almost wholly deprived of the aid given by large applications of capital. Under these circumstances it is possible for the more civilized peoples, without in any way exploiting the native populations, without depriving them of their earnings or their patrimony, to apply capital and directive skill in such a manner as to reap a generous profit.

The example of Mexico and of certain countries of South America shows that backward regions may be developed by capital invested under the protection of local governments, and that no adequate reason exists for administering these countries from a distance. In other cases, however, a rapacious and unstable native rule paralyzes industry, and the utilization of natural resources is impossible until a responsible and equitable government has been instituted. It is necessary for some civilized power to suppress tribal and local warfare, to stamp out brigandage, and to establish an efficient police, a righteous administration of justice, and a rational system of taxation. When order and stability have thus been assured, the next step is the investment of development capital in the form of harbors, railways, highways, telegraphs, improved natural waterways, and irrigation works. As the means of communication are perfected, there follows naturally the employment of capital in the opening of mines, the cutting of forests, the clearing and planting of estates, and, possibly, the establishment of factories. The development of a tropical region by the aid of capital from abroad requires the presence of a small body of white men in the capacity of officials, traders, planters, and superintendents, representing in the midst of the less advanced population the superior power and intelligence of the civilized peoples.

The extension of modern forms of agricultural exploitation into climates where white men cannot endure heavy field-work creates special problems respecting the relations of capital and labor. Successful enterprise requires an abundant supply of suitable and reliable labor, and this can come only from the natives or from other colored races. In the old plantation colony the problem was solved by enslaving the local population, or by kidnapping negroes from Africa. Of late there is a tendency, in case the natives cannot be tempted or taxed to work, to draw upon the great reservoir of labor power in the East Indies and China. In the British colonies alone the numbers of coolies that have been imported under five-year contracts are approximately: In Guiana, 70,000; Trinidad, 70,000; Natal, 40,000; Jamaica, 13,000; Mauritius, 250,000. Owing partly to the racial inequality of employer and employee, and partly to the character of tropical agriculture, which cannot bear interruption, especially at harvest time, there is a strong tendency in all planting colonies to compel the specific performance of the labor contract. Under the indentured labor system in the British colonies strikes are unlawful, and refusal to work can be punished; on the other hand, the government closely supervises the terms of the labor contract, suppresses all obnoxious features, and provides machinery for compelling the fulfilment of its provisions by the employer.

If the welfare of the colony is the first desideratum, the degree of control exercised by the mother country over the internal affairs of a settlement colony will be moderate at the beginning, and will tend constantly to diminish. The prosperity of the English colonies in America was largely due to the salutary neglect of the mother country. They revolted when she sought by a stricter control to make them subserve her economic interests. The home government, even with the best of intentions, is likely through sheer ignorance to press upon the colony institutions ill-adapted to local conditions. On the other hand, during the early life of the colony the settlers, preoccupied with private affairs, have little leisure for the study of the problems of administration and government. Their political life is unduly dominated by selfish, special interests, and there is danger that the first comers may monopolize or waste the natural wealth which ought to be reserved for later arrivals. As impartial umpire and as custodian of the interests of the future, the home government may wisely exercise a supervision which will diminish as the colonial society grows in mass, stability, and variety of interests. In the final stage of political connection, the colony is granted autonomy in all save external affairs, or even becomes with the mother state a member in a federal empire. On the other hand, this gradual ripening off the parent stem is by no means the normal course of a tropical colony, where there are two unmingling elements in the population — a colored race and an incoming European race. In the West Indies, for example, self-government means the rule of the one race or the other. There is either the domination of a large native population by a permanently resident European caste, cut off from the moral and political conditions which have produced European standards, or else the subjection of the white element to the uneducated and politically inefficient majority race. Here, the home government presents itself as a power superior to local prejudices and able to override the antagonistic class or race interests which otherwise might wreck the prosperity of the colony. For these reasons the system of self-government now enjoyed by the colonies of Canada and Australasia is not likely soon to be extended to the remaining 500,000,000 human beings in existing colonies, dependencies, and protectorates.

The method of direct administration — known as "the crown colony system" — while excellent as a means of balancing conflicting interests and protecting the native majority against oppression by the white minority, errs in trusting too much to the power of ordinance, and showing too little deference to the deeply ingrained customs and characteristics of the native population. The direct government of an alien race by European officials is, moreover, very expensive; and if it is sought to utilize natives as magistrates and police, the best among the

native leaders will stand aloof, leaving often only the riffraff to become the instruments of administration. Provided there exists an advanced civilization and a highly organized native society, the legitimate ends of European control over a tropical region can best be attained by preserving and working upon the native government through the instrumentality of a protectorate. By this method the natives continue to follow their natural leaders, and retain their time-hallowed laws and customs. Resident agents of the suzerain country supervise the native authorities and, by the exercise of personal influence, prevent misrule, suppress obnoxious practices, and introduce gradually the standards of civilized administration. Commercial and industrial development proceeds apace, while the local population is better safeguarded against exploitation.

The present age has seen a marked increase of political dependency. The strong nations evince a growing disposition to police and place under orderly administration all regions where potential wealth exists, in order to make safe and profitable the improvement of such resources by means of the capital and skill of their citizens. The investment motive is likely to become in the future even more imperious than now, and the increasing speed of communication favors the permanence of the colonial relation where once it is established. There is, in fact, every prospect that in the more advanced nations a larger and larger share of attention will be given to colonial affairs and problems.

The table below prepared by the Bureau of Statistics of the United States Treasury Department shows the present area and population of the colonial possessions, protectorates, dependencies, and "spheres of influence" of each country given.

Countries Having Colonial or Noncontiguous Territory	Number of colonies, etc.	Area		Population	
		Mother country	Colonies, and other noncontiguous territory	Mother country	Colonies, and other noncontiguous territory
		Square miles	*Square miles*		
United Kingdom	54	120,979	*12,043,806	41,605,177	*351,254,076
France	29	204,092	4,317,826	38,595,000	62,270,560
Netherlands	8	12,648	782,863	5,103,924	33,408,014
Belgium	1	11,373	900,000	6,744,532	30,000,000
Chinese Empire	5	1,353,350	2,881,560	383,000,000	16,680,000
Germany	12	208,830	1,027,370	56,345,014	14,679,100
Turkey	5	1,115,046	840,486	24,931,600	14,701,221
United States	6	3,025,600	729,272	75,693,734	9,185,636
Portugal	10	34,528	804,004	5,049,729	10,115,804
Japan	2	147,655	13,543	43,760,754	2,797,400
Russia	3	8,660,395	114,320	128,932,173	3,300,000
Austria-Hungary	1	240,952	23,262	45,310,531	1,568,092
Italy	2	110,646	142,000	32,449,754	729,516
Spain	4	197,670	246,698	18,089,500	475,611
Denmark	4	15,289	87,148	2,447,441	127,184
Total	146	15,459,053	24,954,158	908,058,863	551,292,214

*Includes feudatory states of India, whose area is 731,944 square miles; population, in 1901, 63,181,000.

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Coloniza'tion Society of America, The National, an association to colonize free negroes in Africa or elsewhere. The idea was evolved by friends of negro advancement and opponents of slavery; by Dr. Samuel Hopkins of Newport, R. I., in 1770, at once to Christianize and civilize Africa, and to assist emancipation here by providing a place to which free negroes could go; and by Jefferson during the Revolution, for the latter object. But about 1800 it was taken up by the slaveholding interest, for exactly the opposite purpose — to strengthen their system by deporting the free negroes, who made the slaves discontented and were considered otherwise objectionable. Virginia tried repeatedly to obtain a national grant for colonizing purposes, and failing this, in 1806 enacted that any slave thereafter freed should leave the State within a year or be again reduced to slavery; and in 1816 the petition to Congress was renewed, to force some national action. On the first of January the society above was organized. The president (Judge Bushrod Washington), all the managers, and all but a small minority of the vice-presidents, were slaveholders; its constitution professed no purpose to benefit the blacks, and its ablest northern advocate denied that it had any. Support was asked for it in the North on the ground of its civilizing Africa and leading to gradual emancipation; in the South, on the ground of its contributing to the continuance and strengthening of slavery, augmenting the value of slave property, and providing an overflow for the excess of slaves beyond profitable employment. This impossible "straddle" of purposes ruined its chance of accomplishing much; though a number of the best northern philanthropists, and their southern peers like Birney, clung to it for some years and hoped for good from it. A great many State branches were organized, and vigorous public appeals made for it. Charles Carroll, James Madison, Henry Clay, and Latrobe the architect were its presidents. In 1820 a colony of a few hundreds was sent to Sherbro Island, West Africa, with tools and arms, and in 1822 another was sent to

found Liberia, with sincere hopes. But the perpetual vilification of the free negroes by the managers, advocates, and organs of the society, their anxiety to do nothing to antagonize the slaveholders, and their advocacy of the severest "black laws" to force the freedmen into desiring deportation as a refuge, alienated the anti-slavery element, who felt that they were being used as cats'-paws of the slave interest. Even Daniel Webster in 1825 refused to join it on that ground, though in 1822 he favored it. By 1830 the Tappans, Gerrit Smith, Birney, Lundy, Garrison, and others had withdrawn from it, and the last-named was openly denouncing it. In 1833 he went to England to expose it before the anti-slavery people there, and they united in a public protest against it. A similar society was organized there, but accomplished nothing. The American society maintained its organization even after the War, though its problem was altered, as well as the southern attitude toward it. An effort a few years since to promote a large negro emigration to Kansas or Oklahoma was met with strong objection from southern employers of labor. Consult: Wilson, 'Rise and Fall of the Slave Power in America,' Vol. I., chap. 15; Alexander, 'History of Colonization on the West Coast of Africa.'

Colonna, kō-lŏn'nä, **Aegidius de,** Italian scholastic theologian: b. 1247; d. 1316. He was prior-general of the Augustine order, and an ardent realist and disciple of St. Thomas Aquinas, under whom he studied at Paris.

Colonna, Fabio, Italian botanist: b. Naples 1567; d. there about 1650. He published several botanical works and is classed as the founder of genera in botany.

Colonna, Fabrizio, fä-brēt'sē-ō, Italian general: d. Naples 1520. He was the cousin of Prospero Colonna (q.v.) and father of Vittoria, served in the army of Charles VII. of France in 1494; in that of Frederick, king of Naples, in 1497; and afterward in that of Ferdinand the Catholic, by whom he was made grand constable in 1507. Subsequently he served in the papal army under Julius II. In 1512 he was made prisoner at the battle of Ravenna by Alfonso d'Este, Duke of Ferrara, who treated him with distinction, and dismissed him without ransom. To show his gratutude he tried to reconcile Alfonso with the Pope, and gave him a safe conduct to come to Rome; but Julius kept him prisoner, and attacked his states. Colonna, indignant at this breach of faith, rescued Alfonso from the papal troops, and reconducted him to Ferrara.

Colonna, Marco Antonio, Italian commander: b. 1535; d. 1 Aug. 1584. He commanded the papal forces at the battle of Lepanto and was subsequently viceroy of Sicily.

Colonna, Ottone. See MARTIN V. POPE.

Colonna, Pompeo, pŏm-pā'ō, Italian ecclesiastic, nephew of Prospero Colonna (q.v.): d. 1532. He was a restless and intriguing Roman cardinal who quarreled in succession with the Popes Julius II., Leo X., and Clement VII., and had part in all the troubles of the court of Rome. When Clement VII. was the prisoner of the Constable de Bourbon, Pompeo exerted his influence for his liberation. He at length became viceroy of Naples.

Colonna, Prospero, Italian general: b. 1452; d. 1523. On the invasion of Italy by Charles VIII. he took part with that prince, owing to his enmity against the Orsini family. He shortly afterward, however, abandoned the French cause, and bore arms in the Spanish interest. Among his most noted victories were those gained at Vicenza over the Venetians 1513; and at Bicoque over the French 1522. He also took Milan from the French in 1521, and Genoa in 1522. In 1523 he defended Milan successfully against Admiral Bonnivet.

Colonna, Stefano, Italian noble: d. 1347. He deserted the policy of his house, and became a supporter of the Guelf party. He was chosen a senator with Orsini, the hereditary enemy of his family. He was a leader of the nobles in opposition to Rienzi, to whose government he temporarily submitted, but was killed in an attempt to take the city by a *coup-de-main.*

Colonna, Vittoria, Italian poet: b. Marino 1490; d. Rome 25 Feb. 1547. She was the daughter of Fabrizio Colonna (q.v.), and when four years old was betrothed to a boy of the same age, Fernando d'Avalos, son of the Marchese di Pescara. At 17 they were married. After her husband's death in the battle of Pavia (1525), Vittoria found her chief consolation in solitude, and the cultivation of her poetical genius. For seven years she resided at Naples and Ischia, then removed to the convent of Orvieto and afterward to that of Viterbo. In her later years she left the convent and resided in Rome. Her earlier poems were chiefly devoted to the memory of her husband. Among her later verse the 'Rime Spirituali' (1548), is remarkable for truth of sentiment and enlightened piety. She was the friend of Michaelangelo, who wrote several poems to her. Consult Campori, 'Vittoria Colonna' (1878); Reumont, 'Vittoria Colonna, Leben Dichten, Glauben in 16 Jahhundert' (1881); Mrs. Roscoe, 'Vittoria Colonna, Her Life and Poems' (1868).

Colonna, a village in the papal states, which gave its name to one of the most powerful and celebrated aristocratic Roman families. During the Middle Ages the family played an important part in the affairs of Europe, became allied to the greatest houses of Italy, Spain, and Germany, and furnished many celebrated warriors, Popes, and cardinals.

Colonna, Cape. See SUNIUM.

Colonna Palace (It. *palazzo Colonna*), a handsome and interesting structure at the foot of the Quirinal, belonging to the family from whom it is named, but occupied of late years by the French embassy. It was commenced by Pope Martin V. in the 15th century, and was the residence of Julius II. and of Cardinal Borromeo. It contains a picture gallery, open to the public every day except holidays, which in point of size and architecture ranks with the finest in Rome. The ceiling of the great hall, supported by handsome columns of *giallo antico,* is covered with frescoes illustrative of the history of the Colonnas, the central subject being the battle of Lepanto. The collection of paintings, formerly numbering 1,362 pieces, has been greatly reduced by division among branches of the family, but still embraces many magnificent works by Titian, Guido, Salvator Rosa, Guercino, Paul Veronese, Giulio Romano, Holbein, and lesser artists. Almost equally celebrated as the

picture gallery are the Colonna gardens, which extend behind the palace in terraces up the west slope of the Quirinal. They are planted with box, ilex, laurel, etc., and have long rows of straw houses in which the lemon is brought to rich perfection. There are some colossal ruins in the garden, supposed to belong to the temple of the sun erected by Aurelian, and to the baths of Constantine.

Colonnade, a range of columns. If the columns are four in number it is tetrastyle; if six in number, hexastyle; when there are eight, octastyle; when ten, decastyle, and so on according to the Greek numerals. When a colonnade is in front of a building it is called a portico; when surrounding a building, a peristyle; and when double or more, polystyle. The colonnade is, moreover, designated according to the nature of the intercolumniations introduced as follows: pycnostyle, when the space between the columns is one diameter and a half of the column; systyle, when it is of two diameters; eustyle, when of two diameters and a quarter; diastyle, when three; and araeostyle, when four or more. A colonnade differs from an arcade in this respect, that the columns of the former support straight architraves instead of arches.

Colonsay (kŏl'ŏn sā) and **Oronsay,** ō'rŏn-sā, two islands off the west coast of Argyle, Scotland, united at low water, and at high water only about 100 yards apart; united length about 12 miles; breadth varying from 1 to 3 miles. Colonsay is much the larger, and has a diversified surface with fine rock and other scenery and beautiful sandy beaches. On Oronsay are the imposing ruins of an extensive priory, and near it a fine sculptured cross. Cattle and sheep are reared, and fishing is carried on. Visitors land at Scalasaig pier, on the island of Colonsay. The islands are named after St. Columba and St. Oran. Pop. in 1891, 381.

Colonus, in civil law, a freeman of inferior rank, corresponding with the Saxon *ceorl* and the German rural slaves. It has been held probable that many of the ceorls were descended from the *coloni* taken into Saxony by the Romans. The names of the *coloni* and their families were all recorded in the archives of the colony or district, from which fact they were known as *adscriptitii* also.

Colonus, kō-lō'nŭs, an eminence near Athens, to which Œdipus retired during his banishment to Thebes, and from which Sophocles gave the title of "*Œdipus Coloneus*" to one of his finest tragedies. According to Pollux, there were two places at Athens known as Equestris and Agoræus Colonus.

Colony, a settlement formed in one country by the inhabitants of another. Colonies may either be formed in dependence on the mother country or in independence. In the latter case the name of colony is retained only in a historical sense. The motives which lead to the formation of colonies, and the manner of their formation, are various. The lust of territory; the requirements of commerce; the desire of increasing wealth, combined with the love of adventure; the necessity of relieving the pressure of redundant population; political dissensions; the convenience of removing to a distance persons likely to disturb the peace of the state, and especially the apparent ease with which a numerous criminal class may be got rid of by expatriations, are among the chief motives which have influenced colonization. Colonization is only a more formal development of the migratory tendency; and a colony may be considered as an organized and permanent migration. Among ancient nations the principal promoters of colonization in the more formal sense were the Phœnicians, the Greeks, and the Romans, and the greatest colonizers in modern times have been the English and the Spaniards, next to whom may be reckoned the Portuguese, the Dutch, and the French. The Phœnician colonies, extending along the shores and throughout the islands of the Mediterranean, were mainly commercial. The most famous of them was Carthage, itself a great colonizing state. From the distance of the mother states, and the slowness of communication, many of them must have been practically independent from a very early period; but this was not the case with the colonies of Carthage, which wielded powerful armies and maintained great fleets, both for commerce and for conquest. The Greek colonies were widely spread, being numerous in Asia Minor, the Balkan peninsula, and the islands and coasts of the Mediterranean, in South Italy, and Sicily. They were commonly independent, and frequently soon surpassed the mother states in power and importance. Constantinople, Naples, Palermo, and Marseilles were all originally Greek colonies. The Greek civilization was largely based upon and highly favorable to individual liberty, and the independence of spirit which it fostered made political dissension a frequent cause of colonization. A still more pressing one was the limited extent of the Greek territories, and the inviting character of those by which they were surrounded. Rome was a state which left nothing to the individual. Its colonies were chiefly military, and while the empire lasted were all in strict subordination. As the Roman power declined the remains of them amalgamated with the peoples among whom they were placed, and contributed largely to the homogeneous growth of modern civilization.

Before America and the way by sea to the East Indies were discovered, the states of Europe in the Middle Ages, with the exception of the Genoese and the Venetians, had no foreign colonies. The intercourse and wars of the Portuguese with the Moors, then more advanced in civilization than most of the European nations, served to incite their rivalry and stimulate them to maritime enterprise, and they became the pioneers of Europe in maritime discovery. One of the chief names in this connection is that of Henry the Navigator, son of John I. of Portugal. The Portuguese in 1419 discovered Madeira; in 1431–60 the Azores; in 1487 Bartolomeo Diaz doubled the Cape of Good Hope; and on 20 May 1498, Vasco de Gama landed near Calicut on the Malabar coast, after a voyage round the south of Africa. The Moors had previously been in possession of the inland trade of India, and it was not without a struggle that the Portuguese succeeded in establishing settlements on the coast of Malabar. The first Portuguese colonies were garrisons placed along the coasts of the continents and islands they visited for the security of their commerce, as Mozambique, Sofala, and Melinda on the east coast of Africa, Ormuz and Muscat, in the Persian Gulf; Goa, Diu, and Damaø, on the Malabar coast of India. Goa became the capital of their Indian do-

minions. Colonies were established in Ceylon in 1505; in the Moluccas in 1510; Java, Sumatra, Celebes, and Borneo were also colonized, though the settlements there did not attain so great importance. The direction taken by the Portuguese navigators made them miss the discovery of America; but Brazil was discovered by Cabral in May 1500, a few months after Pinçon, and was colonized by the Portuguese about 1530. The splendid colonial empire of which the foundations were thus laid was not destined to last. As in the case of Spain the energy of the Portuguese was trammelled by climatic and other conditions, and this, together with a despotic colonial policy, had weakened the power of Portugal before she fell in 1580 under the dominion of Spain. The colonial possessions of Portugal were afterward assailed by the Dutch as enemies of the Spaniards, and when she recovered her independence in 1640, many of them were irretrievably lost. Brazil declared its independence in 1822. The colonial possessions of Portugal are now mostly in Africa; the whole of her possessions in that continent embracing an area of more than 5,000,000 square miles.

Soon after the Portuguese the Spaniards commenced the work of colonization. On 12 Oct. 1492, Columbus discovered the island of San Salvador. Hayti, or San Domingo, named by Columbus Española, was discovered in the course of the same voyage, December 1492, and immediately colonized. Porto Rico and Jamaica were colonized in 1509, Cuba in 1511. On the mainland a Spanish settlement was effected in Colombia (New Granada) in 1510. Mexico was conquered 1519–21; Ecuador, Venezuela, New Granada, Peru, and Chile, were occupied and subdued between 1524 and 1541; and Spain was raised to the first rank among the colonizing powers of Europe. The Spaniards regarded their new possessions in various aspects. Some, animated by a zeal for religion, considered the conversion of the natives as the great end which Heaven had assigned to them. Others were inspired by the love of glory or the passion for gain, and scrupled at no means by which it was possible to gratify their wishes. Owing to the degraded character of many of the first colonists, who were often mere adventurers and released criminals, the first settlements suffered much from internal strife and confusion. After many dissensions the government of the colonies, in its fundamental traits, was settled in 1532, during the reign of Charles V. A council of the Indies in Europe, viceroys, at first two, afterward four, together with eight independent captains-general in America, were the heads of the administration. Cities were founded, at first along the coasts, for the sake of commerce and as military posts; afterward also in the interior, especially in the vicinity of the mines; as Vera Cruz, Cumana, Porto Bello, Carthagena, Valencia, Caracas; Acapulco, and Panamá, on the coast of the Pacific; Lima, Concepcion, and Buenos Ayres. The whole ecclesiastical discipline of the mother country was transferred to the colonies, except that in them the Church was much more independent of the king. The intercourse with Spain was confined at first to the single port of Seville, afterward to that of Cadiz, from which two squadrons started annually. So, although commerce was not expressly granted by law to a society, it remained nevertheless entirely in the hands of a few individuals. Spain took possession of the Philippine Islands in 1564, and a regular intercourse was maintained from 1572 by the South Sea galleons, between Acapulco and Manila; but owing to the great restrictions on commerce those islands, notwithstanding their advantageous situation, were an expense to the crown. Spain proved to be the foremost of the colonizing powers of Europe in respect to the formation of new states; the most unfortunate of all in regard to the retention of her possessions. The causes of the loss of her colonies differed from those which prevailed in the case of the Portuguese. European wars and the decline of her home power were the most important, but they did not so often lead to the colonies falling under other powers, as in the case of Portugal. They more frequently became the occasion of revolt, and the opportunity for declarations of independence on the part of the colonies themselves. Thus were formed the republics of Mexico, of Central America, of Venezuela, New Granada or Colombia, Ecuador, Peru, Bolivia, Chile, etc.; but as the weak government of the mother country served to promote this early defection, few of the states formed in this unfortunate school have yet attained the repose of settled government. An insurrection began in Cuba in 1895, and after Spain had in vain endeavored to suppress it the United States interferred. War followed, with the result that after a brief struggle not only Cuba, but also Porto Rico and the Philippine Islands were lost to Spain.

The Dutch, during the struggle for their independence, first became the formidable rivals of the Portuguese, then subject to the Spanish yoke. They had already for some time carried on the trade in East India merchandise between Lisbon and the rest of Europe, but their intercourse with Lisbon was prohibited by Philip II. in 1584. The prohibition was revived in 1594 with the utmost severity, and a number of Dutch vessels in the harbor were seized. Excluded from the European trade in the productions of India, they resolved to import directly from India the articles which were refused to them in Europe. Companies were formed, which were united into one by a charter granted 20 March 1602 to the Dutch East India Company, established in 1595. This charter, which was renewed afterward at different times, conferred not only the monopoly of the East India trade, but also sovereign powers over the conquests which the company should make, and the colonies which it should establish in India. An entirely new colonial policy was thus introduced, which instead of political or ecclesiastical aggrandizement, contemplated mercantile advantage as its main object. The Dutch colonies in the East Indies were thus commercial colonies; and the islands of the Malay Archipelago, being more easily defended than the continent of India, became the principal seat of the Dutch power. This was undoubtedly the chief cause of their colonies being so long in a flourishing condition, as they required only the dominion of the sea to maintain them. In 1619 the newly built Batavia was made the capital of the Dutch East Indies. About the middle of the 17th century the power of the Dutch reached its highest point. They effected the establishment of a colony at the Cape of Good Hope in 1650, which afforded an

excellent bulwark for their East India possessions, and took Ceylon from the Portuguese, after a long and sanguinary struggle in 1658. All the Dutch colonies in the East Indies were under the governor-general of Batavia. In 1621 the Dutch also established a West India Company, which at first made extensive conquests in Brazil, but soon lost them entirely (1623–60). Their settlements on some of the smaller West India Islands, as San Eustatia, Curaçoa, Saba, and San Martin (1632–49), were more permanent. On the continent Surinam, Paramaribo, Essequibo, and Berbice were in the hands of the Dutch in 1667. In North America the Netherlands held the valley of the Hudson, and pushed south at the expense of the Swedes, winning the present States of New Jersey and Delaware, only to lose them to England. The decline of the Dutch colonial power, partly caused by European wars and partly by the successful rivalry of the English, continued from the end of the 17th century till the French Revolution. On the recovery of its independence, the commerce and the colonial importance of Holland somewhat revived, and though many of her colonies were lost, the value of the remainder was enhanced by improved administration. The Dutch still possess numerous colonial possessions in the East Indies, including Java, Sumatra, parts of Borneo, the Moluccas, and part of New Guinea; several small islands in the West Indies, and Surinam.

No colonizing power has had a career of such uniform prosperity as Great Britain. The freedom of her institutions, and the practical enterprise and self-reliance of her people peculiarly fitted her for the work of colonization, and it has steadily advanced with her equally in peace and in war. Her insular situation freeing her from the ambition of direct territorial aggrandizement, and giving her the command of the seas, enabled her in every war to strip her opponents of colonial possessions which were not unfrequently retained as the price of peace. The only break in a career of prosperity which has resulted in the formation of an empire greater in extent of territory and of population than any other known to history was the revolt of her American colonies, which resulted in the formation of a state destined ultimately to rival Great Britain herself in political and commercial importance and in the freedom of its institutions. This state, too, by the successful result of the war of 1898 with Spain, itself entered on a policy of colonial expansion.

The English made their appearance as a colonial power nearly at the same time with the Dutch, but at first with far inferior success. After many fruitless attempts to find a northeast or northwest passage to the East Indies, English vessels found their way round the Cape of Good Hope to the East Indies in 1591. In 1600 Elizabeth granted a charter to the East India Company. Its commerce with India, however, was not at first important. It established only single factories on the continent, and at the beginning of the 18th century the possessions of the English in the East were limited almost exclusively to Madras, Calcutta, and Bencoolen. The ruin of the Mogul empire in India, which commenced in internal disturbances after the death of Aurengzebe (1707), and was completed by the incursions of Nadir Shah (1739), afforded the opportunity for the growth of British power, as the British and French were compelled to interfere in the contentions of the native princes and governors. The French, under Labourdonnaye and Dupleix, appeared at first likely to maintain the superiority; but the British succeeded in acquiring the ascendency in the Carnatic; and in the middle of the 18th century they greatly extended their dominions under Clive. By the destruction of Pondicherry they secured their superiority on the coast of Coromandel; and the victory of Clive at Plassey, 26 June 1756, laid the foundation of their exclusive sovereignty in India. By the Treaty of Allahabad, 12 Aug. 1765, Bengal was surrendered to the British by the titular Great Mogul; and the fall of the empire of Mysore, the dominions of Hyder Ali and Tippoo Saib, may be considered as completely establishing the British supremacy in India. The Mahrattas, with whom the British waged war at intervals from 1774 to 1818, and the Sikhs, subdued in 1849, were the last formidable enemies of the company. With the exception of a few dependent states the British territory now embraced nearly the whole of India, and this vast territory was still under the government of a chartered mercantile company, exercising many of the most important functions of an independent sovereignty. On the suppression of the Indian mutiny (1857–8) this state of things was deemed too hazardous to last, and the government of India was transferred to the crown by act of Parliament in 1858. Ceylon was first occupied in 1795–6.

The discoveries of the Cabots, following soon after the voyages of Columbus, gave the English crown a claim to North America, which in the reign of Elizabeth led to colonization on a large scale. In 1606 James I. divided the territory claimed by England into two parts — South Virginia, extending from Cape Fear to the Potomac; and North Virginia, from the mouth of the Hudson to Newfoundland. Two companies were formed for the colonization of America — the London Company, to which was granted South Virginia; and the Plymouth Company, to which was granted North Virginia, The region between the Potomac and the Hudson was neutral ground. The London Company in 1607 founded the commonwealth of Virginia by building Jamestown on the James River, so called in honor of the king. A House of Burgesses for the new colony met for the first time on 19 June 1619, and thus was constituted the beginning of representative government in the British colonies of America. In 1614 Capt. John Smith, having examined the coast from the Penobscot to Cape Cod, named the country here New England. The next permanent settlement on the North American coast was effected in this district by the body of Puritans, known as the Pilgrim Fathers, who sailed from England 6 Sept. 1620, in the Mayflower, and arrived 9 November in Massachusetts Bay. The government of this colony was that of a religious oligarchy. Another colony was established in New Hampshire in 1623, and in the same year Maine, which had previously been colonized by the French, received its first permanent English settlement. New Jersey was colonized in 1634. Connecticut was colonized in 1635 by emigrants from Massachusetts. Rhode Island was settled in 1636. Samuel Champlain, the French navi-

gator, was the first European who entered the region now forming the State of New York (1609). In the same year Henry Hudson, an Englishman in the service of the Dutch East India Company, discovered the river to which his name has been given, where Dutch settlements were effected and gradually spread. The English, who claimed this territory as included in Cabot's discoveries, finally seized the Dutch colony of New Amsterdam by force in 1664, giving it the name of New York in honor of James, Duke of York (James II.), to whom Charles II. had made a grant of the province. In 1681 the territory west of the Delaware was granted to William Penn, who colonized it with Quakers, and founded Pennsylvania in 1682. The first settlement in Maryland was made in 1631 by a party from Virginia. In 1633 a colony of Roman Catholics arrived here from Great Britain. The country south of Virginia was permanently settled in 1670 by a party of English colonists who landed at Port Royal and afterward removed to Charleston. The colony was called Carolina. Georgia, originally a part of Carolina, was granted by George II., after whom it was named, to a colony from England in 1732.

Colonies were early established in the West India Islands, including Barbados, half of St. Christopher's (1625), and soon after many smaller islands. Yet the West India possessions did not become important as plantations until the sugarcane was introduced into Barbados in 1641 and into Jamaica in 1660. This island had been taken from the Spaniards in 1655. The cultivation of coffee was introduced into the West India Islands in 1732. Newfoundland was taken possession of by the English in 1583, and colonized in 1621 and 1633. Canada was surrendered by France to Great Britain at the Peace of Paris in 1763 (see section on French colonies below). In 1764 began the dispute between Great Britain and its North American colonies, on the question whether the former had the right to impose taxes on the colonies when they were not represented in the British Parliament; and on 19 April 1775 commenced the war which terminated with the acknowledgment of the independence of the 13 provinces. Though the United States thus entered on their independent career, Canada still remains as a great and flourishing British dependency.

Australia was discovered in the beginning of the 17th century. The first Australasian settlements of Great Britain were penal colonies. New South Wales, discovered in 1770, was established as a penal colony in 1788; Tasmania (Van Diemen's Land), discovered by Tasman in 1742, followed in 1803. West Australia, for some time a penal settlement, was founded as a free colony in 1829; Victoria (Port Phillip) was colonized in 1835, and made an independent colony in 1851; South Australia was settled in 1836; Queensland became a separate colony in 1859; New Zealand, discovered by Tasman in 1742, began to be used in connection with the whale fishery about 1790, was settled in 1839, and made a colony in 1840. In 1851 gold was discovered to be plentiful in Victoria. This gave a great impetus to the prosperity of the Australian colonies, and the influx of population it caused has largely contributed to promote their general development. A federal union of the British colonies in Australia was proclaimed 1 Jan. 1901, with the title of the Commonwealth of Australia. The Fiji Islands became a colony in 1874, and other islands in the Pacific have been acquired since, as well as part of New Guinea and part of Borneo.

The acquisition of the South African colonies dates from the Napoleonic period, the Cape Colony and Mauritius being both secured to Great Britain in 1814. Natal was proclaimed a British colony in 1843. The Guinea Coast settlements date from the 17th century. Extensive spheres of influence have been recently acquired, being partly developed by chartered companies.

In Europe Great Britain has only two possessions of the nature of colonies, acquired for military reasons: Gibraltar in 1704; Malta and Gozo, 1800.

It is estimated that the existing British colonies and dependencies embrace fully one fifth of the land surface of the globe, and a rather larger proportion of its population. The whole of the British colonial possessions have been grouped in about 40 administrative divisions, and they are situated in every quarter of the globe. See GREAT BRITAIN.

According to their governmental relations with the crown the colonies are arranged under three heads: (1) Crown colonies, in which the crown has the entire control of legislation, while the administration is carried on by public officers under the control of the home government; (2) colonies possessing representative institutions, but not responsible government, in which the crown has no more than a veto on legislation, but the home government retains the control of public officers; (3) colonies possessing representative institutions and responsible government, in which the crown has only a veto on legislation, and the home government has no control over any officer except the governor. All colonies are, however, disabled from such acts of independent sovereignty as the initiative in war, alliances, and diplomacy generally.

France was somewhat late of entering fully upon a colonial career, being retarded by internal dissensions and religious wars. Between 1627 and 1636 Pierre Belain d'Esnambuc colonized St. Christopher's, Guadeloupe, and Martinique. Champlain was the pioneer of the French in the exploration of the North American continent, where they soon had considerable possessions, including Canada — in which they had settlements as early as 1604–5, and where Champlain founded Quebec in 1608 — and Louisiana, colonized in 1699. Commercial companies were then deemed essential in colonizing, and a West India Company and an East India Company were established by Colbert in 1664. He purchased on several West India Islands, as Martinique, Guadeloupe, St. Lucia, Grenada, and others, settlements already formed by private persons, and sent out colonists in 1664 to Cayenne. But the settlements in part of St. Domingo, by the buccaneers, became of more importance than those effected by the government. The West India Company survived only 10 years. The East India Company, after fruitless attempts to form a colony in Madagascar, founded Pondicherry on the Coromandel coast in 1670. This became the capital of extensive French possessions in the East Indies. The French also acquired the Isle de France (Mauritius) and Bourbon (Réunion), occupied in 1720.

At the beginning of the 18th century France had attained an important position as a colonial power. In North America her settlements extended from Canada to California, particularly along the Great Lakes and the Mississippi River, embracing many districts which have since become of the highest importance. Nova Scotia (Acadie) and Newfoundland (Terre Neuve), which had been disputed with Great Britain, were then in her possession. Her West India Islands were more flourishing than those of England, and she still had a prosperous career before her in India. The superiority of the fleet of England gave that power a great advantage in colonial contests, and many of the French colonies subsequently fell under the power of Great Britain. The struggle for the supremacy in India, though France was finally unsuccessful, was long and gallantly maintained, and more than once seemed to promise a different issue. The North American colonies were partly lost by conquest and partly suffered to fall into decay. Of the West India possessions several were taken by Great Britain, and finally ceded to her. Canada was finally ceded to England in 1763; Louisiana, after being surrendered to Spain, to prevent it from falling into the hands of the English, was sold by Napoleon to the United States in 1803. At the general pacification of 1815 France recovered some remains of her colonial possessions, and since then she has acquired extensive regions beyond sea, some of them highly valuable. She occupied in 1830 and begun in 1833 to colonize Algeria, a country whose irregular and lawless government had exposed her as well as other European states to frequent annoyance. Tunis, Senegambia, great tracts of the Sahara, Sudan, and Congo regions, the islands of Madagascar and Réunion, are all comprised in France's African possessions, while in Asia she possesses a large portion of the Indo-Chinese peninsula, and in America French Guiana. Some of the French colonies are represented in the National Assembly by members chosen for the purpose.

Denmark established an East India Company in 1618 with a view to enter on the colonial trade; and other companies were afterward formed. In the same year with the formation of the first company, the colony of Tranquebar was founded on the Coromandel coast. Its success was fluctuating, like that of the companies formed to manage it, and at last, in 1845, it was sold to the East India Company. St. Thomas in the West Indies was settled by the Danes in 1672; St. John and some of the smaller islands in the same group (the Virgin Islands) were also occupied by them. The island of Santa Cruz was purchased from France in 1733. The United States tried to buy these islands in 1902. Sweden established an East India Company in 1741. She acquired the island of St. Bartholomew from France in 1785, but restored it in 1878, and has now no colonies.

Germany has recently been making some attempts at establishing colonies in different parts of the world, and in this way acquired considerable tracts in southwest Africa, east Africa, between the Portuguese and British possessions, Camerun, Togo, New Guinea, etc. Italy has also shown the same ambition, and has established a colony on the African side of the Red Sea, between it and Abyssinia, and in Somaliland.

The colonial policy of paternalistic countries as Spain and Portugal naturally differed from that of commercial and industrial nations like England and Holland. In the former the expense and risk of colonizing was borne by the government, who retained direct control over the colonies and their productions; but in the latter the work, being too much for individual enterprise, was entrusted to companies, whose charters conferred on them not only exclusive privileges in regard to trading, but also extensive powers of conquest and administration. In respect to trade a very exclusive and jealous policy long prevailed, but since the adoption of a free-trade policy in Great Britain, the whole trade of her colonies has been thrown open without reserve, as far as the privileges of the mother country are concerned, to the competition of foreign nations. Other countries, while not following her commercial policy entirely, have relaxed more or less the stringency of the regulations affecting their colonial trade. Consult: Leroy-Beaulieu, 'De la colonisation chez les peuples modernes' (Paris, 3d ed. 1887).

Col'ophon, kŏl'ō-fŏn, an inscription at the "Finis" of a book, giving the printer's name and date and place of printing; in the early days of printing nearly all books had colophons. The printers followed the usage of their predecessors. the copyists, who almost invariably appended to the works they transcribed their own names, often with date and not unusually with some pious ejaculation. Not a few of the early printers adhered to the custom of the pious ejaculation, but usually the fraternity seized the opportunity of the colophon to magnify themselves and their art and in particular their own proficiency in the art. A collection of colophons of books printed in the first half century of typography would make a highly interesting and amusing chapter in the history of the Art Preservative of Arts. Usually they are ludicrous in the extravagant claims the printers make for the unapproachable excellence of their handwork; but some are modest and dignified, while a few are pathetic, showing the hard struggle made by masters of the noble craft for a bare subsistence. It was quite usual to compose the colophons of Latin classic works in heroic or in elegiac verses. Udalricus Gallus, for example — thus does Ulrich Hahn latinize his German name — in the colophon of his Virgil (Rome 1472) makes a pun with his Latin patronymic Gallus and the Latin name for a native of Gaul, which is also Gallus. In Latin, the noun gallus, as in German hahn, means cock. In the four elegiac couplets which constitute his colophon Ulrich apostrophizes the goose, which, by its cries, notified the Romans of the approach of the Gauls: "O Goose, keeper of Jove's Tarpeian abode, why flap your wings? The Gaul (Gallus) has fallen; the avenger is here, Udalricus Gallus; he has shown that there is no further call for your quills; in a day he prints more than is penned in a year." The two German printers, Conrad Schweynheym and Arnold Pannartz, who produced the *editio princeps* of the same poet in 1469, express in the colophon the hope that their artistic work may make amend for their harsh Teutonic names, unknown to the Muses:

> Aspera ridebis cognomina teutona; forsan
> Mitiget ars musis inscia verba virum;

which names, however, they contrive to squeeze into a Latin hexameter, thus:

Conradus Suueynheym Arnoldus Pannartzque magistri.

How graceful, modest and dignified is the tetrastich appended by the celebrated French printer, Nicolas Jenson, to his edition of Suetonius: I, Nicolas Jenson, a Frenchman, printed this book; who shall deny it to be a work of art? But while you peruse Suetonius do, I pray thee, love the artist's name —

Artificis nomen fac, oro, lector ames.

Posterity has confirmed that printer's estimate of his work, for his typography has ever since been regarded as a standard of elegance. Vindelin of Spire, the elder printed at Venice in 1470, in the colophon of his Virgil, an elegiac octastich celebrating himself and his typography and boldly challenging comparison with the Grecian masters of form:

Laudent ergo alii Polycletos Parrhasiosve
Et quosvis alios id genus artifices —

let others praise the Polycletuses or the Parrhasiuses, and the rest of that class of artists: Vindelin shall have the highest praise of all.

And Adam Rot, another German printer at Venice, in his Virgil (1471) in 12 hexameter verses, challenges Solomon and Hiram and the Sibyl, and Greece with all her sages, and Rome, mighty in arms and equal to the gods, to show forth such an art as he is master of. In a like spirit Bartolomaeus of Cremona in a hexastich colophon to Virgil (Venice 1472) augurs for his natal town undying fame, insured to her by this work of her alumnus, which is more enduring than the Athene of Pheidias —

Phidiacum hinc superat Bartholomæus ebur.

But Christopher Valdarf (? Waldorf) is content with styling himself in the colophon of his Virgil (Venice 1471) the glory of Ratisbon, his native town:

Ratisponensis gloria Christophore.

Colophon, an ancient Ionian (Greek) city of Asia Minor situated at a short distance from the coast and about eight miles north of Ephesus. Its inhabitants were removed by Lysimachus after the death of Alexander the Great. Colophon was one of the places that claimed to be the birthplace of Homer. It was the native city of Mimnermus and other poets. Its site was discovered in 1887 by the German explorers, Schuchhardt and Wolters. Proverbially Colophon came to mean "a finishing stroke" because of the many instances in which the city's cavalry carried the day. The word took this proverbial meaning in Latin and was used by early printers as the imprint at the close of a volume; commonly used before the introduction of the title page.

Colophonium. See ROSIN.

Col'ophony, a name formerly used for common rosin (q.v.), but now found only in books.

Coloquintida. See COLOCYNTH.

Color, the impression given to the eye by lights of various rates of vibration. The optic nerves are excited by vibrations of the light-bearing ether when the rapidity of the vibrations is not greater than or less than two limits, which perhaps vary slightly with different eyes, just as some ears cannot hear intensely shrill sounds or dull sounds that are perceived by others. Every vibration between these limits is recognized as light; its intensity or brightness is observed; but, besides this, the eye is differently affected by light of different times of vibration, in a way that it is not possible to describe. It is to this variation in the sensation that the name color is given. The word color is also applied to the properties of bodies that cause them to emit the light that thus affects our senses.

In considering the subject we must remark in the first place that ordinary white light, the light which comes from an incandescent solid or liquid, consists, as Newton showed by his celebrated experiment of passing it through a triangular glass prism, of a large number of colored lights, which, meeting the eye together, produce the sensation of white light. The colors of the spectrum are usually said to be seven — red, orange, yellow, green, blue, indigo, violet; although in reality there is an enormous if not an infinite number of distinct colors in it. These colors are frequently called the primary colors, and other tints and shades are producible by mixing them; but in a stricter sense the primary colors are three in number, namely, red, green, and violet (or blue). These three colors or kinds of light cannot be resolved into any others, while a yellow ray, for instance, can be resolved into a red and green, or can be produced by the mingling of red and green light, consequently yellow is not now regarded by scientific men as a primary color. Inasmuch, however, as a yellow and a blue pigment will always produce a green when mixed, red, yellow, and blue may still in a sense be regarded as primary. In the scientific sense of the word white and black are not considered colors, a white body reflecting and a black body absorbing all the rays of light without separating them, whereas the colors proper are due to separation of the rays of light by partial absorption and reflection or by refraction. That the colors of the spectrum may be recombined so as to make white light, the following experiment shows. Let a disk be painted as nearly as possible with the primary colors of the spectrum in sectors. If this painted circle be made to whirl rapidly round its centre all the colors will practically be seen simultaneously at each point, owing to the persistence of the impression on the retina of the eye, and the effect will be that the circle will appear white. If the proportions of the colored sectors be altered, or if any of them be cut or covered with white or black paper, various colors or shades of color are producible. If one complete sector be removed, and the wheel whirled round, the color produced is the complementary color to the removed sector. By complementary color is meant the color or colors which, with any color or colors mentioned, together make white; thus any of the primary colors is complementary to the other two, and a secondary color is complementary to the remaining primary.

The color resulting from the mixture of two or more lights is the color which is seen when they fall on the same part of the retina. There are various methods of mixing lights, such as, (1) by combining reflected and transmitted light; (2) by causing two or more spectra to overlap; and (3) by employing a rotating disk

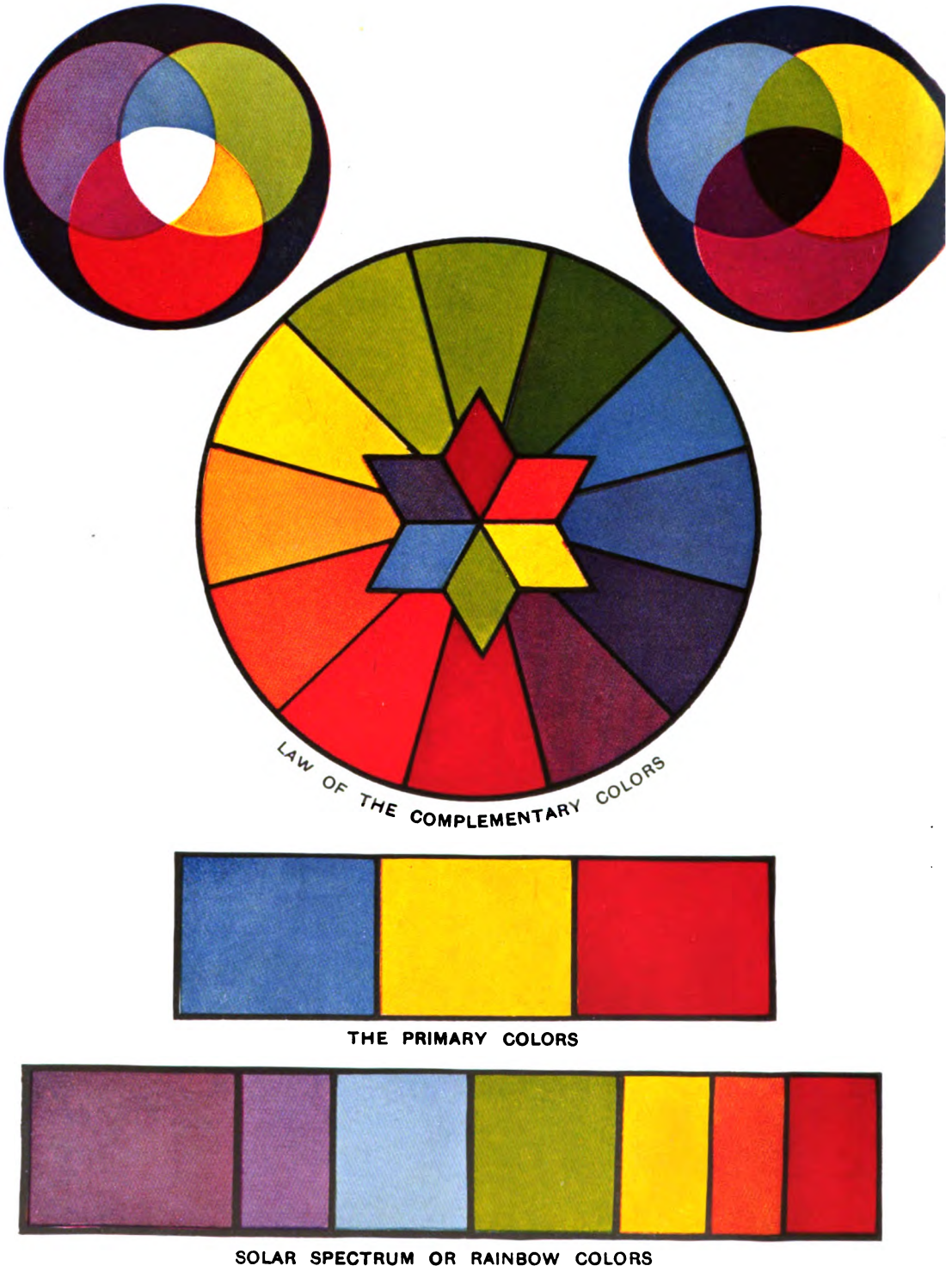


DIAGRAM ILLUSTRATING THE PRIMARY, SOLAR SPECTRUM OR RAINBOW COLORS AND LAW OF THE COMPLEMENTARY COLORS.

OR.

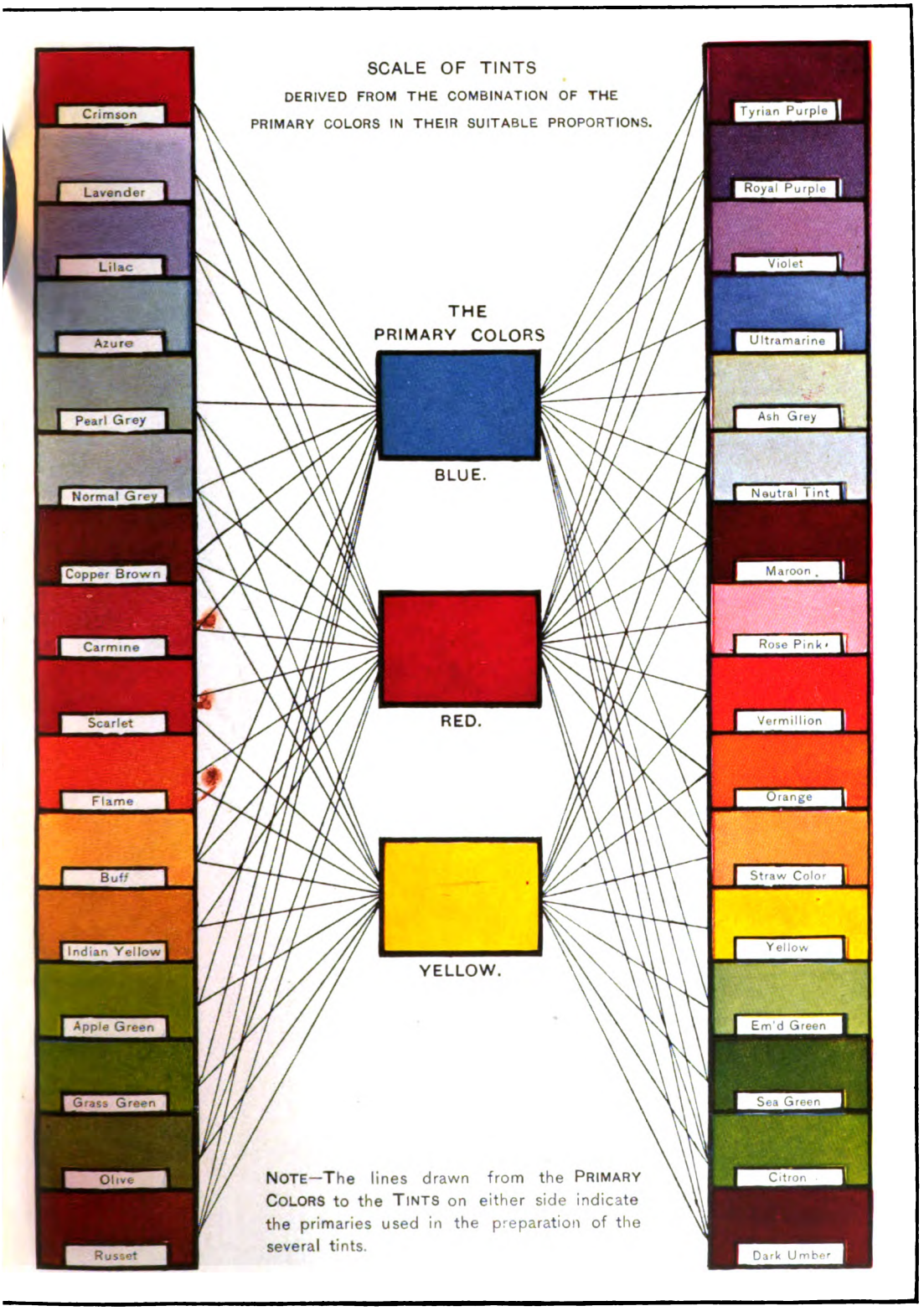


DIAGRAM ILLUSTRATING THE PRIMARY COLORS AND THEIR COMBINATIONS OR TINTS.

composed of differently colored sectors, as shown above. Colored disks of paper, each having a radial slit, are very convenient for this purpose, as any moderate number of such disks can be combined, and the sizes of the sectors exhibited can be varied at pleasure. The mixed color obtained by the rotating disk is to be regarded as a mean of the colors of the several sectors,—a mean in which each of these colors is assigned a weight proportional to the size of its sector. Thus if the 360 degrees which compose the entire disk consist of 100° of red paper, 100° of green, and 160° of blue, the intensity of the light received from the red when the disk is rotating will only be $\frac{1}{3}\frac{0}{6}$ of that which would be received from the red sector when seen at rest; and the total effect on the retina is represented by $\frac{1}{3}\frac{0}{6}$ of the intensity of the red, plus $\frac{1}{3}\frac{0}{6}$ of the intensity of the green, plus $\frac{1}{3}\frac{6}{6}$ of the intensity of the blue; so that the resultant color may be called the mean of 10 parts of red, 10 of green, and 16 of blue. All the results of mixing colors can be represented geometrically by means of a cone or pyramid within which all possible colors will have their definite places. The vertex will represent total blackness, or the complete absence of light; and colors situated on the same line passing through the vertex will differ only in intensity of light. Any cross-section of the cone will contain all colors, except so far as intensity is concerned, and the colors residing on its perimeter will be the colors of the spectrum ranged in order, with purple to fill up the interval between violet and red. It would seem that the true form of the cross-section is approximately triangular, with red, green, and violet at the three corners. When all the colors have been assigned their proper places in the cone, a straight line joining any two of them passes through colors which are means of these two; and if two lines are drawn from the vertex to any two colors, the parallelogram constructed on these two lines will have at its farther corner the color which is the sum of these two colors. A certain axial line of the cone will contain white or gray at all points of its length, and is called the line of white. It is convenient to distinguish three qualities of color, which may be called hue, depth, and brightness. Brightness or intensity of light is represented by distance from the vertex of the cone. Depth depends upon angular distance from the line of white, and is the same for all points on the same line through the vertex. Paleness or lightness is the opposite of depth, and is measured by angular nearness to the line of white. Hue or tint is that which is often *par excellence* termed color.

All authorities are now agreed in accepting the doctrine, first propounded by Dr. Thomas Young, that there are three elements of color sensation, or three distinct physiological actions, which by their various combinations produce our various sensations of color. Each is excitable by light of various wave-lengths lying within a wide range, but has a maximum of excitability for a particular wave-length, and is affected only to a slight degree by light of wave-length very different from this. The complete diagram of all color is theoretically a triangular pyramid, having for its three edges the colors which correspond to these wave-lengths; but it is probable that we cannot obtain one of the three elementary color sensations quite free from admixture of the other two, and the edges of the pyramid are thus practically rounded off. One of these sensations is excited in its greatest purity by the green, another by the extreme red, and a third by the extreme violet. These three actions are ascribed to three distinct sets of nerves, having their terminations in different parts of the thickness of the retina, a supposition which aids in accounting for the approximate achromatism of the eye, for the three sets of nerve terminations may thus be at the proper distances for receiving distinct images of red, green, and violet respectively, the focal length of a lens being shorter for violet than for red. As it is completely established that the difference between the colors of the spectrum is a difference of vibration-frequency, there is an obvious analogy between color and musical pitch. Attempts have been made to compare the successive colors of the spectrum with the notes of the gamut; but forcing is necessary, as in almost all details the relations between colors are strikingly different from the relations between sounds.

When white light falls on the various objects that surround us, it is not always reflected back to our eye as white light. The bodies are illuminated by it, but they have the power of so altering it that they appear to us colored. The reason of the natural colors of bodies is a difficult subject, and one that is scarcely yet understood. It is usual to say that the surfaces of bodies have the power of absorbing certain parts of the white light and reflecting the remainder back, and that what we see is the complementary color to that which is absorbed. This is generally the case with light passing through a transparent colored body. But there is good reason for thinking that this is not really the case always. Experiment, in fact, seems to show that the light which comes from colored bodies is frequently generated by the bodies themselves by a kind of luminous resonance, as it has been called; just as a harp with two or three strings will send out a sound by resonance when a loud noise of any kind is made near to it, but the sound emitted by the harp will be only that belonging to its two or three strings, and not a clash like that which set it in vibration. The subject is one of much difficulty, as we know nothing of the molecular construction of the surfaces of bodies.

Lastly, we have to speak of the colored lights produced by ignited gases. The lights themselves are often far less complicated than white light, though we have spoken of them last. Incandescent gases, instead of giving out white light, as incandescent solids and liquids do, give out light of colors depending on the nature of the gas or vapor. Seen by the eye the flame is colored, and examined by the spectroscope it is found to be in many cases a very simple light indeed. Thus sodium vapor gives a yellow light, and on looking at a flame containing nothing but sodium it is seen to consist of two particular yellow lights shown by two bright yellow lines in its spectrum. Thallium, another metal, gives a simple green light. Hydrogen gas also gives a pale-blue flame when burning, and shows some five or six bright lines. So also do other gases. These colored flames are taken advantage of by the pyrotechnist, who mixes the powder for his fireworks with various bodies which give colored flames. See LIGHT; SPECTRUM.

Color-blindness, a singular affection, producing an inability to distinguish one color from another, and in certain rare cases to discern color at all, the eye perceiving only light and shade, or black and white. Almost no attention appears to have been paid to this subject till the end of the 18th century, when the famous chemist, Dr. Dalton, brought it into notice by publishing in 1794 an account of his own case as marked by this peculiarity. More recently, Dr. George Wilson of Edinburgh also examined minutely into this phenomenon, and collected many striking instances. From the result of these investigations it would appear that color-blindness is much more common among men than among women, and that of the former one in 20 is unable to discern the nicer shades of color, and one in 50 to distinguish certain primary colors from one another. The colors most liable to be confounded are red and brown with green, purple and green with blue, red with black, light hues of all sorts with white, and dark shades with black. Many of the instances adduced by Dr. Wilson are exceedingly curious and amusing. An undertaker covered a coffin with bright scarlet instead of black; a chemical lecturer had always to ask the colors of his compounds; a physician never met with scarlet fever in the course of his practice; a gentleman meeting a lady in a green dress condoled with her on the bereavement which he imagined she had sustained; and a quaker purchased a bottle-green coat for himself and a scarlet merino gown for his wife. The cause of this remarkable affection in almost every case which has been carefully investigated has been found to be seated in the sensorium, not in the visual apparatus, and to consist in the absence of the elementary sensation corresponding to red. To persons thus affected, the solar spectrum appears to consist of two decidedly distinct colors, with white or gray at their place of junction. One of these two colors is doubtless nearly identical with the normal sensation of blue or violet. The other color extends a considerable distance into what to normal eyes is the red portion of the spectrum. The scarlet of the spectrum is thus visible to the color-blind, not as scarlet but as a deep dark color, perhaps a kind of dark green, orange and yellow as brighter shades of the same color, while bluish-green appears nearly white. The eyes of persons so constituted present in general nothing abnormal either internally or externally, while their power of vision is equal to, and in many cases even superior to, that of persons in whom no such peculiarity exists. The colors most easily distinguished by the color-blind are yellow and blue, the latter color, if pure and well-illuminated, being the one many of the color-blind see best, and which is rarely mistaken for other colors. The use of yellow spectacles has accordingly proved advantageous in some cases. It is a curious fact that the substitution of artificial light for daylight often enables persons affected in this manner to discern colors.

Color Photography. From the earliest days of photography, efforts have been made to reproduce by it alone the colors of nature. It was found as long ago as 1801 by Ritter, of Jena, that the various rays of the spectrum differed considerably in their action on silver chloride, and in 1810 Seebeck, also of Jena, obtained a reproduction of the spectrum, in some approach to natural colors, on paper coated with silver chloride. These images could not, however, be fixed.

Various other experimenters have from time to time endeavored to obtain the desired result by the use of different materials and methods, but without effecting a complete solution of the problem.

In 1891 Lippman laid the foundation of the process known by his name, it being based on the theory of Zenker and work of Wiener, with due acknowledgment to both. This is distinguished as an "interference" process, the effect being produced by decomposition of the light.

The apparatus employed for the production of the picture is very simple, differing but little from that used for ordinary photography. Any transparent sensitive film answers as the photographic surface. This film is exposed in a camera of the usual type, with the difference in arrangement that the plate is backed by a layer of mercury, which layer, of course, acts as a mirror. The arrangement is effected by using a slide so arranged that mercury can be allowed to flow into a space back of the plate after the plate has been placed in the slide. After exposure the mercury is allowed to flow out, and the plate is then developed in the usual way.

The materials on the finished plate are the same as those on an ordinary negative, but a difference exists in the structure of the deposit, by which it is enabled to decompose the light by which it is illuminated and reflect those portions of it which correspond to the natural colors of the object from which the picture was taken.

The reason for the formation of this structure as formulated by Lippman is that the light waves, as they rush through a plate as ordinarily arranged, impress the plate more or less strongly, and thus leave a design of different intensities of the image, but in this rapid passage they leave no record of their own forms. Each ray of light of a certain color has a certain structure; it is made up of waves which have a certain wave-length. If there be a mirror behind the plate, the light, says Lippman, is reflected back on itself; the light rushes in and rushes out again with the same velocity; the entering and issuing rays interfere, and the effect of the interference is that vibration takes place; but the effects of propagation are stopped, and instead of having propagated waves we get stationary waves; that is, the waves now rise and fall, each in its own place; they pause, therefore, in the interior of the film and impress their form upon it.

On looking through a film obtained by the Lippman method it appears like an ordinary negative; its color effect is obtained only when viewed by reflected light, different portions of the plate reflecting different colors according to the light-waves by which it had been impressed. In order that the interference colors may be seen so that they are true to nature, the plate must be viewed by vertical incidence, which is inconvenient. They may be projected by an arrangement devised for the purpose.

In 1861 Prof. Maxwell showed at a lecture at the Royal Institution that by taking photographs of a colored ribbon through three solutions colored to represent the primary colors, and then projecting these photographs so that their

images were superposed, a colored image of the ribbon was given, which was faulty, however, from lack of photographic materials more sensitive to the less refrangible rays. In 1873 Prof. Vogel announced that dyes would influence the distribution of color-sensitiveness in plates.

On these facts are based the process of Ives, brought out in 1892. In his process three negatives are obtained through color-filters; from these positive transparencies are made (in monotone), which are placed in a special viewing instrument called the "kromskop," each in combination with its properly adjusted color-screen; these being then combined, the images are seen in the original colors of nature.

The next development in this method was the introduction of the process worked out by Prof. Joly in 1894. This differs considerably from the Ives method in the manner of working, but in principle it is very similar. Only one negative, instead of three, is required, but this is taken through a transparent lined screen, ruled very finely and closely with parallel alternate lines of orange, yellowish-green, and blue. After development a positive transparency is made from the negative, which, when mounted accurately and in close contact with a viewing-screen similarly ruled with parallel lines of red, green, and violet, the image is seen in its original colors. These mounted positives are usually viewed as lantern-slides, but are somewhat marred by the obtrusiveness of the lines when seen too closely.

To go back to the underlying principle of the three-color process — the "filtering" out of certain rays in taking the different plates — we should explain that the primary colors from which white light is formed are now set down as a particular shade of red, a particular green, and a particular blue-violet. The primary pigmentary colors, it may be added, are red, yellow, and blue, as has always been taught. If we obtain three negatives from an object, each taken through a color-filter or screen adjusted for the red, the green, and the blue-violet respectively, these plates will present negative images of the object in the negative values of the colors named. When from each of these negatives we produce a positive in the complementary color, and combine these positives in accurate registration, we shall, if the operations have been correctly performed, obtain a reproduction of the original object in the exact colors of nature. The ordinary photographic plate, as is well known, is not sensitive to all the rays. If, however, the addition of certain colored substances, chiefly analine compounds, be made to the emulsion, these apparently combine with the haloid silver salt to form an organic compound of silver which is sensitive to the light reflected from various colors according to the particular dye employed; and in this way it is possible to obtain a plate which will be sensitive to the light reflected from all the colors of the spectrum, though for convenience in working, the extreme red is generally excluded, or otherwise the plate could be made and handled only in complete darkness.

The processes of Lumière and others are essentially the same as that of Ives, varying in the details of working.

In the working of the three-color process the negatives are taken through color-screens of red, green, and blue-violet, adjusted for use with the Cadett spectrum plate. By means of a repeating back used in connection with a frame containing the screens, these may all be taken upon one plate; that is when the size of the picture required is small, such as is suitable for a lantern-slide. The length of exposure varies with each of the screens, an ordinary ratio being, say, 55, 13, 4 for the red, green and blue-violet respectively; but on account of unavoidable variations in different batches of emulsion, largely due to the difficulty in obtaining gelatin of uniform quality, these ratio exposures are liable to differ, but can be readjusted without great difficulty by making a trial exposure upon some subject with well-marked high lights and half-tones, such as a crumpled piece of white blotting-paper, which should appear equal in all three negatives. The length of the exposure through the red screen may be gauged by a fraction tint actinometer, by timing to a certain tint; from the time thus obtained the remaining two exposures can then be calculated from the ratio numbers.

There is a special form of camera in which the exposure for the three negatives can be made simultaneously by means of mirrors.

The plate must be developed either in darkness or by a special "safe" light supplied for use with such a plate, and a developer of the rapid type used, yielding a soft negative of good gradation without stain. Correctness of exposure is essential, forcing development being almost certain to result in failure. Intensification and reduction can be effected only at great risk of interfering with the gradation of the image, and should never be resorted to unless it is impossible to make another exposure. The best intensifying re-agent is said to be mercuric iodide with sodium sulphite.

The next step is the production from the negatives of the three positives, and first we produce a blue — or rather greenish-blue — positive from the negative obtained through the red color-filter. This, in the Sanger-Shepherd process, is done by first making a lantern-slide positive in the ordinary way by contact, taking care to secure one of good quality and well representing all the detail and gradation in the negative clear and free from fog, for the density and detail of the finished slide will largely depend upon the blue positive. This, after fixing and washing, is treated with a solution of potassium ferri-cyanide, again well washed, then immersed in a solution of ferric salt, rinsed, and replaced in the fixing solution, and finally again washed to free from hyposulphite. The effect of this is to convert the deposit of silver into one of Prussian blue. When dry this plate should be varnished, preferably with a solution of celluloid.

The remaining two positives, the pink and the yellow, are produced by modifications of the carbon process. A celluloid film coated with an emulsion of silver bromide in soft and soluble gelatin is employed. This is sensitized by immersion in a solution of potassium or ammonium bichromate, and, when dry, printed in contact with the two other negatives, care being taken to place the celluloid side next the film side of the negative. The necessary exposure varies from 1 to 10 minutes, according to the light, and should be gauged by means of the fraction tint actinometer. The silver bromide takes no part in the formation of the image, its func-

tions being to afford some guide in the exposure and development by giving a faintly visible image, and to assist in the more rapid disintegration of the gelatin in the warm water used for the development. The water used should be of a temperature of from 90° to 100° F., as in the carbon process, and when all the soluble portions which have not been acted upon by light are removed, the silver bromide is dissolved out by a solution of hyposulphite, leaving the almost invisible photographic image in relief in clear gelatin. The positive thus obtained from the negative taken through the green filter is then immersed in a dye-bath of a pinkish-red color, and that from the negative taken from the blue-violet filter in one of a yellow color, and they are stained to the required depth, comparing the result by holding in approximate position occasionally with the blue positive, without touching each other. It is usually better to overstain these positives and then wash down in water to the required depth of color.

The blue positive may be obtained in similar manner upon a thin celluloid support, using a weak solution of methylene blue as the stain, and this method is preferred by some workers. The advantage, however, rests with the prussiate process, in that a positive is produced of maximum sharpness, being printed in actual contact, without the necessity for the interposition of the celluloid, this being more essential in the case of the blue print, which forms the foundation of the finished slide, for however slight the diffusion may be, it must necessarily be more apparent if it exists in each of the three monochromes.

In the method of working recommended by Messrs. Lumière the three stained positives are produced upon a mica support. The mica has the great advantage of rigidity, but the still greater disadvantage of frequently failing to retain the gelatin film, which will sometimes float off, even in the bichromate sensitizing solution.

The pink and yellow positives, having been dried, are placed in register with the blue, and any preponderance or inequality in coloring noted. This can be corrected by careful reduction, in cold water, of either the pink or yellow films. The greens are usually the best guide, as, if these are correct, the other colors will usually be bound to follow. If the blue be at fault, it will be found better to make another rather than attempt to alter it. When finally adjusted and dry, the two celluloid films are varnished with a special transparency varnish, in order to prevent the colors from running. The three positives may now be placed in accurate register and bound up with a cover glass as usual, but the transparency and unity of the complete positive will be much improved by mounting in Canada balsam. This is effected by first fixing the two celluloid positives on one edge of the blue plate, by trimming first the pink, so that when it is in register there is a margin of at least one eighth of an inch of the blue extending beyond it, then the yellow, so that the pink extends beyond it for the same distance. The three can then be fixed down by a piece of lantern binding strip, or better and more securely, by a thin strip of paper firmly fastened down with fish-glue, as the gum of the binder does not always adhere securely to the celluloid. The three positives and the cover glass are then made warm; the Canada balsam, thinned by heating in a beaker, poured in a sufficient quantity between each of the positives and also under the cover glass, and the excess pressed out; the whole being then placed between strong spring clips till set; after which the slide can be cleaned with alcohol and masked and bound up as usual. Should any separation or bubbles occur, these may generally be remedied by again warming the slide and replacing it in the clips for a few hours.

The three-color process has assumed much importance as a means of producing colored prints. To do this, the process is modified to produce three half-tone plates, the negatives being taken through filters of the complementary colors, and from these the prints are made by the use of suitable inks, the impressions being made accurately one over the other. Here the primary colors are represented by pigments of red, yellow, and blue (as before noted) and the colors overlapping and mingling produce, approximately at least, the various tints required.

It has been recently reported that Prof. A. B. Leckenby has devised a new method of color photography, the details of which have not yet been made known. The method is said to be the same as the old system of photography up to the making of the print. The difference lies in the emulsion of the sensitive paper. The slight differences in the shades on the negative plate are just enough to act in different ways on the paper during printing, and produce the several colors. One fault has been found with the pictures; they are not all the same shade. A red rose may show pink at one time, and with the next toning and fixing, a dark crimson. In either case the color will still be red, but the shades will be decidedly different. Even this objection, which is not in itself very serious, Dr. Leckenby thinks will be remedied, and he has worked out a method which will have the effect of bringing the various prints to a more even tone.

Color Printing, the art of producing pictures, designs, cards, etc., in various colors by means of lithography, printing from metal blocks, etc. The ordinary methods are: (1) The chromo-lithographic, in which a tracing of the original picture, or the like, is first made, and a copy transferred to as many stones as there are colors in the original, every color requiring a fresh stone. The drawing on each stone is made to fit in, or register, with the preceding one, and as the paper passes through the machine an additional color is added every time, and thus the picture is built up, color upon color (each being allowed to dry before the next is put on), until it is completed. Some chromos or oleographs may have as many as 25 or 30 printings or colors. (2) Block or surface color-printing is specially adapted for book illustrations, or work where nicety of detail or rapidity is required. As in chromo-lithography, various printings are necessary; but these are reduced in number by printing several tints of the same color at one operation. Each block, which is usually of zinc and prepared in the usual way, is capable of producing three or more gradations of the same color; the darkest shade from the normal surface, lighter shades being

got from parts which have been bitten or corroded in an almost imperceptible degree — the deeper corrosions giving the lightest shade. When the tints of one color are thus printed from one block and at one operation, a second block with gradations, in the same way, is used, registering as in chromo-lithography, and so on till the picture is finished.

Colorado, kŏl-ō-rä'do, the "Centennial State" (admission to the Union planned for 4 July 1876, consummated 1 August), is bounded north by Wyoming and western Nebraska, south by New Mexico and western Oklahoma, east by Kansas and Nebraska, west by Utah. Capital, Denver. Area, 103,925 square miles (280 of it water). Pop. (1900) 539,700.

Topography.— Eastern Colorado, about one third the total area, is the westernmost portion of the great treeless plains that continue the Kansas prairies. Near the abrupt rocky faces of the mountains they rise in low rounded foothills called "hog-backs," remnants of the junction of sedimentary with primary rocks. The remainder of the State belongs entirely to the Rocky Mountain system, the main range lying on the east and facing the plain, while the western portion falls in minor slopes toward the Pacific. Colorado contains the highest mountains in the United States excepting Mount McKinley in Alaska and Mount Whitney in California.

There are some 200 peaks more than 13,000 feet high, and 40 over 14,000. The highest is Blanca Peak, 14,464 feet, near the south border. The lowest ground of the plains is 3,047 feet above sea-level. The main mass of the Rockies crosses Colorado in two principal lines of elevation, joining and separating, and enclosing a series of elevated watered valleys called parks, which extend with slight breaks through its entire length in the State. On the south the Saguache or Sawatch range, or Great Divide, a continuation of the Sierra Madre of Mexico, enters west of the Rio Grande; and the Culebra east, continued by the Sangre de Cristo. North of the Arkansas the eastern line is carried on by the Front Range, the one first encountered by the early emigrants, and still the main line of transmontane travel, and this in turn by Medicine Bow Range extending to Wyoming. On the west, the Saguache meets the Park Range from the north. West of these main systems lies a welter of short broken ranges and plateaus, parallel, lateral, and oblique, but with a general trend northwest and southeast. Of these the principal are the Roan or Book, north of the Grand River in the extreme west, the Uncompahgre parallel to the Gunnison River on the south, the San Miguel still south, the San Juan to the east, and the Elk nearer the centre obliquely to the Saguache. The Elk is a very notable range about 30 miles long, geologically interesting from the extraordinary displacement of strata, and with a number of lofty and handsome summits. Castle Peak, the highest, 14,115 feet; Capitol, Maroon, White Horse, Snow Mass, etc., nearly or quite 14,000 feet, and Italian Mountain, named from its displaying the colors of Italy — red, white, and green. The best-known heights are Long's Peak (14,171) and Pike's Peak (14,147) in Front Range, noted landmarks of the old emigrant trail. This range also contains Mount Evans (14,330), Rosalie Peak (14,340), and others; and on its flanks lie Denver, Colorado Springs, Boulder, etc., while Cripple Creek is a little west of Colorado Springs. The Saguache is the loftiest as a whole — a granite mass over 13,000 feet high for many miles together, and 15 or 20 miles wide. It contains Mounts Harvard (14,375), Princeton (14,196), Yale (14,187), Elbert (14,351), and other immense peaks, and after a depression for some 18 miles, rises in the Mountain of the Holy Cross (14,175), where a deep ravine and a transverse ridge outline a gigantic cross in the snow. The Sangre de Cristo, besides the crowning summit Blanca (above), has Baldy (14,176); and the Culebra is noted for the Spanish Peaks, two striking isolated mountains, the highest 13,623 feet. The principal summits of the Park Range are Gray's Peak (14,341) and Torrey's Peak (14,336). The great passes are far higher than any mountain summits east of the Rockies; there are 15 over 10,000 feet above sea-level; and the loftiest, Argentine Pass, between Gray's Peak and Rosalie Peak, is 13,100 feet. Marshall, Cochetopa, Hamilton, and others are well known.

There are four great parks along the crest, besides multitudes of smaller ones in various parts. By far the largest is San Luis Park, extending into New Mexico; a tract about 7,000 feet above the level of the sea, between the Sangre de Cristo and Culebra ranges on the east, and the Saguache on the west, and more level even than the plains. It is about 140 miles long by 60 miles wide, 8,000 square miles in area, or about as large as Massachusetts. It is drained south by the Rio Grande through the southern centre; the north part is watered by a score of mountain streams which are lost in the huge swamp known as San Luis Lake, half a dozen miles long, and the largest lake in Colorado. Next north is South Park, between the Front and the Saguache, east of Leadville; 8,000 feet high (in places 10,000), and 1,200 square miles in area, or about the same as Rhode Island. Then comes Middle Park, still more elevated, and somewhat larger; and across a continental divide is North Park, largest of all but San Luis, between Medicine Bow and Park ranges. Of the lesser ones, the best known are Monument Park, and the "Garden of the Gods," near Colorado Springs; Estes famed for hunting and fishing, and Huerfano, also in the east; Leon, Cañon, Egeria, Powell, Raven, etc., in the west.

River Systems.— The main Rocky Mountains must obviously be the greatest of American watersheds and source of river systems, except Minnesota; and they contain more than one continental divide between the waters flowing to the Atlantic and those flowing to the Pacific. One of these is the southern boundary of North Park, the streams within it flowing north to the Platte-Missouri-Atlantic system, those south of it feeding the Grand-Colorado-Pacific; another is between Creede and Ouray, separating the headwaters of the Rio Grande from those of the Gunnison and Uncompahgre of the Colorado system. The eastern plains are divided chiefly between the two great systems of the Arkansas and the South Platte; the former occupies more than one half their area in the State, the southern portion, the latter the larger portion of the northern half; between them on the east is a section draining into the Republican River, an affluent of the Kansas. The South

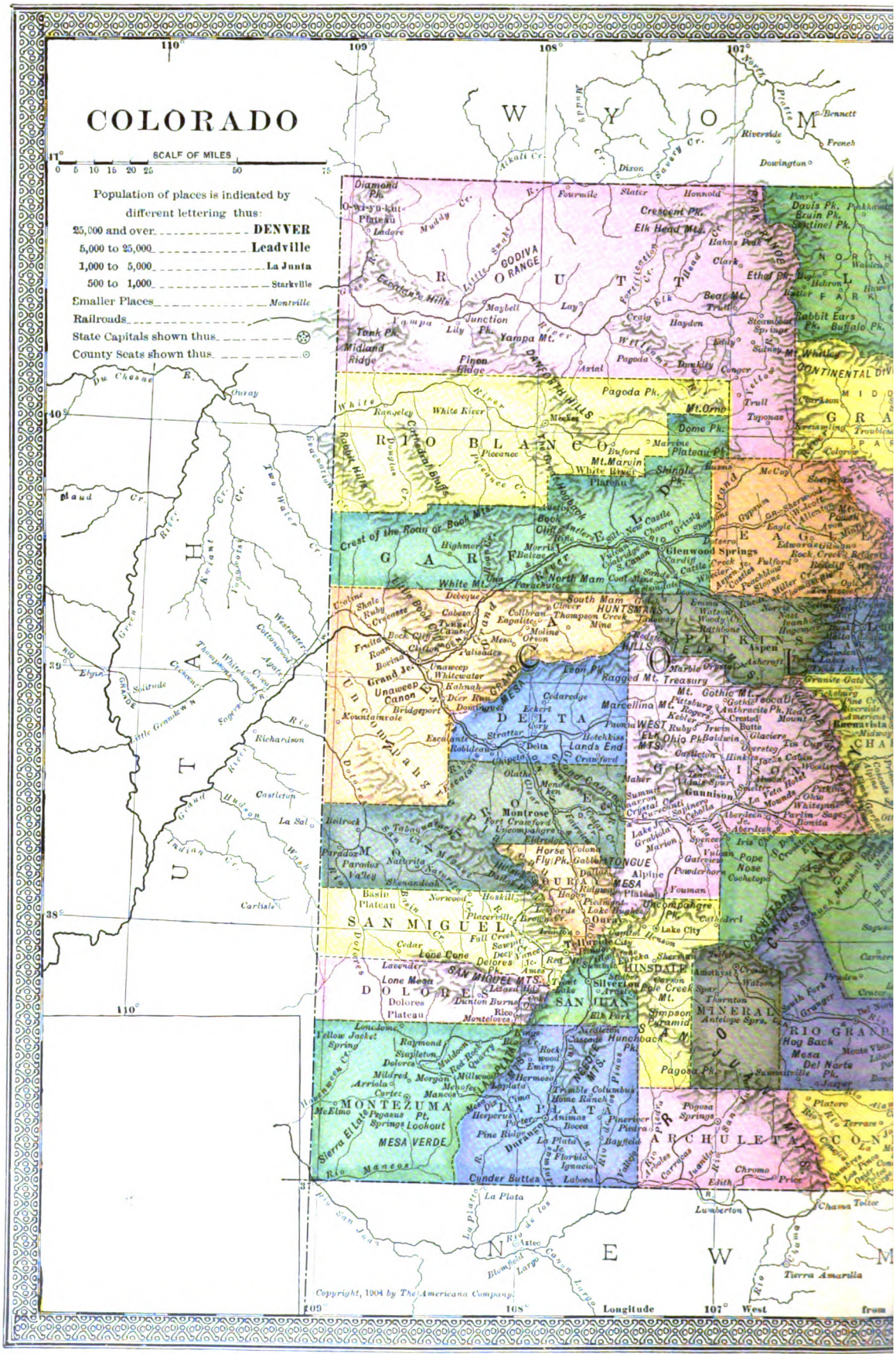
Platte rises in South Park; the Arkansas in the mountains west of it, Leadville lying on one of its head creeks. Except for these and the Rio Grande in San Luis Park, the mountain section is almost entirely drained by the Colorado River system: the Yampa (or Bear) and the White, in the northwest, flowing to the Green; the Grand through the centre, with its chief affluent the Gunnison from the south; and the Dolores in the southwest.

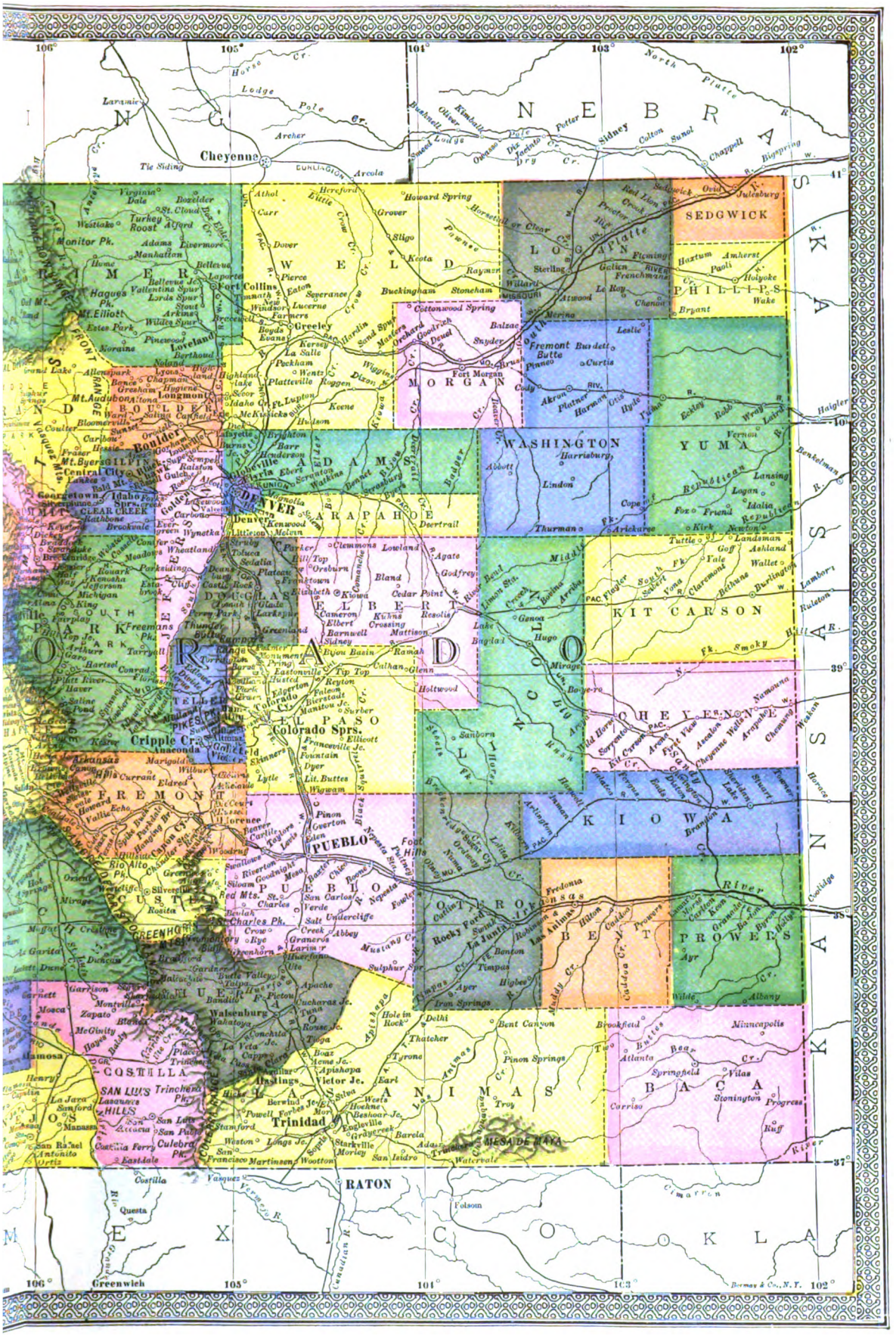
Of equal fame with the giant peaks and even greater beauty, are the stupendous mountain cañons through which its rivers cut their way. Western Colorado forms the eastern edge of what Major Powell has called the Plateau Province; and all the wonders and beauties of this remarkable region are found in this State. There are the terraced platforms, ending in rock faces dropping sheer upon other platforms hundreds of feet below, and ending in perpendicular gorges from 1,000 feet to a mile in depth, where the sand-laden currents with a steep fall, have cut their channels through countless strata of brilliantly variegated sedimentary stone; barren mesas, and cool grassy forested levels and slopes above the plane of perpetual drouth where the mountains bar off the vapors; rock headlands around curves or junctions of streams or gullies, fantastically carved in striking likeness to the work of human architects; and buttes or rock hills sometimes hundreds of feet in length, pillars and towers, cut from the stone valleys by the erosion of interlacing streams. The "Garden of the Gods" is so named from the enormous number of these tapering monuments of quartz and pebbles with a cap of sandstone, rising from the green meadows; with great table mesas sometimes 250 feet high, having sides almost perpendicular, and often a cap of purple basalt. The cañon of the Arkansas is also famous.

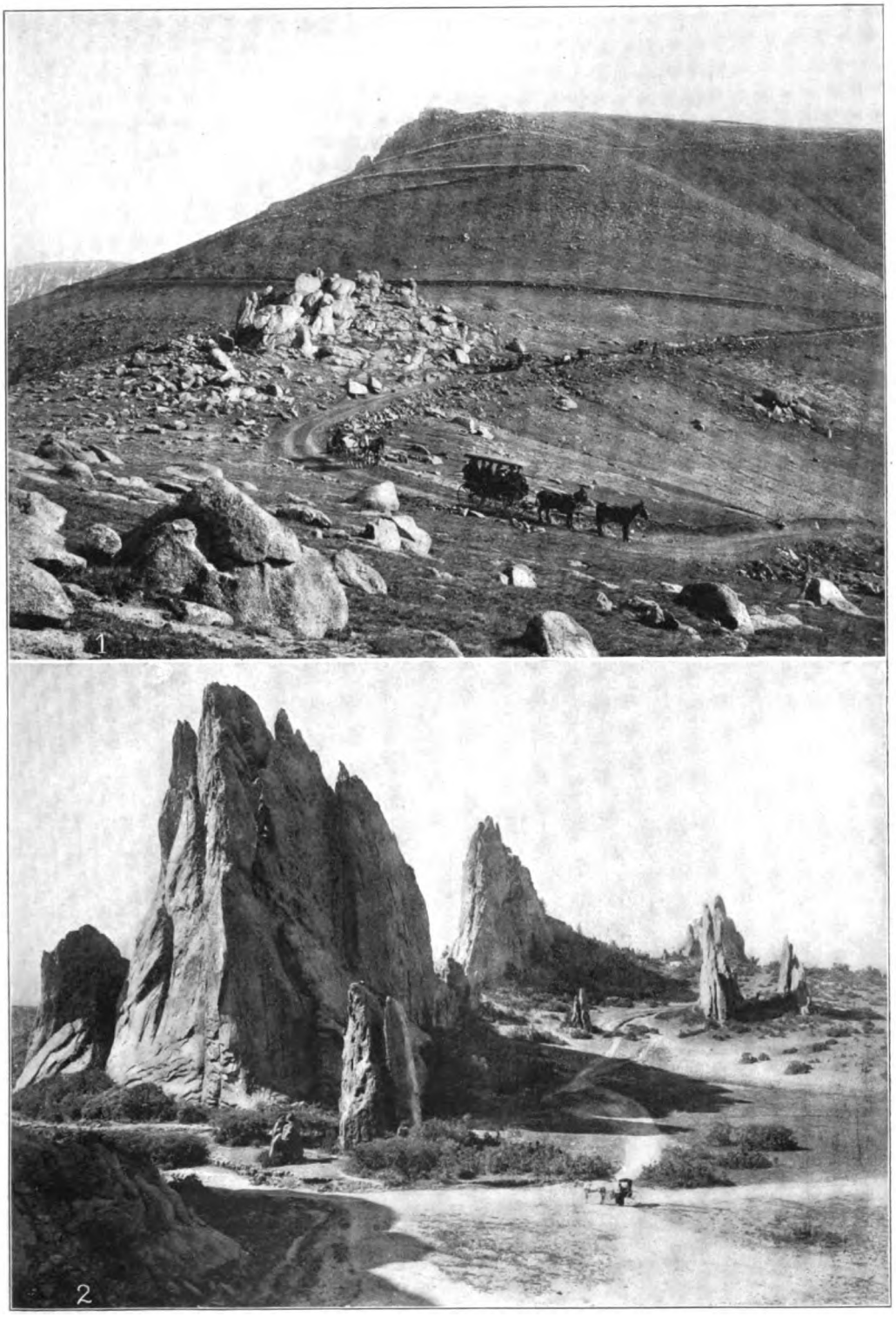
Climate and Rainfall.— The dry, cool, thin air of mountain Colorado makes its accessible eastern portions, especially the parks, widely famed as sanatoriums for patients with asthmatic or pulmonary disease. Colorado Springs, the Rocky Mountain Saratoga, is built up by eastern invalids. The summer days are sometimes hot, but the dry air and bare rocks cause so rapid a radiation that the nights are always cool and dewless. There is little severe winter cold, zero being rare; the frost season is short, and the snows are seldom deep and soon melt, except on the mountains. The January mean temperature for the leading places is about 28.5° F.; the July, 72° to 74° F. The average rainfall is 14.8 inches, fairly even throughout the State, though naturally much heavier on the higher levels, varying from nearly 30 inches at Pike's Peak to 12 at Las Animas in the Arkansas plains. Hence, agriculture can be carried on without irrigation in many mountain regions, though better with it.

Surface, Farming, Stock Raising, and Irrigation.— There are about 16,000 square miles of forested land in the State, the trees being mostly conifers, with cottonwoods along the eastern streams. Of the 40,000 square miles of plain and parks, about one third is arable, the rest being grazing-ground, to which, however, must be added many thousand miles of grassy mountain slope. The pasturage in many parts lasts through the winter; and the plains are covered with gorgeous wild flowers, also perennial. The soil of the plains is mostly sandy loam, with some clay. Along the water-courses the soil is rich, but the rainfall is not sufficient, and irrigation is needed; but is scarcely feasible there except along a few large streams, or near the mountains. But there is an estimated irrigable area of 4,800,000 acres, or 7,500 square miles, in the State; and in recent years an immense amount of energy has been turned to utilizing its possibilities. The land within reach of mountain streams had been so improved thereby that in 1900 Colorado was first in the United States in extent of land irrigated, and was surpassed only by California in number of irrigators and value of crops raised by irrigation. The average size of farms is much larger than in California. But of all the land under cultivation in 1900, 70.9 per cent or 1,611,271 acres, was irrigated, against little over half that in 1890. Of this amount over one third is in a solid block along the South Platte, at the northeast corner of the mountains in the State; the next greatest, nearly a fifth of the whole, in San Luis Park. There are lines along the South Platte and Arkansas; blocks on the Grand in Mesa County, on the Gunnison in Delta and Montrose, and again in Gunnison County; scattered sections on the White and Yampa, along the southern Arkansas tributaries, and indeed in every quarter of the State. There were 1,890 gravity irrigating systems in all, with 7,374 miles of main ditches; besides 277 artesian wells. Each mile of ditch had side ditches covering 390 acres; but only 218 were actually irrigated, from lack of water. The last census year was, however, one of abnormally small rainfall. The cost of construction per mile was $1,569; per acre, $7.21. The State is divided by law into six irrigating divisions: the South Platte — the richest farming section of Colorado — irrigating 711,192 acres; the Arkansas, Rio Grande, Grand, San Juan, and Green.

The most important single crop of Colorado is hay, now amounting to some $10,000,000 a year in value. Two thirds of this is alfalfa, whose great yield and nutritious qualities make irrigation worth while, and most of it is grown by means of irrigation. The next is wheat, 7,207,111 bushels in 1900. It had more than doubled in the decade, and it makes the highest priced flour on the market. Potatoes rank third; the soil is admirably adapted to them, and in 1900 4,465,748 bushels were raised, against 383,123 in 1880. The sugar-beet industry is becoming of the first importance. There are five large beet-sugar factories in the State, which in 1902–3 are estimated to have utilized a crop of over 270,000 tons, and produced nearly 30,000 tons of sugar. In it the State ranks third of the United States. The only other crops of first-rate importance were oats, 3,080,130 bushels; and corn, 1,275,680 bushels. Others, however, are rapidly becoming valuable specialties. Barley is increasingly raised for brewing. With irrigation fruit-culture is assuming large proportions; especially the growing of apples, which have arisen from nearly nothing in 1890 (77,798 trees and some 10,000 bushels) to 2,004,595 trees and 257,563 bushels in 1900. Over 80,000 bushels of peaches, pears, and plums were also grown. Most of the fruit-raising was in Delta, Mesa, and Montrose counties, on the Grand and Gunnison, in Boulder County, on the South Platte, and in Fremont County, on the upper Arkansas.







1. Pike's Peak, Showing Carriage Road.

2. Garden of the Gods.

A fragrant crop on the Arkansas is that of muskmelons, including the famed Rocky Ford cantaloupes.

Stock raising has increased with the production of feed, or *vice versa*. In 1900 the value of Colorado live stock was $49,359,781; the number of meat cattle more than doubled in the decade (640,913 to 1,333,202), as it had done in each decade since 1870; and sheep, swine, and horses increased 50 to 75 per cent. The quality improved even faster than the quantity. Colorado ranchmen have been among the foremost to import blooded bulls to breed up the native stock, and in 1900 the average price of bulls was $55.26, the highest in all the States save one (Wyoming), against $34.49 for the whole country, and $15.26 for the South Atlantic States. This breeding is displacing the Texas long-horn with blooded stock, and the average herd is smaller and better looked after. Dairying has increased by a third in the decade. There were 76 creameries and 27 cheese factories in the State in 1901, and a large condensed milk factory was built. Sheep and wool form the wealth of several counties.

Geology and Mining.— The main ranges of the Rocky Mountains are predominantly igneous granite and the like, with sedimentary rocks of great antiquity to the east and west (erosion is believed to have bared the former), and Cretaceous and Tertiary in the eastern plains and along the valleys in the west. The Cretaceous rocks hold great coal deposits; and the volcanic upthrows have left enormous deposits of the precious metals and others. Colorado is the foremost State in the Union except Pennsylvania in mineral resources, and by far the first in all except iron and coal. In 1900 40,111 of its inhabitants were employed in mining, 16,040 above ground, and 24,071 below. In 1901 it produced 1,342,712 ounces of gold, worth $27,693,500, almost a seven-fold increase within the decade; and 18,557,068 ounces of silver, worth $11,062,680 (coining value, $23,838,772); in all $38,756,180. More than half of this came from Cripple Creek in Teller County, and the remainder from 33 of the 57 counties of the State. The production of gold is relatively steady, and tends to increase; that of silver is subject to immense fluctuations, but is on the decline, many mines having closed down on account of the great fall in price. The greatest output was in 1892, the year before the repeal of the Sherman Act. Colorado's gold product in 1901 was 64 per cent greater than that of California, four times that of Alaska or South Dakota, and 35½ per cent of that in the entire United States; its gold and silver together over one third. The mines at Cripple Creek and Leadville are the best equipped in the country. About three fourths of the silver is from lead ore, and Colorado's lead product is about one fourth that of the whole country, much of it being independent of silver. It is not only marketed as a raw material, but is the most valuable flux for smelting gold and silver, and therefore large quantities are imported from other States. In 1900 it produced 82,137 tons. In 1895 Leadville produced three fourths of all in the State; in 1902, a little more than one third, Creede and the San Juan district having taken its place. Trade with Belgium within a few years has developed a great zinc industry, previously slighted: and the output of zinc and manganiferous iron is worth some $600,000 a year. Copper is much more important: not so much from direct mining, which is trivial, as from extraction from ores of the precious metals containing it. It amounts to some 4,000 tons a year, or in value, nearly $2,000,000. But of late, coal and iron are coming to the front. In 1900 Colorado ranked eighth in coal and fourth in coke in the country (5,300,000 tons of coal and over 500,000 of coke), and mined toward 500,000 tons of iron ore, mainly brown hematite. Except Minnesota, it far outranked every State west of the Mississippi in both. About half the coal was from Las Animas County in the southeast. These products are only the chief of a vast number of mineral stores — salt and sulphur (whence many valuable mineral springs), mercury and platinum, porcelain clay, marble and sandstone, petroleum and natural gas, etc.

Manufactures.— The chief industries of Colorado could be predicted from a glance at its raw materials — precious metals, copper and lead, coal and iron, wood, cattle, and grain. These mean smelting, iron and steel and railroad work, lumber manufacture, meat-packing, flouring-mills and breweries. The predominating industry is the smelting and refining of lead ores or with lead, which makes two fifths of the State's total of product in value — $40,732,271 out of $102,830,137; over a third the investment of capital — $22,569,715 out of $62,825,472; and nearly one sixth the wages paid — $2,390,383 out of $15,146,667. Copper-smelting embraced about one tenth as much capital and product, and paid one eighth as much in wages. Iron and steel were second, with $2,903,136 capital, $6,108,295 product, and $710,742 wages. The great advantage of Colorado in having its iron, coal, and flux close together have given it a practical monopoly of the market west of the Mississippi. The increase over 1899 was 25,000 tons of pig iron and 40,000 of steel rails. Foundry and machine-shop products are really a part of this: product, $3,986,915; wages, $1,125,432; and car-shop work is dependent on iron and lumber — $3,141,602 product, $1,676,500 wages. Flouring and grist-milling showed $4,528,062 product, $139,510 wages; wholesale slaughtering and meat-packing, $3,562,357 product and $139,510 wages; malt liquors, $2,042,863 product, $256,764 wages; lumber, timber, and planing-mill output, $2,693,575 product, $655,053 wages. Colorado industries pay about $1,000,000 a year internal revenue tax.

Railroads.— Colorado has about 5,000 miles of main track of steam roads; besides well-developed electric systems, not only in cities, but between mining camps. A number of great trunk lines cross the State and pierce to the heart of its mountain districts, giving the best transportation service of any State along the Rocky Mountains. The chief systems are the Union Pacific, the Missouri Pacific, the Atchison, Topeka & Santa Fé, the Denver & Rio Grande, the Rock Island, the Colorado & Southern, the Colorado Midland, and the Rio Grande Western railroads. Within the past few years two important branch lines have been built from Denver, connecting with the Burlington and the Northwestern systems.

Finances.— In 1902 the assessed valuation of the State was about $354,002,501 and the bonded debt $1,004,720 net. The tax rate was $4.50 per $1,000.

Banks.— On 1 Jan. 1903 there were 53 national banks in Colorado, with a capital stock of $5,607,000, deposits of about $66,000,000, and reserves of $15,000,000; 40 State banks, with about $2,000,000 capital, about $15,000,000 resources, and over $20,000,000 deposits; and a number of private banks.

Education.— Colorado stands high among States in the efficiency of its school system, the length of its school year (not exceeded by any west of the Atlantic seaboard), and the salaries paid to its teachers. It expends over $3,000,000 a year on its public schools; and erected 126 school buildings in the two years 1899 and 1900. Out of 158,142 children of school age in 1900, 120,846, or three fourths, were enrolled, and the actual attendance was 96,728; of whom 83,325 attended six months or more and 7,805 four to five months. It has nearly 2,000 public schools, with 3,500 teachers, and over 40 public high schools. There is a State normal school at Greeley, with about 600 pupils; and a private one at Denver. For higher education there are the University of Colorado (1877) at Boulder; Colorado College (1874) at Colorado Springs; the University of Denver (1864) M. E.; College of the Sacred Heart (1876) R. C.; and Baptist Female College, at Denver; the State School of Mines at Golden, accommodating 200 to 250 pupils, and constantly crowded; and the State Agricultural School at Fort Collins. These institutions are constantly adding new buildings and facilities, and increasing in students. There are medical colleges at Boulder and Denver. There are also several private secondary schools —at Boulder, Cañon City, Del Norte, Leadville, and Montclair.

Churches.— In 1900 there were about 650 church organizations in the State, and nearly 500 Sunday-schools. The strongest denominations are the Methodist, Presbyterian, and Roman Catholic; there are also considerable numbers of Congregationalists, Baptists, Episcopalians, Lutherans, and Disciples of Christ.

Charitable and Penal Institutions.— Each of these has a board of control, under the general supervision of the State Board of Charities and Correction. Besides the care of the poor by the counties and some city institutions, as elsewhere, there is a State insane retreat at Pueblo, and a soldiers' and sailors' home at Monte Vista. The State prison is at Cañon City. The convicts are employed at useful labors inside, and also at road-making and the digging of irrigation ditches outside. The indeterminate sentence is used. There is also a State reformatory and farm at Buena Vista; and an industrial school for juvenile offenders at Golden, where the inmates are not confined nor marked with penal badges, and the appeal is to their honor.

State Government.— The State constitution is of 1 Aug. 1876, adopted soon after the State's admission. Woman suffrage was adopted in 1893, and women are eligible to office. In 1901 over a score of them were elected to be county superintendents of public instruction, and several to other offices. The governor holds office for two years, and has a salary of $5,000. He has a veto by items, overriden by a two thirds vote. Of the other State officers, the treasurer and auditor are limited to a single successive term. The legislature has biennial sessions, and is limited to a membership of 100 in both branches; there are now 65 in the House (elected for two years), and 35 in the Senate (four years). The State had two representatives in Congress prior to the reapportionment under the census of 1900, which gave it three. There are three judges of the State supreme court, elected for nine years; the judges of the judicial districts are elected for six, and each county has a judge, elected for three. The terms of county commissioners are three years; there are three in all counties having under 10,000 population, and five in those with more than that number. The State militia consists of two infantry regiments of 550 each, an artillery squadron of 200, and a battery of 75.

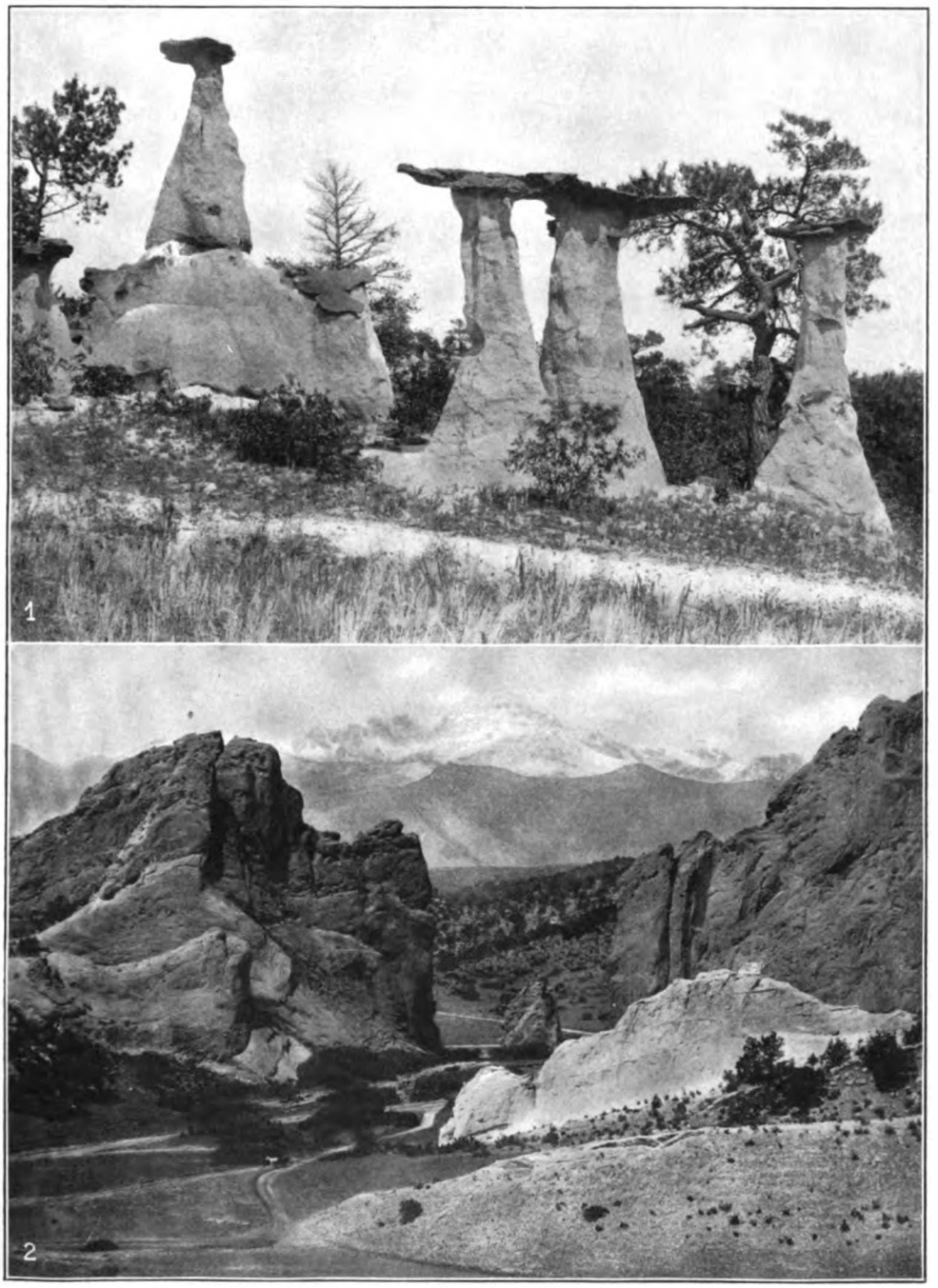
Politics.— Colorado, admitted as a Republican State, has alternated between the parties till within the last few years, when it has become Democratic, mainly on the currency issue. The Populists are also strong there, and the Republicans are predominantly Silver Republicans.

Population and Divisions.— The first (Territorial) census, that of 1860, showed 34,277 people; 1870, 39,864; 1880, 194,327; 1890, 412,198. The census of 1900 showed a population of 539,700. The foreign-born numbered 91,155. Of these, 26,481 were from England, Scotland, and Canada; 4,606 were from Germany; 10,765 from Sweden; 10,132 from Ireland; 6,818 from Italy; and 6,024 from Austria(probably in the main Hungarians and Slavs). Counting the north of Ireland English, probably a third of the foreign-born were English. The colored were 10,654. The enormous predominance of males usual in a mining district had dwindled with the settled industries, and the males were under 55 per cent.

There are 57 counties in the State, as follows, with their county-seats:

Adams, Brighton.	La Plata, Durango.
Archuleta, Pagosa Springs.	Larimer, Fort Collins.
Baca, Springfield.	Las Animas, Trinidad.
Bent, Las Animas.	Lincoln, Hugo.
Boulder, Boulder.	Logan, Sterling.
Chaffee, Buena Vista.	Mesa, Grand Junction.
Cheyenne, Cheyenne Wells.	Mineral, Creede.
Clear Creek, Georgetown.	Montezuma, Cortez.
Conejos, Conejos.	Montrose, Montrose.
Costilla, San Luis.	Morgan, Fort Morgan.
Custer, Silvercliff.	Otero, Lajunta.
Delta, Delta.	Ouray, Ouray.
Denver, Denver.	Park, Fairplay.
Dolores, Rico.	Phillips, Holyoke.
Douglas, Castlerock.	Pitkin, Aspen.
Eagle, Redcliff.	Prowers, Lamar.
Elbert, Kiowa.	Pueblo, Pueblo.
El Paso, Colorado Springs.	Rio Grande, Del Norte.
Fremont, Cañon City.	Rout, Hahn's Peak.
Garfield, Glenwood Springs.	Saguache, Saguache.
Gilpin, Central City.	San Juan, Silverton.
Grand, Sulphur Springs.	San Miguel, Telluride.
Gunnison, Gunnison.	Sedgwick, Julesburg.
Hinsdale, Lake City.	South Arapahoe, Littleton.
Huerfano, Walsenburg.	Summit, Breckenridge.
Jefferson, Golden.	Teller, Cripple Creek.
Kiowa, Sheridan Lake.	Washington, Akron.
Kit Carson, Burlington.	Weld, Greeley.
Lake, Leadville.	Yuma, Yuma.

There are 27 places in Colorado of over 2,000 people; 17 of over 3,000; and 8 of over 4,000. The metropolis is Denver, on the east flank of the Rocky Mountains, north of the centre, with 133,859 inhabitants in 1900, having nearly quadrupled in 20 years; the head of the Rocky Mountain trade, and chief United States market for ranching, prospecting, and mountaineering supples. Pueblo, with 28,157, and Colorado Springs with 21,085, are on the same front line of the mountains: the former a mining emporium; the latter the greatest sanatorium of the West. Leadville, 12,455, is the head of the



1. The Dutch Wedding, in Monument Park,
2. Pike's Peak, from the Garden of the Gods.

great mining district on the upper Arkansas west of South Park; Cripple Creek, 10,147, is the centre of its rich mining region, west of Colorado Springs; Boulder, 6,150, in the mountains northwest of Denver, is a sanatorium with medicinal springs, also a manufacturing town; Trinidad, 5,345, in the extreme south, is the southernmost of the frontal towns, below Pueblo; Victor, 4,986, is one of the Cripple Creek settlements.

History.— The State is named from the river (Sp. "red-colored"). In prehistoric times the pueblo builders dwelt in the southern part; but the early Spaniards found no survivors to establish missions among, and the country was not even explored to any extent till, in 1776, Francisco Escalante led an expedition into the Dolores and Gunnison region. It remained totally unoccupied, however, and a part of it passed under United States control by the Louisiana Purchase of 1803, the rest being claimed by Mexico. In 1806–7 Lieut. Zebulon M. Pike crossed the mountains, discovering Pike's Peak, and reached the Rio Grande; and in 1819 Stephen H. Long explored the northern part, Long's Peak being named after him. Frémont's explorations of 1842 and 1844 added considerably to the knowledge of the region, and lines of fur-trading posts were established on the South Platte and the Arkansas. After the Mexican war this formed a part of the territory taken from Mexico; but in 1854 Conejos, in the Rio Grande valley, was founded by colonists from New Mexico, and a Jesuit mission established there. But the real founding of the State as a civilized settlement dates from 1858. Prospectors from Kansas and Georgia were seeking for gold in this likely district; and its discovery by W. G. Russell of Georgia on the headwaters of the South Platte, near Idaho Springs, and by others farther north on the same river system, near Boulder, drew a torrent of immigration there in 1858–9, from Kansas, Nebraska, and Missouri. Denver, Boulder, and Auraria, Black Hawk, Central City, Golden City, Mount Vernon, and Nevada City, were all founded in those years; Breckenridge, Empire, and Gold Hill in 1860; Georgetown and Mill City in 1861. Arapahoe County, Kan., was organized 1859, extending to the snow-crests; that and parts of Nebraska, New Mexico, and Utah were organized into the Territory of Colorado 28 Feb. 1861, in accordance with the resolution of a convention at Denver in 1859. The first governor was William Gilpin, a Pennsylvania Quaker, who had been prominent in its development, and especially had originated the plan of making it include both sides of the Rocky Mountain chain. The War checked settlement somewhat; much more did the fierce Indian war of 1864–5 with the Cheyennes and Arapahoes of the plains, which made the roads unsafe and forced many of the settlements out of existence. Immigration was resumed when the savages were quelled, and nearly 40,000 persons were living in the Territory in 1870 — 25,000 males to 15,000 females. The Indian wars were chronic at intervals, but were past seriously affecting the Territory, and the Utes, who held much of the best mountain and park land, were forced to cede it by 1880. Repeated attempts had been made to organize a State government, without success; but the political conditions of 1874–6 made two senators more desirable, and the enabling act was passed 3 March 1875, the formal admission being intended for the centennial of the Declaration of Independence. The easy gold-working was, however, coming to an end, and the State was running down, when a new process of working silver and lead from the carbonates made hitherto useless ores suddenly more valuable than the gold had been. Leadville was founded in the heart of the region best suited for this, and shortly became the most famous mining camp of the West. For a few years past the great silver interests of the State have dictated its political sympathies, and the nominal party divisions have been subordinate to the one controlling issue.

Consult for early history and modern settlement, Bancroft, 'History of the Pacific States' (Vol. XX. 1890).

Colorado, Texas, city and county-seat of Mitchell County, situated on the Texas & Pacific Railroad, about 235 miles northwest of Austin. It is surrounded by a stock-raising and wool-growing region. Salt is extensively produced. Pop. about 2,000.

Colorado Agricultural College, a coeducational institution at Fort Collins, Col., providing instruction in agriculture, mechanical engineering, veterinary science, etc., a four years' course leading to the degree of B.S. It was opened in 1879, and received a grant of 90,000 acres of land under the act of Congress of 1862, providing for the endowment of "colleges for the benefit of agriculture and the mechanic arts." About half of this land is still owned by the college, and the institution receives its annual income mostly from State tax and government appropriations. In 1902 there were 27 instructors and 387 students.

Colorado Beetle, a coleopterous insect of the family *Chrysomelidæ,* belonging to the phytophagous group of tetramerous beetles (*Chrysomela,* or *Polygramma,* or *Doryphora decemlineata*). In size it is nearly half an inch in length, almost oval, convex, of a yellowish or ochre-yellow color, marked with black spots and blotches, and on the elytra with 10 black longitudinal stripes. The wings, which are folded under the elytra, are of a blood-red color. It is a native of the eastern slopes of the Rocky Mountains, where it fed on a wild solanaceous plant (*Solanum rostratum*) until the introduction and cultivation of the potato into the western States afforded it a more appropriate food. It has gradually spread at the rate of nearly 100 miles a year, until it is now found over all the central and northern parts of the United States east of the Rocky Mountains, and throughout Canada, where it has done incalculable mischief to the potato crops of these regions. The damage is chiefly wrought by the larvæ (of which they produce three broods annually), which are hatched on, and greedily devour, the stalk and leaves of the potato plant. See POTATO.

Colorado College, a coeducational nonsectarian institution in Colorado Springs, organized in 1874. It offers full collegiate courses and confers the degrees of A.B., B.S., and Ph.B. In 1902 the college reported 33 professors and instructors; 500 students; 25,000 volumes in the library; value of grounds and

buildings, $500,000; annual income, $41,000; president, William F. Slocum, LL.D.

Colorado Desert. See DESERT.

Colorado River, one of the chief streams of Texas. Rising in the high table-lands of Bexar, near the line of New Mexico, about lat. 32° 30′ N. and lon. 102° W., it flows southeast, receiving in its upper course the Conca, the San Saba, and the Lano on the south, and the Pecan from the north, and empties into Matagorda Bay. Austin, Bastrop, and Columbus are on its banks, and Matagorda near its mouth. For most of its course it flows through a fertile region, and has an average width of 250 feet. It is a clear stream; its name, meaning red, was originally applied to the Brazos, north and east, but the two were interchanged. The Colorado is some 900 miles long, and navigable to Austin or farther.

Colorado River, or **Colorado of the West,** a great river of the United States and Mexico, formed at about lat. 38° N. and lon. 110° W., by the junction of the Green and Grand rivers. The Green river rises in the Rocky Mountains in the west of Wyoming, receiving in its southwestern course the waters of the Bear, the White, the Uintah, and San Rafael. From Flaming Gorge, a point in the northwest of Colorado, where the Uintah Mountains rise, the Green River cleaves its way rapidly through cañons, the walls of which tower up to a height of nearly 1,500 feet. The Grand River rises in the Rocky Mountains, west of Denver, Col., receiving in its southwestern course the South Fork or Gunnison, the San Miguel, and Dolores. After the junction the Colorado flows southwest through Utah, joined on the east by the San Juan, on the west by the Dirty Devil and Escalante; southwest through the north of Arizona, till its waters are increased by the Colorado Chiquito, or Little Colorado of Arizona. Near the inflow of this tributary is the Marble Cañon, 3,600 feet deep and about one third the length of the greater cañon below.

From the mouth of the Little Colorado the river bends west and for more than 200 miles flows through the wonderful Grand Cañon. The successive divisions of the cañon are known as the Kaibab section, the Kanab section, the Uinkaret section, and the Sheavwitz section. The walls of this water-worn trench are often vertical, or nearly so, for a distance of thousands of feet at a time; sometimes they slope steeply, or constitute magnificent terraces. The cliffs or rock-walls attain a height of from 4,000 to 7,000 feet above the stream. (For heights of particular points, see CAÑON.) There are frequent whirlpools and waterfalls. Below the cañon the valley opens, and there is much fertile bottom-land on one or both sides of the river. Numerous tributaries pierce the high plateau on either side, the whole presenting a strangely intersected topography. Escaping from the Grand Cañon, the river flows southwest to the borders of Nevada, receiving from the west the Paria, Tapeat's River, the Kanat (of Arizona), and the Virgen (of Nevada).

Above Callville, Nev., the Colorado, as also its tributaries, again bores its way through deep cañons, the sides of which in some places present walls of solid rock nearly 7,000 feet high; the plateaus at the top of these rock masses, generally treeless, are again surmounted by terraces 1,000 feet or more high. These lower and higher terraces are both piled with massive ruins, once the walled towns and cities of the Toltecs, as is supposed, a race said to be represented by the present Moqui Indians in the northeast of Arizona. Below Callville the river is again shut in by the last of the cañons, the Black Cañon, 25 miles long, and from 1,000 to 1,500 feet high. Shortly after receiving the Virgen, the Colorado takes a southerly course, severing Arizona and Sonora on the east from Nevada, California, and lower California on the west, and receiving on the east Bill Williams' Fork and the Gila. After absorbing the Gila the river sweeps round in a westerly direction for 7 or 8 miles, and soon expands to a width of 1,200 feet. Thence it pursues a tortuous course of 180 miles, the last portion being through Mexican territory, to its mouth in the Gulf of California. There is a vast delta or flood plain formed by the waste from rock erosion. From the sources of the Green River the Colorado measures a total length of about 2,000 miles. It is navigable for steamers as far as Callville, 612 miles from its mouth, and can be made navigable, it is thought, to the foot of the Grand Cañon, 57 miles higher. The first attempt to navigate the upper part of the Colorado was made in 1891. In 1893 the stream was proved navigable for 130 miles between Green River and Cataract Cañon.

The investigation of the geologists dispelled the theory once held that the Grand Cañon was a fracture of the earth's crust. It is now clear that a long period of erosion through plateaus successively uplifted has produced this remarkable gorge. At the bottom of the cañon throughout a considerable part of its course the Archæan system is laid bare. The Algonkian beds with their high coloring give brilliancy to that portion of the cañon where they can be traced. The Cambrian beds are found above the Algonkian, but in places rest directly on the Archæan. The thickness of the Cambrian (here known as the Tonto formation) is in places 1,000 feet. The upper part of the cañon walls consists of carboniferous formations (Red Wall formation below, Aubrey limestone and sandstone above). It has been estimated that all of the Eocene, Cretaceous, Jurassic, and perhaps Triassic beds and the greater part of the Permian were worn away from the plateau region during the period of erosion. The Marble Cañon platform, like that of the Grand Cañon consists of carboniferous strata with a considerable number of Permian remnants scattered over it.

In less than 50 years after the landing of Columbus, Spaniards explored the Colorado. In 1540 the river was visited by a detachment of Coronaro's expedition and another of his exploring parties gave the first description of the Grand Cañon as seen by white men. About the same time Fernando Alarçon ascended the stream in boats for a long distance. Catholic missionaries subsequently traveled through these regions. For about 300 years, nothing more was learned concerning the Colorado. Much light was thrown on the subject by the investigations of Ives in 1858. In 1869 Powell explored the region and made the descent through the whole course of cañons to the mouth of the Rio Virgen, a distance of more than 1,000 miles.

Dutton made geological studies of the Grand Cañon in 1875. In 1889 the cañons were explored by a party of engineers sent out to make surveys.

Bibliography.—W. M. Davis, 'An Expedition to the Grand Cañon of the Colorado'; Dutton, 'Monograph II, U. S. Geol. Survey' (1882).

Colorado Springs, Col., a city and county-seat of El Paso County, on the Denver & R. G., the Denver T. & G., the Santa Fe R. I. & M. P., and the Colorado M. R.R.'s. It is situated on a plain at an elevation of 6,000 feet, near Pike's Peak and has a world-wide reputation as a health and pleasure resort. Colorado Springs is an attractive city and is the midway gate to the western section of the State. The celebrated mineral springs of Manitou attract many visitors.

Industries.— Colorado Springs was settled in 1870 and its wonderful growth since 1892 may be largely attributed to the development of the Cripple Creek gold mines, which are 30 miles distant on the opposite side of Pike's Peak. The gold output since the discovery of the district in 1891 has been $136,000,000. A great part of this wealth flows into Colorado Springs, whose population has more than doubled in the past ten years, and whose bank deposits have increased 600 per cent. in the same period, and now amount to about $10,000,000.

Buildings, Educational Institutions, Railways, Etc.— Colorado Springs boasts a handsome opera house and five clubs, one occupying an edifice worth $80,000; 17 fine school buildings, Colorado College (q. v.), the oldest institution of its kind in the State, with over 800 hundred students, a State institution for the education of the blind and mute, sanitoriums, church edifices, 2 hospitals, and 6 trunk lines, 28 miles of electric railway and a modern telephone system.

Government, Etc.— The city is governed by a mayor, who is chosen biennially, and a city council. Colorado Springs has a water supply costing over $1,000,000 and a sewerage system perfected at an expense of $10,000,000. Pop. (1904) 24,000.

HENRY RUSSELL WRAY,
Secretary Chamber of Commerce.

Colorado Stage. The rocks of the Colorado Stage, one of the lower divisions of the upper Cretaceous Series, are all of marine origin and cover a great area, having been laid down in an interior sea that stretched from northern New Mexico, where it opened into what was then the Gulf of Mexico, to the Arctic Ocean. This sea at about the latitude of Duluth, Minn., was over 1,000 miles wide. The Colorado is separated into two sub-stages, the lower, or Fort Benton, clays, shales, and limestones, with a maximum thickness of 1,000 feet, and the upper or Niobrara, shales, sandstones, chalk, and chalky marls, with a maximum thickness of 2,000 feet. Along the northern border of what was the Gulf of Mexico, in Alabama and Mississippi the Colorado is represented by the rotten limestone 500 to 1,200 feet thick, and along the western shore of the gulf, across Texas into Mexico, by the Eagle Ford shales, 500 feet thick, and by part of the great chalk belt 300 to 600 feet thick, that stretches from Arkansas into northern Mexico. The Colorado Stage is of interest because of its marking the time when more of North America was under water than since the Carboniferous Epoch, and because of the beds of chalk in South Dakota, Kansas, Arkansas, Texas, and Mexico. See CHALK; CRETACEOUS SERIES.

Colorado, University of, a coeducational institution at Boulder, Col., supported by the State. It was incorporated in 1861 by the Territorial legislature; when Colorado became a State in 1876, the Constitution provided that the university at Boulder should become the State University, thus giving it the advantage of the lands appropriated by the national Congress for such institutions. The University of Colorado commenced its work in September, 1877, with two departments, the collegiate and the preparatory. Since then the preparatory work has been gradually withdrawn from the university until the preparatory school has a separate organization; and the schools of medicine, law, and applied science have been added. The collegiate department offers courses leading to the degrees of A.B., Ph.B., and B.S. In 1903 there were over 500 students in the university proper, and nearly 400 in the preparatory school. The library numbers 26,000 volumes.

Coloration, Protective. The color of plants and animals is primarily due to the action of light, and is dependent on the pigment in the tissues of flowers, and in the skin, scales, hair, or feathers of animals. Plants are colored green by chlorophyll, so are caterpillars from eating plants; animals derive their colors from the waste matter of the blood. The "chromatic function" is that adaptation of color of the skin of the frog, chameleon, squid, fish, or crustacean, which rapidly changes so as to be assimilated to the tints of the objects on which they rest. In all animals the coloration is due to pigment-cells (see CHROMATOPHORES), which are more or less ramified, and which, under the stimulus of the prevailing color of the habitat, cause the animal to be assimilated in hue to the ground, or tree, or sea-bottom. In most animals the coloration is permanent, in a few it changes with the change of color of the immediate surroundings of the animal, as in the chameleon. In insects, fishes, and birds, where the variety of colors is almost endless, it is usually more or less protective, though, when the males are brightly colored this is the effect of sexual selection.

Pigment in Animals.— That this is primarily due to the action of light is proved by the fact that cave animals, or those living in darkness, are white or bleached out, so that the pigment cells become degenerate, the pigment losing its more or less dark color, while in insects the colors are either optical or natural; the pigments, when present, are formed in the cellular layer of the skin (*hypadermis*). The pigments are formed from the waste products of the blood which have not been carried away with the urinary excretions. These colors tend to fade after death, but when enclosed and preserved in air-tight sacs, such as the scales and hairs of butterflies, and the wing-covers of beetles, they remain bright for a longer time, though eventually fading when dried specimens are exposed to the light. It has been shown that red, yellow, brown, and black colors in the scales of certain butterflies are always due to pigments, while in a few cases greens, blues, violets, purples, and whites are due to

pigments in the scales themselves. Mayer finds that the pigments of the American silkworm moth (*telea polyphenmus*) are derived from the blood of the chrysalis. He has artificially produced several kinds of pigments from the blood, which are similar in color to various markings on the wings of the moth, and has found that chemical reagents have the same effects on their manufactured products as on similar pigments in the wings of the living moth.

Origin of Spots, Bands, or Stripes.—The markings of caterpillars, the stripes of the zebra, of many African antelopes, and of the tiger are supposed to be due to the direct effects of light and shade, to shadows cast in jungle-grass or in forests. The proofs of this are the experiments of Steinach, who glued strips of black paper to the skins of frogs which were kept in the dark; when they were exposed to the light, only the uncovered parts of their skins returned to a lighter hue, while the covered parts remained dark. The reflected green light in the case of frogs turning green when among leaves, appears to act directly upon the pigment cells. When the bottom of the vessel is covered with felt or with a wire net, the frogs become black, but recover their green color when a green branch is introduced into the vessel containing them. Those caterpillars living among pine needles are green, striped with white, yellow, and red, exactly harmonizing with the red and yellow or white portions of each needle; this seems due to the direct reflection of different shades of light on the moist skin of the caterpillar. In other caterpillars the longitudinal lines are broken up into spots, and if the process is carried on farther the spotting becomes transverse. Eyelike spots on certain caterpillars have been observed to be gradually formed at successive molts from what were originally continuous lines or stripes. It thus appears that the wonderful variety of colors and markings in animals is primarily due to the direct result of the environment, bringing about different results in animals of different groups and exposed to different environments. (For coloration due to changes of temperature see *Seasonal Dimorphism* under DIMORPHISM.)

General Protective Resemblance.— Cases in illustration are the white animals of the Arctic regions, where extreme cold and dryness have turned the hair of the polar bear, and the feathers of the snowy owl white. This applies to species, the individual ptarmigan, ermine, hare, fox, etc., turn white in winter, but of a russet hue in summer, due to the differing light reflected from the ground in summer and the snow in winter. The ptarmigan, grouse, prairie chicken, and the like, which build open nests, are protectively colored, while the conspicuously marked kingfisher, parrot, etc., build a nest which conceals the sitting bird.

The under side of the wings of certain butterflies, such as the species of *Polygonia, Suvanessa antiopa*, and the East Indian *Vallima* are assimilated in color, together with their often ragged outlines, to dead and tattered leaves; when the butterfly is resting on the ground or in bushes among the dead leaves, it is difficult to distinguish. On the other hand the upper side of the wings are conspicuously marked with reddish hues and conspicuous bars. Certain moths, when resting on the lichen-covered bark of trees, are wonderfully similar to the surroundings, and are thus protected from the attacks of birds or lizards. In the Arctic regions and in Labrador certain butterflies and moths are of the color of lichen-covered rocks, so much so that when at rest they are difficult to detect.

Special Protective Resemblances.—The most striking examples are the measuring-worms, or geometrid caterpillars, which, when holding themselves out straight and stiff, resemble twigs, not only in shape, but in color and markings; and still more wonderful are those species whose bodies are provided with tubercles which in shape resemble the leaf-bud and other excrescences in the back of the twigs. How to account for the origin of such protuberances is a puzzle. The stick-insect is another example; though not common with us, and supposed to be well protected from the bills of birds, yet in the East Indian archipelago they are said to be the principal food of one kind of bird. Another example is the famous leaf-insect (*phyllium*) of Java, in which the wings are very broad, thin, and marked with veins like the mid-rib and side-ribs of a leaf.

Alluring Resemblances.— Such are the tentacles of the angler-fish or goose-fish, which, buried in the mud, waves its tentacles so as to deceive small fish. An Asiatic lizard (*phrynocephalus mystaceus*) is colored like sand, but is furnished with a red fold of skin at each angle of the mouth, which, says Marshall, is produced into a flower-like shape resembling a little red flower which grows in the sand. An Indian mantis (*Hymenopus bicornis*) devours insects which are attracted by its flower-like shape and pink color, which are like an orchid, the shape being due to the flattening of the tarsal joints of the legs, which radiate from the body like the petals of a flower.

Recognition Marks.— By Naller and others the stripes of the African antelopes, the upturned white tail of the rabbit and hare, and the bars and other conspicuous markings of birds that fly in flocks, are regarded as recognition marks, but others consider that this is rather fanciful and that they are protective alone.

Warning Colors.— Certain animals, of which the skunk affords an example, are so marked as to be easily distinguished by their enemies, which knowing by experience their offensive nature, pass them by. Hence the conspicuous stripes of the different species of these animals in the New World. There are many cases of brightly colored caterpillars which are avoided by birds and lizards which greedily devour green ones. The conspicuous red, blue, and purple spots and stripes are advertisement of their inedibility. In Nicaragua Belt observed that while ducks and fowl fed on ordinary green frogs, a small species gorgeously colored with red and blue, was avoided. On offering one to ducks and fowl they all refused to eat it, except one young duck, which took the frog in its mouth, only to drop it, going about jerking its head as if the taste of the frog was unpleasant. Although these striking markings are supposed to be the result of natural selection, Eisig's theory that the abundant secretion of pigment is the cause of the distastefulness, seems better grounded. Indeed a large number of cases of protective mimicry seem due to the direct action of light and warmth in

bringing about the varied hues of the pigment — moreover the range of primary colors is not very great, and the hues are apparently due to the action of the environment, so that we need not, in most cases at least, invoke the somewhat fanciful hypothesis of Wallace, Poulton, and others to account for these resemblances. As Eisig claims, the abundant secretion of pigment has caused the insects to be inedible, rather than that the bad taste has caused the production of bright colors as an advertisement or warning siginal.

Color Preference.—It has been frequently noticed that house-flies will light on a dark dress in preference to a light one. They will settle down upon a dark red or brown dress in great numbers, and either avoid or rarely alight upon a pearl gray, lavender, or light or white dress or clothing of any kind. It is the same with the mosquito, which has the same color preference as the fly. In malarious countries this is a most important matter. The wearing of light yellow, drab, or white garments is an important means of protection against malaria. Houses in such regions should have light-colored walls to the rooms, especially in sleeping-apartments.

On the other hand, locusts are attracted by white or light-colored garments more than those of any other hue. White butterflies (*Pièris*) show a preference for white flowers; while in several cases yellow butterflies (*Colias, etc.*) prefer to visit yellow to white flowers.

Insects Attracted Rather by the Odors of Flowers than their Colors.— It has been argued by Lubbock and others that the colors of flowers attract insects, and that the gay lines and stripes leading down to the bottom of deep corollas are guides to the nectar. At present this view has been stoutly opposed by Plateau, after many observations, who thinks that the color of flowers has no connection with the visits of insects, but that they are attracted by the odor of the nectar. He finds that any flower is freely visited if it be nectariferous, no matter how colorless or inconspicuous it may be. Many gay flowers are wholly avoided by insects, but on placing nectar at the base of such flowers, insects were at once attracted. It appears from Plateau's observations that color is not a primary factor in attracting insects to flowers. Though bright blossoms are undoubtedly seen by insects from a distance, when they once reach the flowers it is a matter of indifference to them what their color is—blue, red, yellow, green, or white—if they differ from one another in no other respect. Consult: Wallace, 'Darwinism,' (New York 1889); Poulton, 'The Colors of Animals' (New York 1890); Beddard, 'Animal Coloration' (New York 1895); Newbigin, 'Color in Nature' (London 1898); also the writings of Lubbock, Plateau, Coste, Urech, Eimer, Hopkins, Weismann, Tenneck.

Colorimeter, kŭl″ō-rĭm′ę-tėr, an instrument for measuring the depth of color in a liquid by comparison with a standard liquid. In its usual form it consists of two long, narrow glass tubes placed side by side on a stand. The standard liquid and the one in question are poured in equal quantities, one into each tube; and water is then added to the darker till its tint becomes the same as the other. The amount of water used is a measure of the depth of color in the given liquid.

Coloring, one of the essential parts of painting — namely, that part which relates to colors. Besides a knowledge of the art of preparing and mixing colors, and the whole mechanical process from the beginning to the finishing of a picture, which in the various kinds of painting varies according to the materials of each, coloring comprehends the knowledge of the laws of light and colors, and all the rules deducible from the observation of their effects in nature, for the use of the artist. This subject has been treated by Leonardo da Vinci in his work on painting; Lomazzo and Gérard Lairesse in books on the same subject; Mengs in his 'Praktischer Unterricht'; Goethe in his 'Farbenlehre'; etc. The skill of the painter presupposes a natural ability founded on superior sensibility — namely, the ability to image forth, and in the imitation to express with characteristic truth the peculiar substances and color of any object under the influences of the light and air. To make this imitation successful, an accurate attention to the local tones and tints is requisite. By local tones we understand the natural color of an object as it appears on the spot where it stands, or from the spot where the spectator is supposed to be stationed. In works of art the natural color of an object appears always as a local tone, because every object must be regarded from only one point of view, conformably to which the natural color is modified according to the supposed distance. By tints we understand, in a more restricted sense, the gradations of the clear and obscure which lights and shadows produce on the colored surface. In no object of art do these modifications and shades exist in greater delicacy and diversity than in the naked human body, which is consequently the most difficult subject for a painter. Coloring, in as far as it is an imitation of the color and character of flesh (the naked body), is called carnation (q.v.). If, in addition to the accurate coincidence of the natural colors, local tones, and tints of a painting with its original, the artist hits the expression of the peculiar character of the substance of which the object consists, the coloring is called true. But to truth should be joined beauty, which is attained by the harmonious union of all the tones of the painting into one leading tone. The coloring must conform to and promote the object of the painting as a work of art, and by the harmony of the colors and lights, as well as by the truth of the local colors, and of the individual parts of the subject, constitute one beautiful whole. In the choice of lights and the distribution of colors the artist should aim not only at clearness of representation, but at the same time at the production of a pleasing harmony, which should aid the general impression of the piece. Consequently harmony and chiaroscuro are comprehended in the idea of correct, beautiful coloring. We often see pictures in which the colors are true to nature, but which have little merit and are deficient in a harmonious union of excellences.

Coloring Matters. This name ought to include every substance, organic or inorganic, which is the cause of color in another, but in practice it is restricted to the natural coloring

matters of vegetables and animals, and to the dyes that are used for coloring fabrics. The reason of this restriction probably is that these coloring matters are distinctly different from the tissues or fluids which contain them, whereas the color of a mineral is not in general due to an isolable body, but is peculiar to the mineral itself. It is impossible, for instance, to take away the blue color of a copper compound, or the green or yellow of one of chromium. In the mineral world the analogy to the coloring of plants is found rather in rocks; for example, in a sandstone colored with oxide of iron, where the coloring matter may be removed without the rock mass being destroyed.

The organic coloring matters derived from vegetables are both important from their uses in the arts and interesting from their character and decompositions. They may be divided into two classes, those which exist ready formed in the plant, and those which are obtained by the spontaneous or artificial decomposition of some principle in the plant. Of those belonging to the first class, chlorophyll, the green coloring matter of the leaves, and the different colors in the flowers, are the most obvious. Those, however, which are used in the arts are not at first sight apparent, being contained in the seed, bark, stem, or roots, from which they can be extracted by water, alcohol, ether, dilute alkalies, etc. The second class includes bodies which result by oxidation or other chemical change from some usually colorless matters, to which the name "chromogens", color-producers, has been given; the question having been raised whether all coloring matters, even in plants, have not been produced from prior chromogens. The coloring matters have been subjected to investigation by numerous chemists, but, notwithstanding, very little is known about their real constitution. It is certain that many of the crude colors of commerce are mixtures, and it is highly probable that, when better known, their constituent principles will turn out to be diverse in constitution. Coloring matters are generally odorless, with a rough taste, soluble, some in water, others in alcohol. Indigo and alizarine can be sublimed, but most are decomposed by a slight elevation of temperature. They all consist of carbon, hydrogen, and oxygen, to which in some cases nitrogen is added. Some exhibit a weak acid tendency, combining with the oxides of lead, copper, and especially tin, iron, and aluminum, and forming insoluble colored compounds called "lakes." Some have the power of attaching themselves permanently to different vegetable and animal fibres, as silk, wool, cotton, and linen; others are unable to give a color which will not redissolve in water: in such cases the fibre is mordanted, that is, treated with one of the metallic oxides just mentioned, and then, when immersed in the color, the lake is precipitated in the fibre. The coloring matters are liable to change by exposure to daylight; they are also affected by a number of chemical reagents — certain blues, for example, are turned green by alkalies, and red by acids; they are destroyed by nitric acid, bleached by chlorine, decolorized, but not always permanently destroyed, by sulphurous acid, sulphuretted hydrogen, etc.

Of the coloring matters the yellows are the most abundant, and different varieties are got from different plants: fustic, turmeric, quercitron, Persian berries, morindin, saffron, arnotto, purree, chrysophanic acid, and others; of the blues, indigo and litmus are the most familiar; and of the reds and purples, madder, logwood, Brazil-wood, safflower, and a few more. Most of these colors require complicated operations to separate them in the pure state.

The only green coloring matter known, of no importance as a dye, but indispensable to the life of the plant, is chlorophyll. It was formerly supposed that this is a single substance which could be obtained from an alcoholic extract of leaves by adding lime, then decomposing the lime-chlorophyll compound with an acid, and agitating with ether, from which the chlorophyll was got by evaporation. But by another process it was found that it could be separated into two bodies, one yellow, the other blue; and by the application of the spectroscope, Stokes showed that chlorophyll contains four coloring matters, two yellow and two green, differing in optical properties. By further study in the same direction Mr. Sorby thinks he has proved that besides the greens there are four or five distinct yellow coloring matters, to which he has given special names. It is quite obvious, if this be so, that our knowledge of the nature of chlorophyll is just beginning, for each coloring matter will become an object of chemical and physiological investigation, and not till then will it be possible to say how chlorophyll acts in a plant. Experiments have been recently tried to elucidate more precisely the fading of chlorophyll when exposed to light, a change which is accompanied by altered spectrum bands, but in their present state they are too incomplete for description here.

The chief animal coloring matters are those of the blood, the bile, the urine, the retina, of the muscle and of the skin. The blood's coloring matter is the well-known hemoglobin, while the pigments of the bile, bilimbim, and its oxidation product, biliverdin, are derived from the blood pigments. Biliprasin and fuscin, bilicyanin, bilipurpurin, and bilixanthin, are other bile pigments. They may be regarded as various products of oxidation and reduction of the initial bile pigments. Urochrome is the general name applied to the urinary pigments. Its exact composition is by no means definitely understood. In the retina there are a number of pigments or chromophenes. They are mostly lipochromes, or fatty pigments, and have been named rhodophane, chlorophane, and xanthophane, these being red, green, and yellow respectively. There is a further black pigment in the eye, fuscin, allied to the melanins of the skin and hair. The muscle pigments are identical with the blood pigments. The skin pigments belong to a group known as the melanins. It is questioned whether these are iron pigments or not.

The artificial coloring matters may be divided into two classes, those which exist ready formed in nature, as many of the common red and brown paints, or which are formed by the mechanical mixture of such naturally existing colors, and those which do not exist in nature, but are produced by chemical operations. The latter are of mineral or of organic origin, examples of the first class being afforded by

Scheele's, Guignet's and other greens, artificial ultramarine, smalt, and many others, and of the latter by Prussian blue, and especially by the aniline colors. The artificial colors will be more particularly described in the articles DYEING and PIGMENTS; COAL-TAR COLORS.

Colors, in the army, the flags carried by each regiment. Each British regiment carries two colors, the royal or first color, and the regimental or second color; neither of these is now carried into battle. Each United States regiment carries the national color and the regimental color, the latter bearing the regiment's number; both are carried into action. In the navy the term colors is applied only to the national flag.

Colors. See COAL-TAR COLORS.

Colors of Thin Plates. See INTERFERENCE.

Colossæ, kō-lŏs'ē, an ancient city in Phrygia, situated on the Lycus, a branch of the Mæander. Colossæ had disappeared by the Middle Ages, and it is uncertain whether it was superseded by the town of Chonæ in its neighborhood, or whether Chonæ was Colossæ with only a change of name. It was first mentioned by Herodotus, Xerxes passed through it on his march to Sardis, 481 B.C., and it was a place of considerable mercantile importance in the time of Strabo. One of Paul's epistles was addressed to the Colossians, from which it is known that Colossæ was the site of one of the early Christian churches.

Colossal Cavern, The. A large cave discovered in 1895, the entrance to which is about one and a half miles distant from the entrance to the Mammoth Cave, of Kentucky. It was not explored to any great extent until 1898, nor has it yet been thoroughly explored; and no scientific investigation was made of the interior until 1903. On account of its immense size and the varied character of its formations, which are preserved in all their pristine beauty, the Colossal Cavern is a most worthy rival of the Mammoth Cave. The Louisville & Nashville Railroad Company purchased the Cavern in 1896. As exploration was pushed in various directions, the company acquired the land under which its course was found to run, and large sums have been expended in widening narrow passageways, smoothing rough places, building stairways where desirable for comfort, and doing many other things to make exploration easy. There are four separate entrances to the Cavern, only one of which (an artificial entrance) is used by visitors, and over 14,000 linear feet in distance have been surveyed. Among the many attractions of the Cavern are, Colossal Dome, 135 feet high, which is the most symmetrical as well as one of the largest domes known; Vaughn's Dome, 78 feet in height, which is approached through a magnificent canyon, about 300 feet in length; the Twin Pits, 65 feet deep; the Lover's Gallery, 400 feet long; the Ruins of Carthage, 400 feet long and 100 feet wide; Pearly Pool; Pulpit Rock; Dining Room, etc. Taken as a whole, Colossal Cavern presents to lovers of subterranean beauty and grandeur, a field which is perhaps unequaled by any other known cavern. The Cavern is readily and comfortably accessible by wagon from the terminus of the Mammoth Cave R.R.

HORACE C. HOVEY.

Colosseum. See COLISIUM.

Colossians, kō-lŏsh'ĭ-anz, **Epistle to the,** accredited to Paul the Apostle, written to the faithful of Colossæ, a city of Phrygia, near Laodicea. The epistle does not show that Paul had been in Colossæ or that he had, by word of mouth, preached the doctrines of Jesus Christ to the people of that city. There are good reasons to believe that Epaphras, a disciple of the apostles, preached to the Colossians and converted them. From the epistle itself (i. 7, 8,) it would seem that the disciple Epaphras was one of Paul's assistants, that he gave to this apostle accounts of his work, and that such accounts had been pleasing to Paul.

Some critics and commentators writing on this epistle, claim that it was written by Paul when he was in prison, in Rome (iv. 10), and that he wrote epistles, at the same time, to the Ephesians and Philippians. Others hold that the epistle to the faithful in Colossæ was written while he was in prison in Cæsarea.

The epistle contains a summary of Christian doctrine and practices, an arraignment of the sins of the time and the temptations by which the new-born Christians were beset, and a series of practical exhortations to the people of Colossæ in particular, but which are applicable to Christians in general. The epistle itself seems to show clearly that it was addressed to a body of Christians in union with all the other Christian Churches and bodies of the day. The sins and crimes which are mentioned indicate the time and locality where lived the people to whom the epistle was addressed.

A distinctive mark of the Christians was their method of prayer. They saluted each other in the name of Jesus Christ and expressed honor and respect for him, and thus made a prayer of the very beginning of their conversations, discourses, or writings (i. 2). They praised and adored God (i. 16–20), they petitioned Him and returned thanks for all things (i. 9, 12), and they offered the Lord Jesus Christ as atonement for all their wrong doings (i. 14, 21, 22). Several of the early Christian missionaries are mentioned; as Epaphras, Onesimus, Aristarchus, Mark, Barnabas, Luke, Demas, and Tychicus. The epistle must have been written in 62 or 63 A.D. The union among the Christians is shown by the remarks about the faithful in Laodicea and Hierapolis.

The faithful of Colossæ are warned lest any man cheat them or deceive them (ii. 8); they are told that Jesus Christ died for all (iii. 11), and they are given a code of morals and told their duty as Christians in general and as husbands, wives, children, masters, and servants.

Bibliography.— Köpper, Lightfoot, Oltramare, 'Commentaire sur les épitres de S. Paul aux Collossiens, aux Ephésiens et aux Philippiens'; Moffat, Fouard, 'Life of St. Paul.'

Colossus, kō-lŏs'ŭs, in sculpture, a statue of enormous magnitude, from which our adjective colossal is derived. The people of the East from the most ancient times have been celebrated for colossal sculpture. The pagodas of China and of India and the excavated caverns of the East abound with colossi of every description. The Asiatics, the Egyptians, and in particular, the Greeks, have excelled in these works. The celebrated colossus of Rhodes was reckoned one of the seven wonders of the world. It was raised by the Rhodians in honor of Apollo. Strabo, Pliny, and other ancient authors who

lived at the time that the colossus of Rhodes is said to have been in existence, have given its height at 70 cubits, or about 105 feet. Other authors who flourished since its destruction report its height at 80 cubits. The statue stood at the entrance of the harbor of Rhodes, but there is no authority for the statement that it bestrode the harbor mouth, and the Rhodian vessels could pass under its legs. Of other colossal statues of ancient times the most celebrated are the Olympian Zeus and the Athena of the Parthenon, both the work of Phidias. The virgin goddess was represented in a noble attitude, 26 cubits or 39 feet in height, erect, clothed in a tunic reaching to the feet. In her hand she brandished a spear, and at her feet lay her buckler and a dragon of admirable execution, supposed to represent Erichthonius. The statue of Zeus was 60 feet high. The earliest colossus recorded to have been sculptured in Rome was the statue of Jupiter Capitolinus, which Spurius Carvilius placed in the capitol after his victory over the Samnites. There has been dug up among the ruins of ancient Rome a colossal statue of the city of Rome, a personification reckoned among the tutelary divinities of the empire.

Among modern works of this nature are the colossus of San Carlo Borromeo at Arona in the Milanese territory; the four colossal statues at Paris in front of the façade of the palace of the Chamber of Deputies, representing four of the greatest French legislators; and a statue of Germania, 34 feet high, on a pedestal over 81 feet high, erected near Rüdesheim in commemoration of the unification of the German empire. In the United States a figure of "Liberty Enlightening the World," 151 feet high on a pedestal 155 feet high, has been erected in New York, overlooking the harbor and serving as a beacon. It was the work of the French sculptor Bartholdi, and was constructed mainly through the efforts of a French-American Union formed in 1874. In 1880 it was presented by France to the United States, and six years later it was placed on its present site, Bedlow's Island.

Col'peo, a species of fox-dog (*Canis magellanicus*) found in Patagonia and Tierra del Fuego. It is somewhat larger than the other South American fox-dog, and its fur is redder. See Fox-dog.

Col'quitt, Alfred Holt, American legislator: b. Walton County, Ga., 20 April 1824; d. Washington, D. C., 26 March 1894. He was graduated at the College of New Jersey in 1844, and settled in his native State as a lawyer. He served in the Mexican war, and was elected to Congress in 1852 as a Democrat. Upon the outbreak of the Civil War he entered the Confederate army as a captain. He was elected governor of Georgia in 1876 and United States senator in 1882 and in 1888.

Colquitt, Walter T., American lawyer: b. Halifax County, Va., 27 Dec. 1799; d. Macon, Ga., 7 May 1855. He was educated at Princeton, was admitted to the bar in 1820; became a district judge in 1826, holding the first court ever held in Columbus, Ga. He was a successful lawyer, and in criminal practice was without a rival in his State. He was a member of the Georgia State senate 1834, 1837; a representative in Congress 1839–43; a United States senator 1843–9; and a member of the Nashville Convention 1850.

Colt, Samuel, American inventor: b. Hartford, Conn., 19 July 1814; d. there 10 Jan. 1862. He had a common school education and was employed in his father's textile mill; but went to sea as a sailor when 15. His attention being drawn to firearms while at sea, he began to perfect a revolver and patented it in 1835. Its great success led to the erection by him at Hartford of one of the most extensive weapon factories in the world.

Col'ton, Arthur Willis, American writer: b. Washington, Conn., 22 May 1868. He graduated at Yale 1890, held the Foote scholarship there 1890–3, and was instructor in English literature 1893–5. He has of late devoted himself almost entirely to writing, and his stories have appeared in the 'Atlantic Monthly' (1899), 'Scribner's Magazine' (1899), and the 'Century' (1900). In book form he has published 'Bennie Ben Cree'; 'The Debatable Land' (1901); 'The Delectable Mountains' (1901); 'Tioba, and Other Tales' (1903).

Colton, Gardner Quincy, American scientist: b. Georgia, Vt., 7 Feb. 1814; d. Rotterdam, Holland, 11 Aug. 1898. He received a common school education and learned chair making, removing to New York in 1835, and taking up the study of medicine and science in 1842. Lecturing on chemistry and physics a few years later, accident led him to a discovery of the anæsthetic properties of nitrous oxide, or "laughing gas," credit for which is also given to Dr. Horace Wells. He perfected an electric motor in 1847, went to California in 1849, and resumed his scientific lectures in 1860. He later built up a large dental practice.

Colton, Julia M., American writer: b. New York. She was educated at Packer Collegiate Institute, and has contributed to 'St. Nicholas' and other magazines. She has written: 'Annals of Switzerland' (1897); 'Life of Velasquez' (1900); 'Annals of Old Manhattan, 1609–1664' (1902).

Colton, Walter, American writer: b. Rutland, Vt., 9 May 1797; d. Philadelphia, Pa., 22 Jan. 1851. He became professor of moral philosophy and belles-lettres at Middletown Academy, Conn. (1825); in 1828–30 was editor of the 'American Spectator,' Washington. In 1845 he went to California, and in Monterey established the first newspaper of the State, called the Californian. He wrote several books of interest, including 'Visit to Athens and Constantinople' (1836), and 'Three Years in California' (1850); 'The Sea and Sailor' (1851).

Colts'foot (*Tussilago farfara*), a herb of the thistle family (*Compositæ*). The name is derived from the shape of the leaf. The bell-shaped blossom is bright yellow. The plant is naturalized from Europe, and is found in moist soil and waste places from Nova Scotia through northern New England and New York to Minnesota. The leaves have been used, either as an infusion or smoked, as a cure for asthma. Sweet coltsfoot is a common name in America for several species of the genus *Petasites* of the *Compositæ*.

Coluber, kŏl'ū-bẽr. See Colubridæ.

Colubridæ, kō-lū'brĭ-dē, a family of snakes, typified by the limited genus *Coluber* of Linnæus, and itself typical of the sub-order or super-family *Colubroidea* or *Colubrina*. As used

by Cope the family contains non-venomous snakes only, but under Boulenger's system it embraces both the *Opisthoglypha* and *Proteroglypha*, which include the majority of poisonous snakes, especially those of the Old World, all, indeed, except the vipers and pit-vipers (qq.v.). Even in the limited sense, a vast majority of snakes, not less than 1,000 species, fall within the family. All are of relatively small size, only a few giants attaining a length of 10 feet and all have continuous rows of small teeth in both jaws, and none enlarged to serve as poison fangs. The head scales are large non-imbricate plates, but the body scales usually overlap, tile-like. They are oviparous or ovoviviparous, and feed on insects, small mammals, birds, etc., though a few, as the king-snake, habitually devour poisonous serpents. Most of them are terrestrial, but some are aquatic and others arboreal. Nearly cosmopolitan in their distribution, but very sensitive to the influence of cold, they are absent from the polar regions, and in temperate climes hibernate during the winter. Many species are found in North America. (See BLACKSNAKE; CORNSNAKE; GARTERSNAKE; PINESNAKE; WATERSNAKE; etc.) Consult: Cope, 'Scaled Reptiles of North America'; Boulenger, 'Catalogue of Snakes of the British Museum,' where full references will be found.

Col'ugo, kō-loo'gō, **Cobego,** kō-bā'gō, or **Kaguan,** kä'gwän, an East Indian insectivore of the typical genus of the family *Galeopithecidæ*, as yet imperfectly known. It is a slender creature about 18 inches long, its body covered with peculiarly sleek fur, and provided with a parachute of membrane furred on both sides, and extending from the neck nearly to the tip of the tail, by which it is enabled to make long sailing leaps like a flying-squirrel, a feature which gives it its technical name, *Galeopithicus volitans*. Like the bat, which the colugo resembles in various actions, it is a creature of twilight, hanging suspended by its hind legs, from branches during the glare of day, and seldom venturing forth in the complete darkness of night. It feeds upon leaves, fruit, and insects. Consult: Moseley, 'Notes by a Naturalist on H. M. S. Challenger'; Wallace, 'Malay Archipelago.'

Columba, kō-lŭm'ba, **Saint,** apostle of the Northern Picts of Caledonia and founder of numerous monasteries in the Hebrides and the Scottish mainland: b. 7 Dec. 521 in the territory of the Kinel-Conal, modern Donegal. He was a scion of the illustrious race of Conal, and was thus of kin to the northern princes of Ireland and of the Gælic princes of Scotland. Whether his name, or surname, Columba, is Latin or a Latin modification of a Gælic name cannot be determined; it appears also in the form Colm (whence the name Malcolm, servant or devotee of Columba); and the saint is also known as Columkillé (Columba of the churches, or *cellae*, the c in Gælic being equal to k), because of the great number of churches and monasteries he founded both in Ireland and in Scotland and the isles. He became a monk in his youth in the monastery of Moville in Donegal, and at the age of 30 was a priest. Among the monastic establishments founded by him in Ireland are those of Daire-Calgaich (Calgach's oak grove), the site of the famous city of Derry or Londonderry; and Dair-mach (oak of the plain) where now is Darrow. This was the greatest of all his Irish monasteries. It is worthy of note that after his migration to Scotland, he and his immediate successors in Iona exercised jurisdiction over these Irish monasteries. About the year 563, being then under excommunication for the part he had taken in the bloody battle of Cooldrevny, he set sail for North Britain with a band of his monks to preach the Christian religion to the still pagan Picts of northern Caledonia. He was entertained hospitably by his kinsman, Conal, king of the Scots in Argyll (Airer-Gædhill, land of the Gæl) who gave him for his residence the island in the Hebrides later called I, or Iona and I-Columkillé. Having established in Iona a monastery and training-school of missionaries, he crossed over to the country of the northern Picts — the southern Picts had already been converted to Christianity — and to them preached the gospel with such effect that their king Brude and the whole people embraced the faith. Before Columba's death all northern Caledonia was Christian and monasteries were very numerous whether on the mainland or in the islands. Iona was the mother house, and thence Columba and his successors, abbots of Iona, governed not only the monastic houses but the churches also; and though there were bishops for the special functions of the episcopate — the ordering of priests, for example, the administering of confirmation, the consecrating of churches, and the like — those bishops were subject to the authority of the abbot of Iona, though he was never more than a presbyter in ecclesiastical order. What time was at his disposal amid the many cares of his station, Columba devoted to study and to transcription of the Scriptures. On 8 June 597 he was employed in this labor, transcribing the psalm Benedicamus Domino (the 33d in the Septuagint and the Vulgate, but the 34th in the authorized English version); after penning the words "Inquirentes autem Dominum non minuentur omni bono" — they who seek the Lord shall want no manner of thing that is good. "Here," he said, "I must stop; what follows let Baithen write," and laid down the pen. At the midnight hour he was in choir for the office of Matins, having come to the church unaided and knelt at the altar; through sleep he in a few moments passed to death.

Columba, or **Columbà Noachi,** nō-ā'kī (Lat. "Noah's dove"), a small constellation of stars south of Lepus and Canis Major, about the time of whose discovery there are different statements. It is generally believed that it was discovered by Royer in 1679 or 1680. This is easily disproved by the fact, seldom noted, that Bayer in his 'Uranometria,' published in 1603, on the 37th map, just below Canis Major, pictures the dove flying with the olive-branch in its mouth. Dr. Gould states that it was mentioned by Petrus Plancius, an eminent Dutch geographer and teacher of Petrus Theodori. The latter died in 1596. The constellation is known to-day by the simple name of Columba, and is situated between Puppis, Pictor, Cælum, Lepus, and Canis Major.

Columbæ, kō-lŭm'bē, an order of birds, also when somewhat extended, called *Pullastræ*, placed next to the *Gallinæ* near the summit of the series of schizognathous birds. It contains

the various kinds of doves and pigeons. The order is not clearly circumscribed, but all typical forms may be distinguished from the *Gallinæ*, with which they have most in common, by the tumid membrane or cere into which the nostrils open at the base of the beak, and by their feet. Their toes are four, namely, three before and one behind, the former not or very slightly united toward their base by a membrane; the hallux is well developed and on the same level as the other toes. The species are monogamous, and pair for life; lay generally but two eggs for a brood, but breed often, and feed their young with macerated food from their own crops. The young at birth are helpless and naked. Upward of 500 species of pigeons have been described from all parts of the world, including many strange forms. Three sub-orders, the *Didi, Pterocletes,* and *Peristeræ* are recognized. The first includes only the extinct dodo, family *Dididæ;* the second the *Pteroclidæ,* or sand-grouse, so called, of Asia and Africa; the third the families *Didunculidæ,* or tooth-billed pigeon, of the Samoan Islands; *Tieronidæ,* or fruit-eating tree-pigeons of the Australian and Malayan regions; *Calœnadidæ,* or bony-gizzard pigeon of the Indian Archipelago; *Gouridæ,* or crowned pigeons of New Guinea; and finally the *Columbidæ* or true pigeons and doves, cosmopolitan group, and the only family represented in North America. Consult: Salvadori, 'Catalogue of Pigeons of the British Museum.'

Columbanus, kŏl-ŭm-bā'nŭs, missionary and founder of a monastic order, that of the Columban monks, was born in Ireland about 545; died in his monastery of Bobbio, in the Apennines, Italy, 21 Nov. 615. The order founded by him, was for a while hardly inferior to the order of St. Benedict in number of monasteries or in the services it rendered to the Church. He was an alumnus of the great monastery of Benchor or Bangor, in Ulster, and thence in his 45th year he went to France as a missioner, accompanied by 12 young disciples. In France he founded the monasteries of Luxeuil and Fontenay, giving to the monks a rule identical with that of the Celtic monasteries of Ireland. He gave offense to the French bishops by the fashion of his tonsure and by his observance of Easter in accordance with the calculation of the eastern churches. And his apostolic outspokenness in rebuking the vices of the Burgundian court, the king (Thierry II.) and the queen mother (Brunchant) led to his expulsion from that country. He now decided to cross the Alps and labor as a missionary in Italy. On his route thither he tarried a while among the Swiss, preaching the gospel on the shore of Lake Constance. One of his 12 companions, named Gallus, falling sick, was left behind when the missionary party resumed their travel: this Gallus afterward laid the foundations in Switzerland of a monastic institute which later was called by his name, St. Gall (Sankt Gallen) and which was one of the notable centres of monasticism in Europe. Columbanus, in 612, founded the great monastery of Bobbio in the Apennines, giving to the monks of that house, which soon was recognized as the mother-house of a multitude of abbeys and monasteries, a rule of great austerity. The keynote of it is implicit, unquestioning obedience in all things to the abbot or superior. It prescribes perpetual silence save where speech is absolutely necessary. The use of animal food of all sorts is interdicted. The monks are allowed one meal daily, taken at eventide, and it consists of vegetables and bread. The monks of his monasteries, called Columbans, came under the Benedictine rule in the 8th century and the Columban order was merged in the Benedictine. Columbanus was a man of learning, acquainted not only with the Latin language current in his time, but with the classic Latin authors, as also with the Hebrew and Greek languages. He left a few writings, all in Latin; they have all been published more than once. They comprise his Monastic Rule (Regula Cœnobialis); a few poems of considerable merit; 16 brief sermons, and several letters of value for ecclesiastical history. A town in Lombardy, San Colombiano, perpetuates the memory of this Celtic missionary to Italy.

Colum'bia, the popular name of the United States; derived from Columbus, and applied to the greatest nation of the New World from a feeling of poetic justice to the memory of its great discoverer.

Columbia, British. See BRITISH COLUMBIA.

Columbia, District of. See DISTRICT OF COLUMBIA.

Columbia, Mo., a city and county-seat of Boone County, situated 10 miles north of the Missouri River, on the Wabash R.R. It was first settled in 1815 by Kentuckians and is governed by a mayor and a council of eight members, who are elected semi-annually. The city has four banks with a combined capital of $370,000. Columbia has many public and educational institutions, including Missouri University, Missouri State Farm and Experiment Station, Parker Memorial Hospital, Stephens Baptist College for Women, Christian College for Women, Columbia Normal Academy, Columbia Business College, University Military Academy, and High School. Pop. (1904) 6,000.

Columbia, Pa., borough, in Lancaster County; on the Susquehanna River, and on the Pennsylvania and the Philadelphia & Reading R.R.'s; about 26 miles southeast of Harrisburg. The place, originally called Wright's Ferry, was founded in 1726 by Quakers from Chester County. Columbia was one of the places proposed, in 1789, for the capital of the United States. The bridge, which connected Columbia with Wrightville, was burned in 1863, to prevent the Confederate forces from proceeding to Philadelphia. A fine bridge has taken the place of the old one. Columbia is an industrial and trade centre of considerable importance. The chief manufactures are foundry and machine-shop products, boilers and engines, flour, beer, wagons, shirts, silk, lace, and lumber. Pop. (1890) 10,199; (1900) 12,316.

Columbia, S. C., the State capital, and county-seat of Richland County, situated in the centre of the State, on the east bank of the Congaree River, at the head of navigation, two miles below the junction of the Broad and Saluda. It is on the Atlantic Coast Line, the Seaboard Air Line, the Southern, and the Columbia, N. & L. R.R.'s, 129 miles northwest

of Charleston, 82 miles northeast of Augusta, Ga., and 153 miles north of Savannah.

Columbia is one of the handsomest cities of its size in the country, and in a district noted for sanitariums. It is built on a sand-hill plateau which forms a bluff 100 feet high at the river, and sloping away on all sides, giving excellent drainage. The streets which are 100 feet wide are at right angles to each other, and there are four avenues 150 feet wide radiating from the capitol. All the chief streets are boulevards, with handsome shade-trees not only along the sides but in the centre. There is also a fine park. The business buildings are rapidly increasing in size and architectural beauty. The granite State-house, costing $4,000,000 and modeled on the capitol at Washington, is one of the most imposing in the South and one of the handsomest in the country. Spacious grounds surround the capitol, and among the city's attractions are the monuments, which include a "Palmetto Tree" in bronze. The executive mansion, the government building, the county court-house, the city hall, the State insane asylum and State penitentiary are also noteworthy. The city is rich for its size in important educational institutions: South Carolina College, founded 1801; the Presbyterian Theological Seminary, also very old; Columbia Female College (Methodist Episcopal Church South), founded 1859; Allen University (African Methodist Episcopal), 1881; the College for Women (Presbyterian) 1890; and Benedict College (colored). It has also a well-attended public-school system, and two high schools.

Municipal Conditions.— The principal streets are asphalt; the roads are chiefly of sand and clay and are excellent. The city owns its waterworks, and has gas, electric light and power, and an electric railway system. The government is by the revised charter of 1894, with a two-years' mayor, and a council which has nearly all the appointing power.

Business Interests.— The city affords one of the most remarkable instances of manufacturing development in the country. It is in the heart of a fertile cotton district, and near forests of pine, oak, walnut, and maple; but its site is the key to an important future. A rocky shelf projecting for four miles from the junction of the Broad and Saluda forms the bed of the Congaree, 500 feet wide, which plunges down it in rapids, affording immense power, which is made available by a canal 2⅞ miles long, 110 feet wide at bottom and 150 at top, with 31 feet fall, furnishing 14,000 horse-power, and operating dynamos which create electricity for manufacturing power, light, and street railways. But the greatest establishments are independent of this except as a resource, using steam dynamos, — for all Columbia's industries are run by electricity. In 1892, there was one cotton mill in the city employing 125 men. Now the great Whaley system of cotton mills includes four in Columbia, with 197,000 spindles, 4,840 looms, and $3,100,000 invested capital. The Olympia mill, with nine to ten acres of floor space, and over 100,000 spindles, is the largest in the world operating under one roof; the Granby and Richland are also large and well-equipped mills; and the three, owned by one company and employing almost 3,000 hands, are the nucleus of a large village of 500 acres owned by the company, with sewerage, fire department, electric street lighting, cottages wired and plumbed, churches, schools, etc. The Columbia Mills Company is also a great organization, capitalized at $1,500,000, and turning out over 20,000 bales of cotton duck a year. Besides this predominant industry, there are growing hosiery works, glass works which utilize the fine sand found nearby, four quarries of fine granite, large lumber works starting up, and small miscellaneous industries. The vast beds of kaolin in the vicinity now supply outside potteries, but local works are contemplated. The rock ledge before mentioned extends two miles below the city with only four feet of water over it, dropping off to ten feet or more at Granby. Deep water is now to be brought up to Columbia, not by dredging, but by a floating dam 15 feet high, costing $250,000, which will enable vessels of ten feet draft to come up to the city, instead of unloading and trucking up from Granby as heretofore. Two steel steamers run from Granby to Georgetown, which will start from Columbia when the dam is completed, and ultimately go to Charleston. This improvement makes Columbia the great distributing point for central and northern South Carolina.

History.— The town was settled about 1700, but remained farm land till 1786, when the people of the State demanded a capital more centrally located than Charleston, and Columbia village was laid out. The legislature first met there in 1790. In the Civil War it shared the general fortunes of the State, till Sherman's army entered it 17 Feb. 1865. The following night a fire broke out which lasted all the next day and laid over half the city in ashes, including a number of business blocks, private residences, schools, the railroad station, several churches, and a convent, and destroyed a great quantity of cotton. Its development since is part of the general industrial awakening of the South. Pop. (1860) 8,052; (1870), 9,298; (1880) 10,036; (1890) 15,353; (1900) 21,108, of which 11,244 were white. Several mill villages, chiefly that of the Whaley mills, with several thousand inhabitants, are outside the old city limits though close by, and 35,000 is a reasonable estimate of the population including these suburbs.

Columbia, Tenn., county-seat of Maury County, situated on the Duck River, and on the Louisville & N. and the Nashville, C. & St. L. R.R.'s. It is the trade centre of a fertile agricultural region, and has a stock yard, a grain elevator, and cotton and flouring mills. It is the seat of Jackson College and two seminaries for young women. It also has a United States arsenal. Pop. (1900) 6,052.

Columbia City, Ind., the county-seat of Whitley County, in the northeastern part of the State, situated on Blue Creek and on the Wabash and on the Pittsburg, Ft. W. & Ch. R.R.'s. It has lumber mills and a few other manufacturing interests. Pop. (1900) 2,975.

Columbia or **Oregon River,** after the Yukon the largest river on the western side of America; it rises in British Columbia, on the west slope of the Rocky Mountains, near Mounts Brown and Hooker, in about lat. 50° N.; has a very irregular course, generally southwest through Washington; forms the northern boundary of Oregon for about 350 miles; and enters

the Pacific by an estuary 35 miles long and from three to seven wide. Its estimated length is 1,400 miles. The area drained by this stream and its tributaries, of which the largest are Clarke's Fork and the Snake River (with very remarkable cañons), has been computed at 298,000 square miles. The river is broken by falls and rapids into separate portions, and formerly a bar across its mouth obstructed navigation. The construction of a jetty has provided a good harbor; and in Nov. 1896 the Government completed a canal and locks at the Cascades, at an expense of nearly $4,000,000, and navigation is (1904) open to The Dalles. The Government is about to begin work to overcome the obstructions at The Dalles. The Columbia and its branches have 2,132 miles of navigable waters. The extraordinarily abundant salmon-fisheries have been largely developed. There are a number of canneries near the mouth of the river; the annual export of canned salmon exceeds 500,000 cans. Captain Gray of Boston was the first modern navigator to enter the river in 1792; and it was explored in 1894 by Lewis and Clarke.

Columbia Salmon. See QUINNAT.

Columbia University, a seat of learning in New York. The design of establishing a college in New York was more than 50 years in contemplation before it was carried into effect. In 1746 provision was made by law for raising money by public lotteries. Five years later the proceeds of these lotteries amounted to about $1,700 and were given to trustees. The fact that two thirds of these trustees were in communion with the Church of England, and that some of them were vestrymen of Trinity Church excited opposition to the proposal as a scheme to strengthen the Established Church and delayed the procurement of a royal charter. Friends of the enterprise proceeded, however, with the arrangement for opening the college and elected for their first president the Rev. Dr. Samuel Johnson, of Stratford, Conn., who assumed the office 17 July 1754, in the school house belonging to Trinity Church. There was a class of eight students.

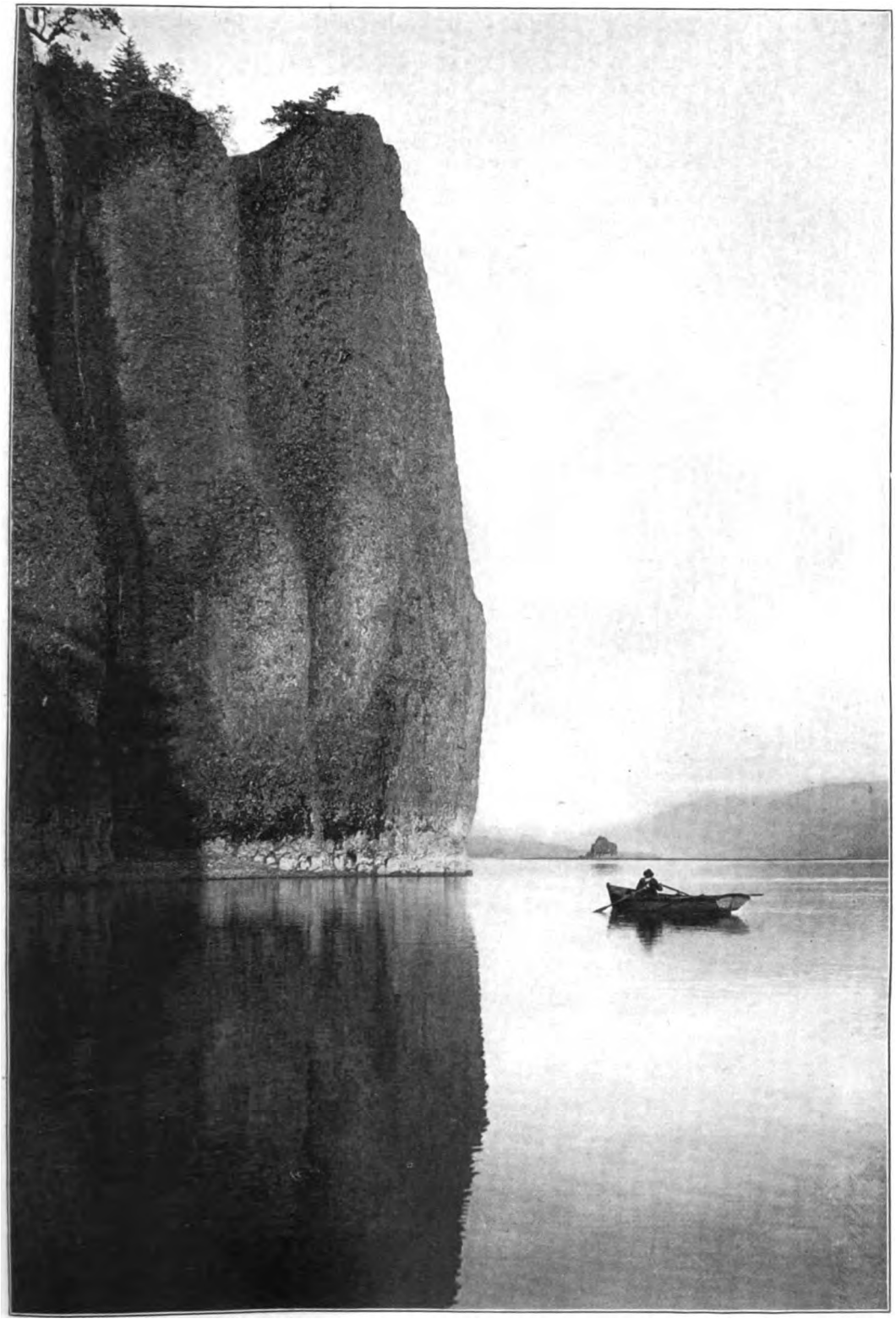
The cosmopolitan character of the governing body of the college is due to its charter. To meet the objections that had been made, it was so drawn as to include in its board of governors, besides other ex-officio representatives, not only the rector of Trinity Church, but the senior minister of the Reformed Protestant Dutch, Ancient Lutheran, French, and Presbyterian churches. It is probably due to this circumstance that Columbia almost alone of all the pre-Revolutionary colleges in the United States has never had a theological faculty connected with it. The trustees, at present, are members of the Episcopal Church, and also of the Reformed, Presbyterian, and Roman Catholic churches, showing that this cosmopolitan character has never been lost. A prominent Hebrew rabbi was at one time a member of its councils.

The charter of King's College, the original name of Columbia, was granted by George II., and finally passed the seals on 31 Oct. 1754, from which day the college dates its existence. It received from Trinity Church, according to a promise previously given, a portion of a grant of land known as "the King's Farm," upon the site of which its first building was erected. It was stipulated in the royal charter that its president should be a communicant of the Episcopal Church and that proper selections from the liturgy of that Church should be used in the religious services of the college. This caused much angry controversy, and after the Revolution it was stricken out of the charter, but remains as the condition of the deed of gift from Trinity Church. King's College played a conspicuous part in securing and confirming the independence of the United States. The Revolutionary War caused a suspension of the activities of the college, and in 1776 the college building was used as a military hospital. After eight years the college work was resumed by act of the legislature, 1 May 1784, under the name of Columbia College.

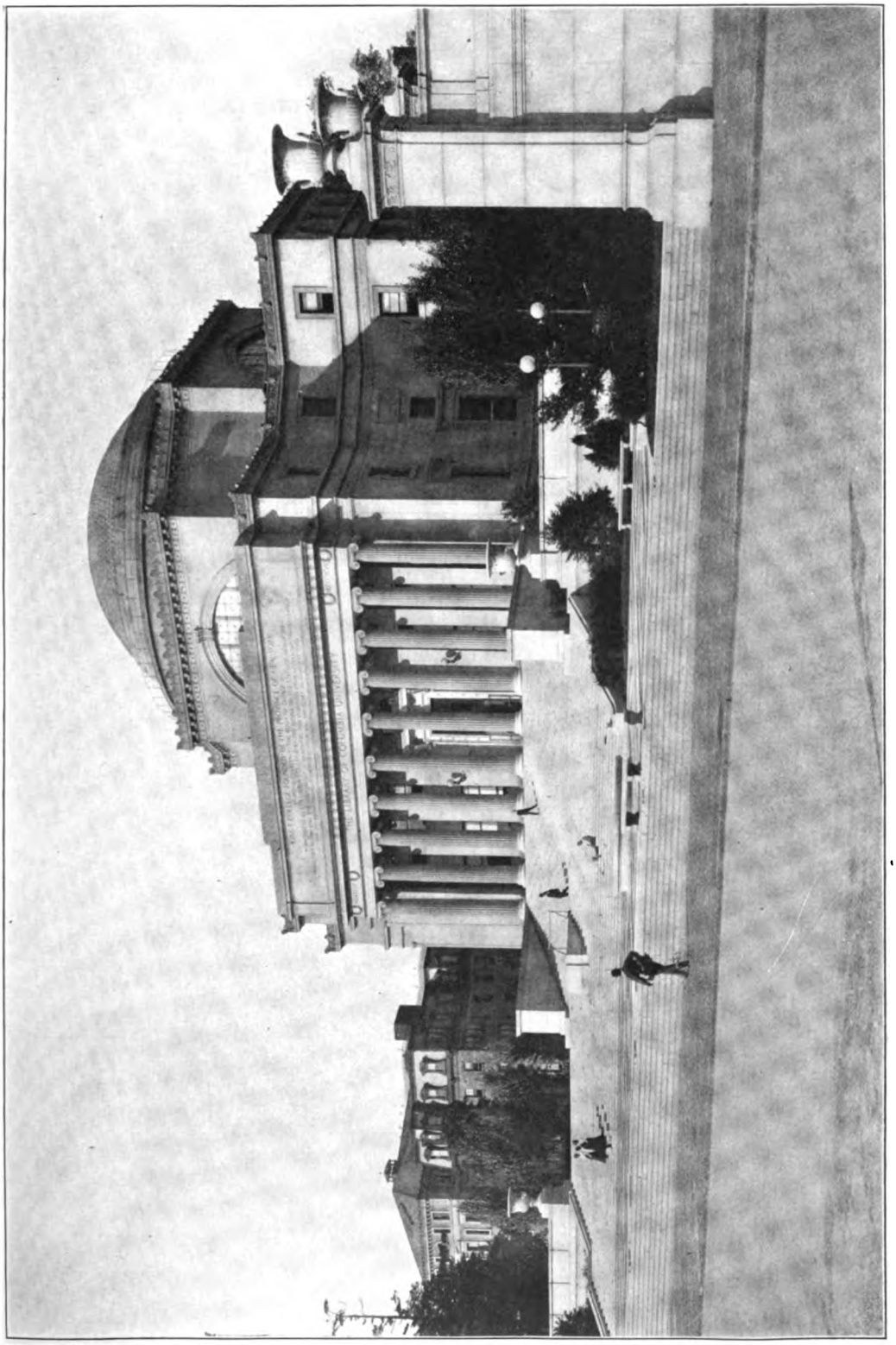
On 13 April 1787 the legislature revived the original charter with amendments, which abolished ex-officio membership of its governing body, canceled the requirement that the president should hold a certain form of religious belief or that a certain form of prayer should be used in the services of the college, and named a body of 29 trustees, which, when reduced to 24 members, was made a self-perpetuating body, under which government the college has remained. The medical faculty was organized in 1792 and a professorship of law was established in 1793.

The original site of the college was in what became later the block bounded by College Place, Barclay, Church, and Murray streets. In 1857 the college was moved to 49th and 50th streets and Madison Avenue, where it remained until 1897. In 1892, for $2,000,000, purchase was made of 17½ acres of land lying between 116th and 120th streets, Amsterdam Avenue, and the boulevard. Here in 1897 the college was reorganized on the basis of a university.

Columbia University, in a technical sense, consists of the faculty of law, the first professor of which (1792), James Kent, during the period of his second appointment in 1823 delivered the courses of lectures which developed into the first two volumes of his famous 'Commentaries'; the faculties of medicine; philosophy, political science; pure science; and applied science. The College of Physicians and Surgeons, the outcome of the medical faculty, established in King's College in 1767, became in June 1860, the Medical College of Columbia. In 1891 it surrendered its separate charter and became an integral part of Columbia College. A peculiarity of the Columbia organization is the system by which seniors in Columbia College, who have entered the college not later than the beginning of the junior year, are allowed to select part or all of the courses necessary for the bachelor's degree from among those designated by the university faculties, professional or non-professional, as open to them. The object of this arrangement is to shorten the time necessary to the attainment of the higher, particularly of the professional, degrees. The degree of master of laws is conferred for advanced work in law done under the faculties of law and political science together. The faculties of law, medicine, and applied science, conduct respectively the schools of law, medicine, and mines, chemistry, engineering, and architecture, to which



CAPE HORN.



LIBRARY BUILDING.

students are admitted as candidates for professional degrees on terms prescribed by the faculties concerned. The school of mines was due to the exertions of Thomas Egleston, who was made professor of mineralogy and metallurgy in 1864, and who opened the school of mines the same year in the basement of the old college building in 49th Street. There is also the school of chemistry, engineering, and architecture, set off from the school of mines in 1896. Out of the school of mines grew the school of pure science, established in 1892. Under President Barnard's influence, in April 1889, the trustees gave their official approval to the plan for founding Barnard College for women studying for Columbia degrees. It is financially a separate corporation, but educationally it is part of the system of the university. Teachers' College, a professional school for teachers, is also financially a separate corporation and educationally a part of the university. It was founded in 1888, chartered in 1889, and included in the university in 1898. (See COLLEGES FOR TEACHERS.) Some of these courses are accepted by Columbia University, and may be taken without extra charge, by students of the university in partial fulfillment of the requirements for the degrees of bachelor of arts, master of arts, and doctor of philosophy. In 1902–3 the university had a total of 5,134 students in all departments, and its library comprised 330,000 bound volumes. The new library building is a gift from ex-President Low, and cost over $1,000,000; in 1903 the university received a gift of $300,000 from Marcellus Hartley Dodge and Mrs. Helen Hartley Jenkins for the erection of a new dormitory. In the same year the trustees voted to purchase the South Field, a tract of land lying directly south of the university campus.

The presidents of the university have been: Samuel Johnson (1754–63); Myles Cooper (1763–75); the Rev. Benjamin Moore (1775–6); William S. Johnson (1787–1800); Charles H. Wharton (1801); the Rt. Rev. Benjamin M. Moore (1801–11); William Harris (1811–29); William A. Duer (1829–42); Nathaniel Moore (1842–9); Charles King (1849–64); Frederick A. P. Barnard (1864–89); Henry Drisler, acting (1888–90); Seth Low (1890–1901); and Nicholas Murray Butler (inaugurated 1902).

SETH LOW,
Ex-President Columbia University.

Columbiad, a poem by Joel Barlow (q.v.) published in 1807. It is an enlarged edition of his 'Vision of Columbus' (1787), and was very popular when first published.

Columbian Catholic Summer School. See SUMMER SCHOOLS.

Columbian Formation, a series of gravels, sands, and clays of Pleistocene age covering the coastal plain of the Atlantic slope from New Jersey southward, and typically developed in the District of Columbia. The formation in the north covers the plain up to elevations of 400 feet, and in the south up to 100 feet. It includes estuarine and delta deposits, and the fossils are recent marine species, indicating a submergence and re-elevation of the coast. The formation may correspond to the Champlain stage of the glaciated portion of the continent. See CHAMPLAIN STAGE; GLACIAL PERIOD.

Columbian World's Fair. See WORLD'S COLUMBIAN EXPOSITION.

Columbian University, a coeducational institution in Washington, D. C., organized in 1821 under the auspices of the Baptist Church. For several years it was Columbian College, but in 1873 it enlarged its courses of study and became a university. During the Civil War the buildings were used, for a time, as a hospital. Mr. W. W. Corcoran gave a generous gift to the school which has been used to endow the «Corcoran Scientific School.» Professors and instructors in the university (1903) 175; pupils, 1,400; volumes in the library, 15,000; grounds and buildings valued at $1,200,000.

Columbidæ, kō-lŭm'bĭ-dē, the family of true pigeons, the typical one of the order *Columbæ,* of which it embraces the bulk of the known species, more than 400 belonging to this family. Over half of them are found in the Malayan and Austro-Malayan Archipelago, and 75 in South and Central America, while all other parts of the world, except the polar regions, have their representative species in smaller numbers. Although our native species give but a faint idea of the richness of color and other peculiarities of adornment of the tropical pigeons, the structural features are remarkably constant and well exemplified in the domestic pigeon. The bill is moderate and compressed, having at its base a soft skin in which the nostrils are placed. The feet have three divided toes before and one behind, all of which are on the same level; the tarsi scutellate. The wings are rather long and exceptionally powerful; the plumage generally compact, and the feathers without aftershafts. One of the most variable features is the tail, which may be short and square or long and pointed, and its rectrices from 12 to 16. Although classed by Cuvier with the gallinaceous birds, the *Columbidæ* differ from them in structure and especially in habits, being monogamous and good flyers. Besides they are unlike the domestic fowl which is the type of the *Gallinæ,* in that the males assist in nest-building and incubation, and the young are not able to walk, and are nourished by the parent birds, which secrete in the double crop a milky fluid utilized to soften their food. Moreover the *Columbidæ* drink at a single draught. They eat seeds and berries, more rarely insects. See DOVE; PASSENGER PIGEON; PIGEON; etc.

Col'umbine, a popular name for *Aquilegia vulgaris* or other species of the genus *Aquilegia.* The common columbine has drooping purplish-blue flowers with five flat sepals; five petals, with long spurs, often curved; five follicles, the root-leaves twice or thrice ternate, the others singly ternate. The claim of the columbine to become the national flower of the United States has been pressed since 1896 by the Columbine Association with offices in Boston. This association urges that the flower is wild and commonly diffused, that it has decorative value, that its common name symbolizes the dove of peace and suggests Columbus, the discoverer; that its Latin name hints at the eagle of power, that the form of the short-spurred variety is strikingly like the Liberty Cap, and that its compound leaf exemplifies the Federal motto *E pluribus unum.*

Colum'bite, a mineral of variable composition, consisting of a compound niobate (columbate) and tantalate of iron and manganese. When niobium is present in large amount relatively to the tantalum, the mineral is called "columbite," and when the reverse is the case, it is called "tantalite"; the two minerals passing into each other, in nature, by insensible gradations. Typical columbite has a hardness of 6, and a specific gravity of from 5.4 to 5.8, the specific gravity increasing with the proportion of tantalum present. The crystals are short and prismatic, often tabular, and belong to the orthorhombic system. The mineral is black or brownish-black in color, and is often iridescent. In the United States columbite is known to occur in most of the States lying near the Appalachian Mountain system, and also in Colorado, South Dakota, and California. One crystalline mass of it, found in the Black Hills region, is said to have weighed about a ton. The existence of columbite in the United States was first made known through a specimen sent by Gov. Winthrop of Connecticut to Sir Hans Sloane, president of the Royal Society of Great Britain.

Colum'bium, a metallic element, better known as niobium (q.v.).

Columbo, the root of a climbing plant, *Jateorrhiza Columbo,* which grows in great profusion in the island of Mozambique. It is also called calumba. The root, sliced transversely into disks, is dried and is used in medicine in the form of an infusion as an appetizer and tonic. It contains a bitter alkaloid *berberine,* and another bitter principle *columbin.* It is free from tannic acid, so, unlike most bitters, it may be mixed with the preparations of iron. It was formerly employed for diarrhœa, dysentery, and gas in the bowels, being carried to India, whence it is exported.

Columbus, Bartholomew (Sp. Bartolomeo Colon; It. Bartolommeo Colombo, his real name), Italian navigator, brother of Christopher Columbus: b. Genoa about 1432; d. San Domingo May 1515. The events of his early years are not on record. In 1470 we find him established at Lisbon as a mariner and constructor of maps — one of those adventurous navigators whom the patronage of the Portuguese princes had drawn to their capital. About 1486 he visited the Cape of Good Hope, probably with Barthelemi Diaz. It is not know how long he was absent when his brother sent him to England to seek the aid of Henry VII., but it appears certain that Christopher was ignorant of his fate, further than that he was captured by pirates. He did, however, attain the ear of the English monarch, and presented him with a map of the world, but it does not appear that he succeeded in securing English aid. On his return through France, he learned that his brother had already discovered the new world, and had sailed on a second voyage. Hastening to the Spanish court, he was received as became the brother of the admiral. Queen Isabella sent him in command of three store ships to the new colony of Hispaniola, where Christopher received him with joy, and appointed him adelantado or lieutenant-governor of the Indies. In this position Bartolommeo showed great bravery and decision. He shared his brother's imprisonment, and with him was liberated on reaching Spain, where the Spanish monarchs confirmed his title, and gave him the lordship of the small island of Mona near St. Domingo, with 200 Indians as his personal body-guard. The fierce energy of his character, however, made them jealous of giving him too much latitude in public affairs. He died without issue.

Columbus, Christopher (Sp. Christobal Colon; It. Cristoforo Colombo, his real name), Italian navigator, the discoverer of America: b. Genoa probably 1446; d. Valladolid, Spain, 20 or 21 May 1506. His father, Domenico Colombo, a poor wool-comber, gave him a careful education. He soon evinced a strong passion for geographical knowledge, and an irresistible inclination for the sea. The details of his early life are confused and unsatisfactory. He appears to have gone to sea at an early age, and to have navigated all parts of the Mediterranean and some of the coasts beyond the Strait of Gibraltar. In 1470 we find him at Lisbon, where he married the daughter of Bartolommeo de Palestrello, a distinguished navigator, who had founded a colony in Porto Santo, an island recently discovered and belonging to the Madeira group, and had left many charts and nautical instruments. Columbus made use of these materials, and his opinion that the other side of the globe contained land, belonging to eastern Asia and connected with India, which was, as yet, little known, became more and more fixed. While the Portuguese were seeking to reach India by a southeast course round Africa, he was convinced that there must be a shorter way by the west. He applied in vain to Genoa for assistance, and equally fruitless were his endeavors to interest John II. of Portugal in the enterprise. He also sent letters on the subject to Henry VII. of England, with the same ill success. He then determined to apply to the Spanish court, Ferdinand and Isabella being at this time the sovereigns of Spain, and after an eight years' struggle with the obstacles thrown in his way by ignorance and malice, he received three small vessels. These were named the Pinta, the Niña, and the Santa Maria; and according to Jal each of them was fully decked and had four masts and a crew of 90 men. The dignity of high-admiral and viceroy of all the countries he might discover was conferred on him, the former to be hereditary in his family. A certain share of the profits was secured to him by a written contract with the sovereigns.

It was early in the morning of Friday, on 3 Aug. 1492, that Columbus set sail from the port of Palos. Eighteen years had elapsed since he had first conceived the idea of this enterprise. The most of that time had been passed in almost hopeless solicitation, amidst poverty, neglect, and ridicule; the prime of his life wasted in the struggle. Nor should it be forgotten that it was to Isabella alone that he was finally indebted for the means of executing his project, which had been coldly rejected by the prudent Ferdinand. Having provided himself at the Canary Islands with fresh water, he sailed southwest into an ocean never before navigated. But when 21 days had elapsed without the sight of any land, the courage of his men began to sink. It was certain, they said, that they should perish, and their visionary commander ought to be forced to return. Some of them even proposed to throw him overboard; and Columbus had to exert all the powers of his daring and

commanding spirit to prevent an open rebellion. A phenomenon, which surprised even him, filled his pilots with consternation: the needle deviated a whole degree. But the sea appeared suddenly covered with grass, and again showed symptoms of shoals and rocks. Numbers of birds were also seen. Columbus sailed in the direction from which they flew. For some days the voyage was continued with revived courage, until at last the dissatisfaction of the crews began to break out into open violence; but Columbus, after endeavoring in vain to pacify his men by promises, finally assumed a different tone, and told them it was useless to murmur; that he was determined to persevere. Fully convinced that he must be near the land, he promised a reward to whosoever should first discover it. On the night of 11 and 12 October Columbus himself descried a light which sometimes flickered in the distance and sometimes disappeared, and at two o'clock on the morning of the 12th a cannon shot from the Pinta announced that a sailor belonging to that vessel had discovered land.

It was the island of Guanahani, which Columbus believed to belong to eastern Asia and to be connected with India, a belief which he carried with him to his grave. Hence the mistaken names of Indians applied to the natives of America, and that of West Indies applied to the group of islands of which Guanahani forms one. On landing Columbus threw himself upon his knees and kissed the earth, returning thanks to God. The natives collected round him in silent astonishment, and his men, ashamed of their disobedience and distrust, threw themselves at his feet, begging his forgiveness. Columbus, drawing his sword, planted the royal standard, and in the name of his sovereigns took possession of the country, which, in memory of his preservation, he called Saint Salvador. He then received the homage of his followers, as admiral and viceroy, and representative of the sovereigns. Being informed by the natives that there was a rich gold country toward the south, Columbus directed his course toward that region, and reached Cuba on 28 October, and Española (Hispaniola, Hayti), on 6 December; but as one of his vessels was wrecked, and the other separated from him, he resolved to carry the news of his success to Spain. Having built a wooden fort from the wreck of his vessel, he left in it 39 volunteers, and set out on his return, 4 Jan. 1493. The day after he left the island he met the Pinta, which had been missing. Both vessels were afterward nearly wrecked in a tremendous storm. Columbus, more interested for his discovery than for himself wrote an account of his voyage on a piece of parchment, which he secured in a cask, and threw the whole overboard, in the hope that it might be carried ashore. He had hardly finished his work when the gale subsided. On 15 March he re-entered the port of Palos amid the acclamations of the people, the thunder of cannon, and the ringing of bells. He hastened immediately to Barcelona, where the court then was, and entered the city in a triumphal procession, with the productions of the newly discovered countries carried before him. A chair was placed for him next to the throne, and, seating himself, he gave an account of his discoveries. He was created a grandee, and all the marks of royal favor were lavished upon him.

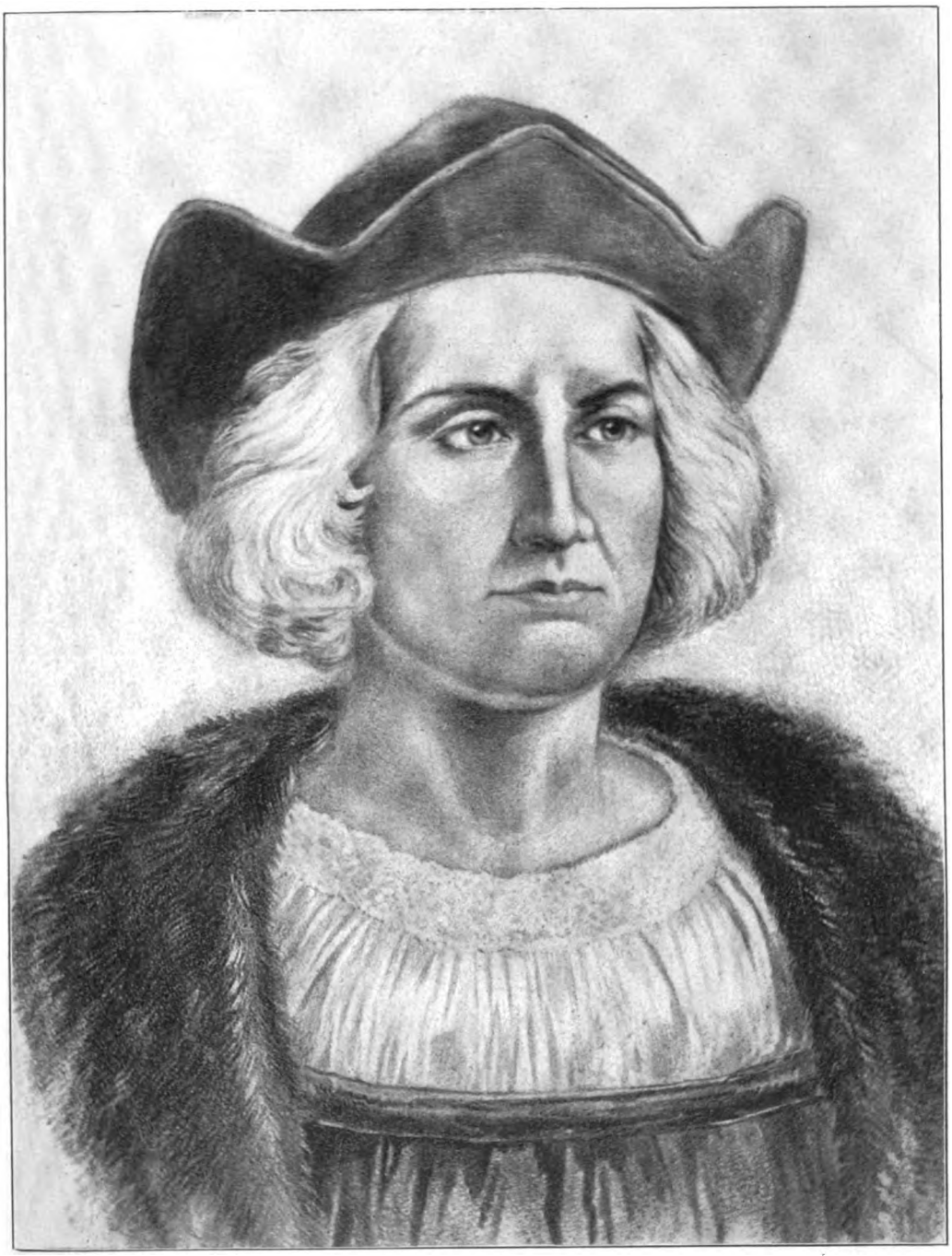
On 25 Sept. 1493, he set sail from Cadiz with 3 large ships of heavy burden and 14 caravels, carrying 1,500 men. On 3 November he discovered the island of Dominica, and afterward Mariegalante, Guadeloupe, and Porto Rico, and on the 22d arrived at Hispaniola. Finding the colony he had left destroyed, he built a fortified town, which he called, in honor of the queen, Isabella, and of which he appointed his brother Diego governor. He immediately left the island in order to make new discoveries, visited Jamaica, and returning after a voyage of five months, worn down with fatigue, found to his great joy that his brother Bartolommeo, who had escaped from his captivity, had arrived at Isabella with provisions and other supplies for the colony. Meanwhile a general dissatisfaction had broken out among his companions, who, instead of the expected treasures, had found hardships and labor. They set on foot many calumnies, and gave the most unfavorable description of the country and the viceroy. Columbus thought he could not better oppose these reports than by sending considerable treasures to his sovereigns, and for this purpose collected gold from the natives, which was not done without violence and some cruelty. Aguado, a personal enemy of Columbus, was sent as commissioner to investigate the complaints against the great discoverer, who, thinking it time to vindicate himself in the presence of his sovereigns, prepared to return to Spain. Having appointed his brother Bartolommeo adelantado or lieutenant-governor, he embarked for Spain in March 1496 with 225 Spaniards and 30 natives. In Spain calumny was silenced by his presence, and probably still more by his treasures. Yet his enemies were powerful enough to detain the supplies intended for the colony a whole year, and to retard the fitting out of a new expedition.

It was not till 30 May 1498, that he sailed with six vessels on his third voyage. To man these vessels criminals had unwisely been taken —a measure which Columbus himself had advised, and which had been taken up with great satisfaction by his enemies. Three of his vessels he sent direct to Hispaniola; with the three others he took a more southerly direction, for the purpose of discovering the mainland, which information derived from the natives induced him to suppose lay to the south of his former discoveries. He visited Trinidad and the continent of America, the coasts of Paria and Cumana, and returned to Hispaniola, convinced that he had reached a continent. His colony had been removed from Isabella, according to his orders, to the other side of the island, and a new fortress erected called St. Domingo. Columbus found the colony in a state of confusion. After having restored tranquillity by his prudent measures, in order to supply the deficiency of laborers he distributed the land and the inhabitants, subjecting the latter to the arbitrary will of their masters, and thus laying the foundation of that system of slavery which has lasted down to our time. His enemies, in the meantime, endeavored to convince his sovereigns that he had abused his power, and that his plan was to make himself independent, till at last even Isabella yielded to the wishes of Ferdinand, who had previously become convinced of the truth of the slanders. Francisco de Bobadilla was sent to Hispaniola with extensive powers to

call the viceroy to account. As soon as he reached the island he summoned Columbus to appear before him and put him in irons. His brothers were treated in the same manner. All three were sent to Spain, accompanied by a number of written charges, drawn up from the statements of the bitterest enemies of Columbus. Columbus endured this outrage with noble equanimity, and wrote, as soon as he had arrived in Cadiz, 25 Nov. 1500, to a lady of the court vindicating his conduct, and describing in eloquent and touching language the treatment he had received. The fetters with which he had been bound he kept to the day of his death, and his son Hernando states that he even ordered that they should be enclosed with him in his coffin. Orders were immediately sent directing him to be set at liberty, and inviting him to court, where his sovereigns received him with the same distinction as formerly. Isabella was moved to tears, and Columbus, overcome by his long-suppressed feelings, threw himself upon his knees, and for some time could not utter a word for the violence of his tears and sobbings. He then defended himself by a simple account of his conduct, and was re-instated to his dignities. Ferdinand even consented to dismiss Bobadilla, which was intended for the first step toward the promised restoration of the great discoverer in his dignities. But these dispositions in the monarchs were soon changed. There was much talk of great expeditions, and in the meantime Nicolas de Ovando y Lares was sent as governor to Hispaniola. Columbus still urged the fulfilment of the promises solemnly made to him; but after two years of delay he became convinced that there was no intention to do him justice.

But he had now learned to suffer, and he was principally desirous of completing his work. Supposing the continent which he had seen to be Asia, he did not doubt that he should find, through the Isthmus of Darien, a way to the East Indies, from which the first fleet of the Portuguese had just returned richly laden. In four slender vessels supplied by the court for this purpose Columbus sailed from Cadiz on his fourth and last voyage 9 May 1502, with his brother Bartolommeo and his son Hernando; arrived contrary to his original intention off St. Domingo 29 June, and was denied permission to enter the port for the purpose of refitting his vessels, and escaping an approaching storm. He succeeded, however, in anchoring his small squadron in a place of safety, and rode out the storm, while a fleet of 18 vessels, which had put to sea in spite of his warning, was almost entirely destroyed. He then continued his voyage to Darien, but without finding the expected passage. Two of his vessels were destroyed by a gale; the two others were wrecked off Jamaica, where he was scarcely able to save himself and his companions. Here the severest trials awaited the constancy of Columbus. Separated from the other part of the world, his destruction seemed to be certain. But he succeeded in procuring a few canoes from the natives, and prevailed on some of his boldest and best men to attempt a voyage to Hispaniola, in two canoes, in order to inform the governor of his situation. Several months elapsed without a glimpse of hope. Part of his companions, reduced to despair, rebelled, repeatedly threatened his life, separated from him, and settled on another part of the island. Here they alienated the minds of the natives by their cruel treatment, so much that they ceased to bring them supplies. The death of all seemed inevitable; but Columbus, whose courage rose with the danger, preserved his men in this crisis. He had ascertained that a total eclipse of the moon was about to take place, and threatened the natives with the vengeance of his God if they should persist in their enmity. As a proof of his assertion the moon, he said, would lose its light, in token of the chastisement which awaited them. When they beheld his threat verified they hastened to bring him provisions, and implore his intercession with the Deity. But hostilities now broke out between him and the rebels, in which several of the latter were killed, and their leader was taken prisoner. After remaining a year on the island, relief at last appeared. The two canoes had reached Hispaniola in safety, but the messengers could not prevail on the governor to undertake the deliverance of the admiral. They finally bought a vessel themselves, and it was on board this ship that Columbus left Jamaica 28 June 1504. He went to St. Domingo, but only to repair his vessel, and then hastened back to Spain. He arrived in Spain ill and exhausted. The death of the queen soon followed, and he urged in vain on Ferdinand the fulfilment of his contract. After two years of illness, humiliations, and despondency, Columbus died at Valladolid. His remains were transported, according to his will, to the city of St. Domingo, but on the cession of Hispaniola to the French, they were removed in January 1796 with great pomp, to the Cathedral of Havana in Cuba. A splendid monument was erected to him, in a convent at Seville, where his body lay before being transferred to St. Domingo. In 1898 his remains were again removed to Spain, Cuba being no longer a Spanish possession since the war with the United States.

In the vigor of manhood Columbus was of an engaging presence, tall, well formed, and muscular, and of an elevated and dignified demeanor. His visage was long, his nose aquiline, his eyes light gray, and apt to enkindle. His whole countenance had an air of authority. Care and trouble had turned his hair white at thirty years of age. He was moderate and simple in diet and apparel, eloquent in discourse, engaging and affable with strangers, and of great amiability and suavity in domestic life. His temper was naturally irritable, but he subdued it by the benevolence and generosity of his heart. Throughout his life he was noted for a strict attention to the offices of religion; nor did his piety consist in mere forms, but partook of that lofty and solemn enthusiasm with which his whole character was strongly tinctured. Of a great and inventive genius, a lofty and noble ambition, his conduct was characterized by the grandeur of his views and the magnanimity of his spirit. For further information respecting the life of Columbus various authorities are available to the inquirer. His son Ferdinand wrote a memoir, but the original is lost, though an early Italian version exists which has been translated into English and other languages. His own journal of his first voyage may also be read in English, both it and Major's 'Select Letters of Columbus' being published by the Hakluyt Society.



CHRISTOPHER COLUMBUS.

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Columbus, Diego, dē-ā'gō (It. Giacomo Colombojē), Italian voyager: b. Genoa about 1450; d. after 1509. He was a brother of Christopher Columbus, whom he accompanied on the second voyage to America, in 1493. He was sometimes left in command at the settlements of Isabella and Santo Domingo and returning to Spain in 1500, subsequently entered the priesthood.

Columbus, Diego (Sp. Colon, kō-lōn'): b. probably at Lisbon about 1476; d. Montalvan, near Toledo, Spain, 23 Feb. 1526. He was a son of Christopher Columbus (q.v.), and from 1492 till his father's death was a page at the Spanish court. He was confirmed admiral of the Indies and governor of Hispaniola in 1509, where he ruled with great pomp and splendor, but his opponents in the New World succeeded in curtailing his powers and he was recalled to Spain.

Columbus, Ferdinand (Sp. Ferdinando Colon, fĕr-dē-nän'dō kō-lōn'), Spanish voyager: b. Cordova, Spain, 15 Aug. 1488; d. Seville 12 July 1539. He was a son of Christopher Columbus, whom he accompanied on his father's fourth voyage 1502–4. His library of 20,000 books was bequeathed to the cathedral chapter of Seville and was known as the "Columbina." But 4,000 of these now remain and the history of the Indies by him is also lost as well as the original Spanish of his life of his father, largely drawn upon by Las Casas. This is the basis of the majority of the lives of Columbus.

Columbus, Luis, loo-ēs' (Sp. Colon), Spanish noble: b. Santo Domingo 1521 or 1522; d. Oran, Africa, 3 Feb. 1572. He was a son of Diego Columbus 2d (q.v.), and a grandson of Christopher Columbus. He was given the title of admiral of the Indies, but in 1530 was obliged to relinquish the title of viceroy, receiving in exchange the island of Jamaica, an estate 25 leagues square in Veragua, a pension of 10,000 ducats and the titles of Duke of Veragua and Marquis of Jamaica. He was captain-general of Hispaniola 1542–51. Arrested in 1559 for having three wives, he was imprisoned for three years and then banished to Africa. Felipa, his daughter married her cousin, Diego, who then became Duke of Veragua, but dying childless in 1518 the family of Columbus then became extinct in the male line. The present Duke of Veragua (b. 1837), traces his descent from Columbus through Diego, Cristoval, Diego's son, and Francesca, the daughter of Cristoval and sister of Diego Columbus, who died in 1578.

Columbus, Ga., a city and county-seat of Muscogee County, situated on the east bank of the Chattahoochee River, at the head of navigation, and on the Central of Ga., the Southern, the Seaboard A. L., and the Georgia F. & A. R.R.'s. It is also connected with Appalachicola, Fla., by three steamer lines. Columbus is in the centre of a fertile cotton and agricultural producing region, and near forests of conifers and hardwood, and deposits of coal and iron. It is also at the foot of the "Piedmont" region, where the rock ledges of the older geological formations give place to the coast plain; hence the Chattahoochee falls sharply for many miles over its rock bed to its new levels and deeper water, affording an immense head of power,— 115 feet fall, with 42,500 horse-power, at average low water, within a mile of Columbus, and 368 feet with 134,000 net horse-power within 36 miles. Three large companies (the Columbus Power Company, the Coweta Company, and the Chattahoochee Falls Company) are making this power available by a series of dams, transmitting electric power from dynamos. Two great dams nearly 1,000 feet long, developing 28,866 horse-power, are already built; and five others, one with a fall of 52 feet, and all developing over 70,000 horse-power, are announced within a year or so. The Coweta Company owns 12 miles of river front to the north. This power implies a great future extension of industries; but the cotton manufacture is already so extensive as to give the city the name of "the Lowell of the South." There are now six large mills here, operating 154,000 spindles and 4,400 looms, employing about 4,000 hands, paying nearly $1,000,000 a year in wages, and using toward 50,000 bales of cotton a year. The great Eagle and Phœnix mills were the pioneers of large manufacture; the Coweta Company has a mill of 35,000 spindles and a village (Bibb) of its own; the North Highlands mills represent an investment of $500,000, and are second in the South in equipment and arrangement. There are also two cotton compressors and ginning works, among the largest in the South; cotton-seed oil mills, etc. Next to this, and equally old, is the iron industry, with two great concerns; the Columbus Iron Works, dating from 1853, which with their department, the Southern Plow Company, cover six acres, and are to be the largest in the South; and the Goldens Foundry and Machine Company. These manufacture all kinds of agricultural implements, cotton screws and compressors, engines and boilers, etc. One of the largest syrup and sugar refining works in the South has lately been erected; there are also a large wagon factory, a barrel factory, three show-case works, grist mills, etc. The trade of the city is large; it is the distributing centre of all southwest Georgia and a considerable part of central Georgia and Alabama. There are five cotton warehouses, and the total receipts of cotton are about 165,000 bales a year.

The city has broad handsome streets, which in the original plan were intended to be boulevards with parks down the centre. Steps are being taken to carry out the design. The business streets are being paved, and 35 miles of macadam roads are completed. There is an electric street railway system, and the city is connected with its suburb, Girard, Ala., by a bridge, which is crossed by the Central R.R. of Ga. There are some fine buildings, and the number is rapidly on the increase. The $60,000 passenger station of the Central of Georgia is one; the Masonic Temple is one of the finest in

the South, and the Odd Fellows have planned an equal; the new Y. M. C. A. building, faced with the finest Georgia marble, is to be one of the most beautiful in the Southern States; and several of its 23 churches, embracing all denominations, are excellent specimens of architecture. The school system is justly famed: Columbus was the first city in the South to adopt graded schools and manual training. It has five large modern school buildings, and the system includes not only free kindergartens and a night school, but a primary industrial school for the children of the poorer wage-earners, with a unique provision for "little dinner carriers" (children carrying dinner to parents at work), regulating the hours to give them a longer nooning. The improvement of the condition of cotton-mill workers (all of the "poor white" class) has engaged the attention of the owners, who have not only provided excellent modern villages for them, but schools and other elevating influences. The Columbus Power Company proposes to build and partly maintain at Bibb a superior school for the operatives' children; and the Eagle and Phœnix Club for employees is a building with library, gymnasium, and all forms of amusement, built by the company, and then given over to the absolute control of the hands. There is also a public library in the city. The city government is by a mayor, elected for two years, and a council, elected on general ticket, the council appointing the other city officers.

History.— Columbus was laid out in 1828, on land taken partly from an Indian reservation. As early as 1845 it had a cotton mill and was a centre of the cotton trade; in 1846 it was nearly destroyed by fire. In 1853 the first iron foundry was built there. During the Civil War it was the reliance of the Southern armies for their clothing, shot and shell, and swords. In its streets and those of Girard was fought the last battle of the War east of the Mississippi, when on 16 April 1865 Wilson captured it. Pop. (1870) 7,401; (1880) 10,123; (1890) 17,303; (1900) 17,604 (10,337 whites); (1903) including suburbs, about 30,000.

Columbus, Ind., a city and county-seat of Bartholomew County, in the southern central part of the State, situated on a fork of the White River and on the Cleveland, C. Ch. & St. L. and the Pittsburg, C. Ch. & St. L. R.R.'s. It has large manufactories of cerealine, agricultural implements, and furniture, and starch- and flour-mills. Pop. (1900) 8,130.

Columbus, Kan., the county-seat of Cherokee County, in the southeastern part of the State, situated on the Kansas City, Ft. S. & M. and the St. Louis & S. F. R.R.'s. It is in an agricultural and mining district, coal and zinc being found in the neighborhood. Pop. (1900) 2,310.

Columbus, Miss., a city and county-seat of Lowndes County, situated on the Tombigbee River and on the Mobile & O. and the Southern R.R.'s., 150 miles southeast of Memphis and the same distance northeast of Jackson. It is the farming trade centre of the country, and has a large cotton-mill, machine shops and lumber-mills. It is the seat of the State Industrial Institute and College for girls and of Franklin Academy. Pop. (1900) 6,484.

Columbus, Neb., the county-seat of Platte County, in the eastern part of the State, situated on the Loup River, near the Platte, and on the Union Pacific and the Burlington & M. R.R.'s. It has various manufacturing interests and is the seat of a Roman Catholic academy. Pop. (1900) 3,522.

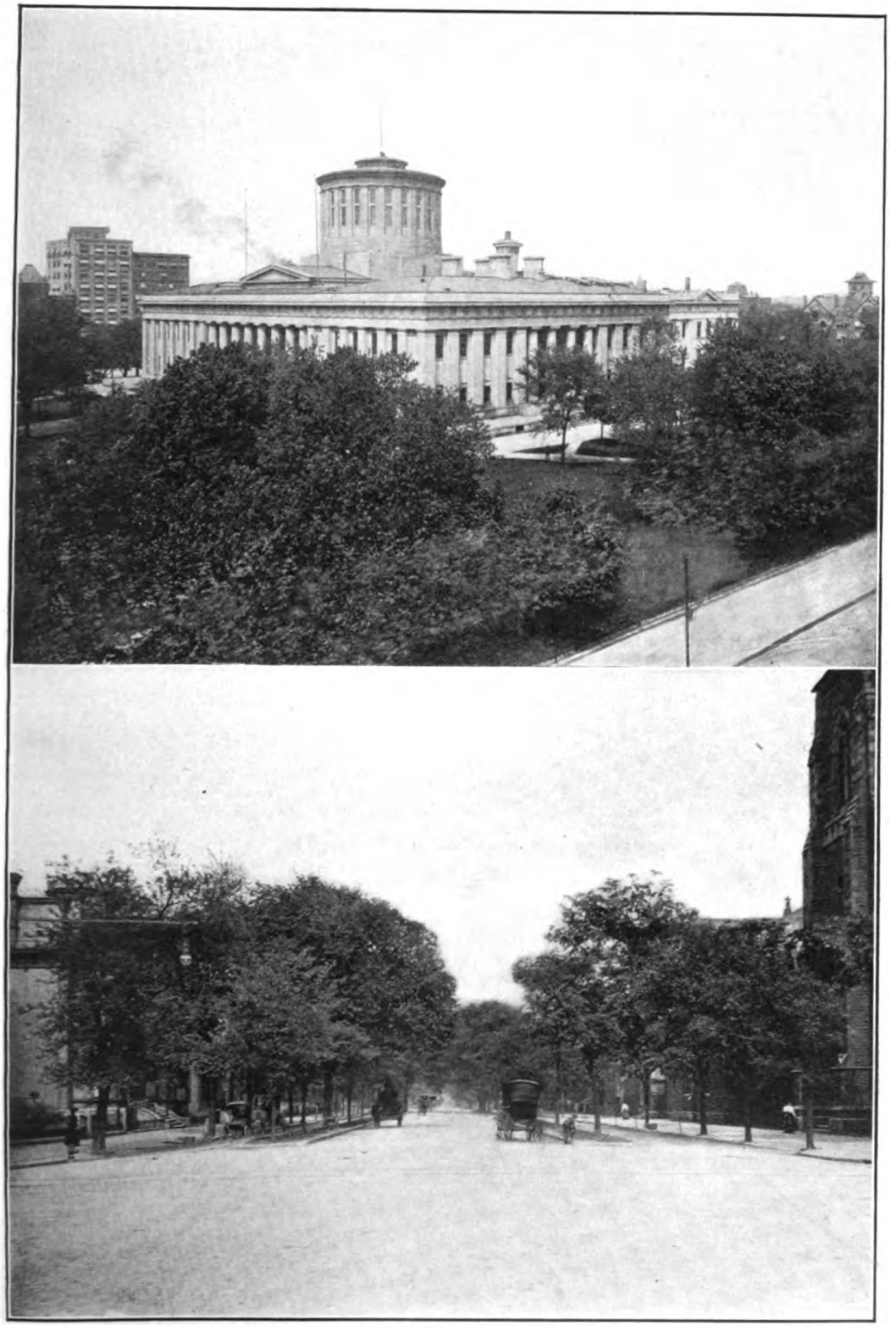
Columbus, Ohio, the capital of the State and the county-seat of Franklin County, is located at the centre of the State and at the junction of the Scioto and Olentangy rivers, in lat. 39° 57′ N., lon. 83° 3′ W., on a slightly elevated alluvial plain, and is nearly equidistant from Cincinnati, southwest; Cleveland, northeast; Toledo, northwest; and Marietta, southeast, the average distance from these points being 115 miles.

Columbus was made the capital by the legislature in 1810, and became the permanent capital in 1816, the original Territorial and State capital having been Chillicothe. The first State buildings were of brick, and cost $85,000. The present massive buildings and additions are of dressed native gray limestone, in the Doric style of architecture. They cover nearly three acres, and their total cost has been $2,500,000.

As early as 1812 Columbus was surveyed in rectangular squares; it was incorporated as a village in 1816, and chartered as a city in 1834. In general outline the city resembles a Maltese cross. It extends eight miles north and south, and seven miles east and west on its arms of expansion. Its longest streets, High and Broad, bisect the city north and south and east and west respectively. The uniform width of the former is 100 feet, and the breadth of the latter is 120 feet. Broad Street is planted with four rows of shade-trees for its entire length east of the capitol square, where it penetrates the fashionable residence district. High Street is the leading business thoroughfare. Capitol square, a miniature park of 10 acres, is situated at the intersection of these streets, two squares east of the Scioto River. The residence portions of the city contain many beautiful homes and fine mansions. There are numerous apartment buildings; the houses of the average people are substantial and comfortable; the tenement districts are but ordinary of their class. On the business streets are many handsome, commodious blocks; many steel, brick, and stone office buildings from 8 to 14 stories high, as well as commodious railway buildings and stations. The streets are wide, well paved and lighted, and are kept in good condition.

The police and fire departments are excellent; the water supply is pure and ample, and the sewerage system good. Natural gas is the principal fuel for domestic use. Bituminous coal, in unlimited quantities, is found a few miles south.

The 40 or more church buildings of Columbus include those of the following religious denominations: Methodist Episcopal, United Presbyterian, Roman Catholic, Lutheran, Baptist, Disciples, Friends, Christian Scientist, Evangelical Jewish, Independent German Protestant, German Evangelical Protestant, African Methodist Episcopal, Seventh Day Adventists, and United Brethren. These churches have a total active church membership of 75,000. The newspapers and periodicals include four English and two German dailies, 21 secular weeklies, and 33 trade, professional, religious, fraternal, and other publications. There are 38 large public school



State Capitol (upper). Looking North on East Broad Street (lower).

buildings, four being devoted to high school purposes. The schools have an average attendance of 18,500, the high schools having 2,300. Among institutions for higher education are the Ohio State University, Capital City University, and St. Mary's Academy. Professional schools include one dental and three medical colleges, and a law school; and there are also private and religious educational institutions. Here are 20 private hospitals; and Columbus is the location of a State hospital for the insane; State institutes for the education of deaf-mutes, blind, and imbecile youth; the Ohio Penitentiary; county, city, and memorial buildings; five opera houses; and a board of trade building. There are five public parks and a United States military post, Fort Columbus. This post, known also as Columbus Barracks, was originally an arsenal, and now has quarters for eight companies of infantry.

From Columbus 18 steam railroads radiate to all parts of the State, intersecting all through lines running east, west, northwest, northeast, and south; and eight interurban lines in operation, and as many more nearing completion, connect with a model street-railway system. Prominent business interests of the city are represented by 6 national and 20 private banks, trust companies, savings and building and loan associations, with a combined capital of $25,000,000. There are 289 great and small manufacturing establishments, representing an investment of $35,000,000, including steel plants, blast-furnaces, malleable iron works, and manufactories of various steel, iron, and wood products, beer and liquors, trucks, cars, cash registers, watches, furniture, agricultural implements, mine, mill, and farm supplies, shoes, cloth fabrics, gloves, hosiery, clothing, medicines, buggies, wagons and all kinds of vehicles, automobiles, novelties, specialties, and general merchandise, with an anual output approximating in value $105,000,000. The mercantile trade is extensive, including all lines, and embracing 23 wholesale and hundreds of retail establishments.

The people of Columbus possess the characteristic push and enterprise of Western cities, and much of the culture and artistic taste of those in the East. The population is drawn from all the counties in the State, especially the 45 which are centrally located. Two thirds of the population are native-born. The largest foreign elements are German, Irish, Welsh, English, and Italian, in this order, and include scattered groups and individuals from almost every civilized and semi-civilized country in the world. Since 1880, when it had 41,215 inhabitants, Columbus has grown rapidly. In 1900 it had a population of 125,560, and that number has increased, according to the estimate of 1903, to about 150,000.

WILLIAM ALEXANDER TAYLOR.

Columbus, Texas, the county-seat of Colorado County, situated on the Colorado River and on the Southern P. R.R. Its chief industry is its cotton trade. It is the seat of Colorado College. Pop. (1900) 1,824.

Columbus Barracks. See COLUMBUS, OHIO.

Columella, kŏl-ū-mĕl'la, **Lucius Junius Moderatus,** Roman practical writer on agriculture: b. Cadiz, Spain. He flourished about the middle of the 1st century, and wrote 12 books, still extant, one of which, on gardening ('De Re Rustica'), is in verse. He treats in this work of all the branches of agriculture. The earlier editions of this work contain also his treatise 'De Arboribus,' in one book. According to Pliny, Columella wrote a work on ancient sacrifices for obtaining the fruits of the earth, but this is lost. The *editio princeps,* printed in folio by Jenson at Venice, in 1472, and forming part of a collection of 'Rei Rusticæ Scriptores varii,' is very rare. The most complete edition is contained in the 'Scriptores Rei Rusticæ' of Schneider (1794–7).

Column (Latin, *columna*), in architecture, a round pillar. In the earliest times the column was merely a tree-trunk, or its imitation in stone, used to support the roof. The parts of a complete column are its base, on which it rests; its body, called the shaft; and its head, called the capital. Columns are used to support the entablature of an order, which has also its proper division. In the most ancient times columns of wood were most usual, as being most easily wrought. In countries like Egypt, where timber fit for construction is scarce and stone abundant, the latter became the principal material for columns, and those of Egypt are remarkable for the beauty of their workmanship and the durability of their materials. The Egyptian columns were numerous, close, short, and very large. They were generally without bases, and had a great variety of capitals, from a simple square block ornamented with hieroglyphics, or faces, to an elaborate composition of palm leaves, not unlike the Corinthian capital. The Greeks, for their columns, used marble of the finest kind, with which their country abounded; and other nations the stone or material of their country. The Greeks properly considered the column as an essential part of the architecture of their temples, and never used it as a mere decoration.

The manner of constructing the columns of all the orders rests on similar principles. They are all divided into three primary parts or divisions, the base, the shaft, and the capital, except the Doric order, which has no base. The lowest or thickest part of the shaft is used by architects as the universal scale or standard whence all the measures which regulate and determine heights and projections are taken; and this standard or scale must be understood before any architectural design can be commenced. The universal architectural scale is called a diameter, and is the diameter of the lowest or the largest part of the column; and, unlike the foot, inch, or yard, is as various as the size of columns. By the diameter, of course, is meant that of the circle which forms the bottom of the column. Half of this diameter, or the length of the radius which forms the circle, is called a module, and is used as well as the diameter as a primary standard of mensuration by some writers upon architecture. These measures of length are subdivided as follows, namely: the diameter into 60 parts, and the module into 30 parts, called a minute. The Doric column has no base. The Ionic column has one peculiar to itself called the Attic, which, with that of the Corinthian order, is described under the article ARCHITECTURE.

The shafts of the different orders differ in height and even in various examples of the same order. The capitals also are as various. Col-

umns are either plain or fluted, and the flutes and manner of dividing them are different in the Doric and Corinthian orders. The Ionic flutes much resemble the Corinthian, and in many instances are exactly similar. Columns of all the orders taper gradually toward the top, but in the middle there is sometimes a slight swelling called an entasis. Roman architecture being derived from the Greek, Roman columns were either exactly similar to Greek ones or modifications of the latter. The principal modifications of the column made by the Romans were that form of the Ionic capital in which there were four pairs of diagonal volutes instead of two pairs of parallel ones, and that peculiar to the Composite order, in which the capital of the Corinthian column was combined with that of the diagonal or modern Ionic.

Columns are also often used for commemorative purposes as well as for architectural supports; like the Trajan and Antonine columns in Rome, and that called the Monument in London, which was erected in commemoration of the great conflagration of 1666, and is one of the loftiest, the best constructed, and the most beautiful. It is a Doric fluted column, 202 feet high from the bottom of the pedestal, which is ornamented with bas-reliefs of Charles II. and his court giving protection to the fallen city, and various inscriptions, to the top of the vase of flames, by which it is surmounted.

Column, in military tactics, a deep, solid mass of troops, formed by placing several bodies of men one behind another (sections, platoons, companies, squadrons, and even several battalions). The column is either open or close. When a battalion is formed in open column, room enough is left between the companies for them to wheel into line. When the distance left between the companies is very small, the battalion is said to be formed in close column. When the distance is intermediate between that in close and that in open column, it is said to be formed either for marching or for attack. On the march and in manœuvring the arrangement of troops in column is general and convenient, and this order is usually kept up till the actual fighting is about to begin; but it is as a rule unsafe to expose troops in column to the firearms of the present day. This formation consequently is retained in combat only when time and space do not allow of any other being adopted, or for some other special reason.

By dividing a large force into columns it becomes possible to march in places where it would be impracticable to move with unbroken lines. They also increase the force and steadiness of troops, both in attack and defense. The drawing up of the infantry in line is usually advisable where there is no obstacle in the ground to prevent advancing in this order. The order in mass may be preferred where a charge is intended, in which physical force, given by the depth of the column, is necessary and also where a charge, particularly of cavalry, is apprehended. Though a cannon ball, and still more a shell, in the midst of the mass, causes a greater havoc, the probability of being hit is diminished on account of the small front exposed.

An objection to columns, founded on the difficulty of moving so dense a mass, and of changing it into a line, has been removed in modern times by the practice of making the columns consist of only one battalion, and by disposing these single battalions near each other in such a way as to support one another by their fire, instead of arranging them uselessly one directly behind another. By the usual way of forming the columns toward the centre, those have received such a mobility and facility of development that a line may be restored in two or three minutes. The charge in close columns, which has been especially common among the French, is of the greatest effect when it succeeds; but when it fails the whole body of assailants is exposed to annihilation or to rout, no orderly retreat being possible. The attack with columns at some distance from each other has this advantage, that the facility of manœuvering is much greater. This mode of attack has been frequently employed in assulting squares of infantry. Marching and fighting in lines, however, are the modes usually practised by cavalry. Column roads are such roads as may be passed with all kinds of arms; when the ordinary road is ruined, they are laid out across the fields and marked by poles with straw (*jalons*).

Column of July, a monument erected in Paris in 1840, on the site of the old Bastile in honor of the citizens killed in the revolution of 1830. It is a shaft of bronze on a marble base, capped with a gilded statue of the Genius of Liberty. It is 154 feet high and 13 feet in diameter.

Column of Saint Mark. See VENICE.

Column of Trajan, a monument erected in Rome in 114 A.D. in honor of the emperor. It is a Roman Doric column of white marble of 34 blocks, 23 composing the shaft, on which is carved representations of various scenes in Trajan's campaigns, containing 2,500 figures of men, each about two feet in height. The quadrilateral pedestal contained the emperor's ashes and bore an inscription. It is 127½ feet high, exclusive of the statue of St. Peter, which now stands on the apex of the column, having taken the place of the colossal figure of Trajan in 1587.

Column Vendome, vŏn-dōm, a monument erected in the Place de Vendome, Paris, by Napoleon I., to commemorate the victories of the Grand Army over the Russians and Austrians in 1805. It is similar in design and ornamentation to the Column of Trajan, but is built of masonry encased in bronze taken from 1,200 captured guns, and capped by the statue of Napoleon. It is 142 feet high and 13 feet in diameter. It was overthrown in 1871 during the Commune but was restored in 1875.

Colure, kō-lūr', one of the two imaginary great circles of the celestial sphere intersecting the poles of the world; one passing through the equinoctial points of Aries and Libra and the pole of the equator; and the other through the solstitial points of Cancer and Capricorn, and the poles both of the ecliptic and equator. For this reason the first is called the equinoctial, and the second the solstitial colure. The name, meaning "docked" or "dock-tailed," is now rarely used; it was originally applied because a portion of these circles is always concealed under the horizon.

Col'ville, SIR **Henry,** English general: b. 10 July 1852. He was educated at Eton and entered the grenadier service in 1870. He

served in Egypt, the Sudan, Uganda, and elsewhere, was knighted in 1885, and in 1897 was promoted major-general. He has published: 'A Ride in Petticoats and Slippers' (1879); 'The Accursed Land' (1884); 'History of the Sudan Campaign' (1887); 'The Land of the Nile Springs' (1895); 'The Work of the Ninth Division' (1901).

Colvin, kŏl'vĭn, **Sidney,** English critic: b. Norwood, Eng., 18 June 1845. He was professor of fine arts at Cambridge 1873–5, since when he has been keeper of prints and drawings at the British Museum. His writings include: 'Children in Italian and English Design' (1872); 'Life of Walter Savage Landor' (1881); 'Life of Keats' (1887); 'A Florentine Picture and Chronicle' (1898); 'Early History of Engraving in England' (1901).

Col'well, Stephen, American lawyer and writer: b. Brooke County, Va., 25 March 1800; d. Philadelphia 15 Jan. 1872. He graduated at Jefferson College, studied law, was admitted to the bar, and practised for some years in Pittsburg. About 1830 he removed to Philadelphia, became an iron merchant, and amassed a fortune. He early developed a fondness for the study of finance, political economy, and social science, and frequently published the results of his studies on questions of current interest or debate. During the Civil War he aided the administration with pen, purse, and voice, and was a liberal supporter of the work of the sanitary commission. He was appointed by the government one of the commissioners to examine the whole internal revenue system and suggest improvements. He left his large and valuable library of works on political and social science to the University of Pennsylvania, where he also endowed a professorship of social science. Of his writings the following may be mentioned: 'Relative Position in Our Industry of Foreign Commerce, Domestic Production, and Internal Trade' (1850); 'New Themes for the Protestant Clergy' (1851); 'The South; . . . Effects of Disunion on Slavery' (1856); 'Ways and Means of Commercial Payment' (1858), his last and most important work.

Colymbidæ, kō-lĭm'bĭ-dē, a family of birds which includes the divers and grebes. See DIVERS; GREBE.

Col'za Oil, or **Rape Oil,** an oil, familiar from its use as an illuminating agent in the moderator and other lamps, expressed from the seeds of several plants of the cabbage and turnip genus, the name being originally «kolzaad» (Dutch), that is kail- or cabbage-seed. It is yellowish brown, has a specific gravity of .92, and little or no smell, and dissolves in hot alcohol and in ether. It becomes thick and solid only at very low temperatures; when heated it volatilizes, but not completely, undergoing partial decomposition. It is purified for use by continued agitation with sulphuric acid, which destroys mucilaginous matter from the seed, and washing with water to remove all trace of the acid. The oil is largely used both in Great Britain and on the Continent in soap-making, tanning, fulling of cloth, lubricating machinery, and for burning. For the last it is so well adapted that it has been specially recommended for lighthouse purposes. It is brilliant and steady, is managed with very little attention, and is cheap. In these respects it is said to be superior to spermaceti.

Coma, in medicine, a state of complete or almost complete insensibility, resulting from various diseases, as apoplexy; from narcotics, as opium; from accident or injury to the brain; or from excessive cold. In cases of coma the pulse is usually low and soft, but sometimes quick, the breathing is rarely stertorous, the pupils of the eyes are commonly more or less dilated, and the face is often swollen and livid. The patient is either altogether unconscious and incapable of replying to any question, or he makes incoherent and rambling statements. Stimulating agencies and blistering are sometimes used in the treatment of comatose cases, but generally the disease or injury producing the condition determines the remedy.

Coma Berenices, bĕr-ĕ-nī'sēz («the Hair of Berenice»), a northern constellation, the name of which is due to the flattery of Alexandrine astronomers, who professed to see in the new constellation a lock of the beautiful hair of Berenice, wife of Ptolemy Energetes. Callimachus in Greek and Catullus in Latin wrote poems descriptive of the apotheosis of the curl. Ptolemy did not introduce it into the Almagest as a distinct constellation, but called it *Plokamos* (Gr., «hair,» or «curl»). Tycho Brahé restored it as a distinct constellation in his catalogue of 1602. It is formed of rather faint stars, none being brighter than the fourth magnitude. Baily, in the «B. A. C.» in 1845, attached the first three letters of the Greek alphabet to three of the brighter stars. The constellation is surrounded by Ursa Major, Canes Venatici, Boötes, Virgo, and Leo.

Comacchio, kō-mä-chē'ō (ancient COMACTIUM, Italy, town in the province of Ferrara, in Emilia, about 20 miles north of Ravenna and 30 miles southeast of the city of Ferrara. The town is built on islands which are connected by bridges. The chief industries are fishing and manufacturing salt.

Coman, Katherine, American teacher: b. Ohio 1857. She has been professor of economics in Wellesley College (Mass.) since 1900. She has written: 'Growth of the English Nation' (1895); 'History of England' (1899); 'History of England for Beginners' (1901), and in collaboration with her colleague Katherine Lee Bates, 'English History Told by English Poets' (1902).

Comana, kō-mā'na. 1. An ancient city of Cappadocia, supposed to be the modern Elbostan, on the river Sarus, celebrated in antiquity for its temple of Artemis Tauropolis, and for the great devotion of its inhabitants to the worship of that goddess. Over 6,000 persons were engaged in the service of the temple. The city was governed by the high priest, who was always a member of the reigning family, and took rank next to the king. 2. A city of Pontus, now Tokat, on the river Iris, and almost as famous for its devotion to Artemis as the other city of the same name.

Comanche, kō-măn'chē (also **Camanche, Chouman, Comande,** a Spanish name; their own name is Nüm, «people»; the Sioux gave them one which the French turned into Padouca), a powerful and ferocious tribe of the

widely distributed Shoshonean stock, speaking the same language as the Shoshoni of Wyoming, and traditionally their neighbors. When first made known to the whites by the French under Dutisné, they were located in eastern Colorado; they had already obtained horses from the Spaniards and become nomads and expert horsemen, and horse-breeders, for the French bought horses from them. In 1724 another French expedition made a treaty with them. They seem shortly after to have been pushed southward by the Sioux, and we find them later roving the plains of northwestern Texas, making plundering raids from Colorado through Texas, deep into Mexico, and westward to Santa Fe. They lived in skin wigwams, with few or no fixed villages except near the Spaniards, and were in eight bands, with a very loose organization. They probably numbered 5,000 warriors, and 25,000 in all, at their best estate; one village near the Spaniards had 800 warriors, and over 4,000 in all. They were at constant war, both with the Spaniards and the other Indian tribes, and in 1783 engaged in a wholesale war with the former; but Anza inflicted a crushing defeat on them, killing 30 of their chiefs, and there was peace for a time. In 1816 they are said to have lost 4,000 of their number by an epidemic of smallpox; but they were still estimated at 9,000; and in 1847 at 10,000 or 12,000, one fifth warriors. They recruited their numbers by kidnapping and adopting Mexican children, boys or girls. For all the years of immigration into those regions, down to 1875, they were the bloody and relentless scourge of the white settlers, and furnished a good part of the Indian horrors of the southwest. They were once placed on a reservation in Texas, but were driven off. In 1868 the bulk of them agreed to go on a reservation in western Oklahoma; but the Quahada or Staked Plain band refused, and kept up their murderous forays. They were sharply punished by Col. McKenzie at McClellan's Creek in 1872, in which year they were estimated at 3,218 on the reservation, with 1,000 more in roving bands. The last of these surrendered in 1875. In 1901 their reservation in Oklahoma was thrown open to settlement. At present they number about 1,400.

Comanche Stage, in American geology a great limestone formation of Lower Cretaceous age that covers much of northern Mexico, and parts of Texas, New Mexico, Indian Territory, and Kansas. The beds contain chalk in places and are mostly of marine origin. The thickness is 1,000 feet in central Texas and reaches a maximum of 20,000 feet in Mexico. See CRETACEOUS SYSTEM.

Comayagua, kō-mä-yä'gwä, or **Valladolid la Nueva,** Honduras, C. A., a town, capital of the department of the same name, situated on the southern border of the plain of Comayagua, on the Humuya River, 220 miles east of Guatemala. It is the seat of a bishopric, has a large and handsome cathedral, a richly endowed hospital, several convents, and a college. It was founded by Alonzo Caceres in 1540, and up to 1827 was a thriving place, with about 18,000 inhabitants. In that year, however, it was burned by the monarchical faction of Guatemala, and has never recovered. Pop. 3,100.

Comb (A.S. *camb*), an instrument to separate and adjust the hair, too well known to need description. We have no certain authority that either the Greek or the Etruscan women applied this useful article regularly to their hair in the operations of the toilet; although it was used by the Greek women, at least, to arrange their hair. The combs used by the Greeks were of boxwood, and had teeth on both sides, while those used by the Egyptians had teeth only on one side. The Romans also had combs of boxwood, and at a later time probably of ivory and other materials. In the work of Guasco Delle Ornatrici there are several representatives of ancient Roman combs. One of them is a long one of box, of which the handle is overlaid with ivory, and appears to have been ornamented with a small meander in gold. It has two rows of fine teeth, delicately wrought and well proportioned. In making combs the material is first cut to the form which the comb is to have, and the teeth are then made all at once by means of circular saws mounted on the same axle and placed at a suitable distance from one another. Large combs in horn or shell, with wide teeth, are sometimes made with a punch, which cuts in the piece the teeth of two combs by the same operation. The teeth are afterward finished with the file. Combs made of vulcanized india-rubber, which are now so common, are made by pressing the caoutchouc while soft into molds, and then bringing them to the desired degree of hardness by the process of vulcanization. Canova and other modern sculptors have made great use of the comb, placed in the heads of their women, to which they add much grace and elegance.

Comb, the wax cavities in which bees lodge their honey. The comb of a bee is composed of hexagonal cells, of which there are two tiers, the cells in which are placed end to end, so that the three plates of wax, which serve as the bottom of the cell in the one tier, constitute also that of the corresponding one in the other. The mathematical problem in "maxima and minima," how to construct the greatest number of cells within the smallest possible room, and with the least expenditure of material, is solved. This the natural theologians and the older naturalists were accustomed to adduce, as one of an infinite number of proofs, that design and a Designer were displayed in nature.

Combaconum, kŏm-bạ-kō'nŭm, Madras, British India, town in the district of Tanjore. It is regarded by the Hindus as a place of peculiar sanctity, and is inhabited largely by the Brahmans. It contains numerous pagodas and tanks with water, supposed to come from the Ganges River. It is one of the strongholds of Brahmanism, but a considerable number of the inhabitants are Roman Catholics, and a Protestant misson has been successfully established. Pop. 54,307.

Combat, Single, a very ancient usage, evidenced by Goliath (1 Sam. xvii.), and by Ajax in the 'Iliad.' The Norse practice of principals going alone to a small holm or island, to be free from disturbance while settling their quarrels by strength and skill, gave rise to the Saxon term *Holm-Gang.* In the days of chivalry the single combat received the strong support of law and custom, and was resorted to both in civil and in criminal cases. The accuser

or plaintiff swore to the truth of his tale, the other gave him the lie, a gage of battle was thrown down and taken up, and they fought it out under rules before an assembly, the supposition being that God would give victory to the right. The barbarous practice survives in European countries, without its excuse of superstition, in the modern duel, which is legally prohibited in the United States. In England it was still a legal method of trial well into the 19th century, but was abolished by statute 59 George III., cap. 48.

Combe, kōm or koom, **Andrew,** Scottish physiologist: b. Edinburgh 27 Oct. 1797; d. there 9 Aug. 1847. He was educated for the medical profession, and in 1822 he commenced practice at Edinburgh, and had considerable success. In 1838 he was appointed one of the physicians extraordinary to the queen in Scotland. His chief works are: 'Observations on Mental Derangement' (1831); 'Principles of Physiology' (1834); 'Physiology of Digestion' (1836); 'A Treatise on the Physiological and Moral Management of Infancy' (1840). Like his brother George (q.v.), he was a zealous phrenologist.

Combe, George, Scottish phrenologist: b. Edinburgh 21 Oct. 1788; d. Moore Park, Surrey, 14 Aug. 1858. He was a brother of Andrew Combe (q.v.), was bred to the law, and in 1812 admitted a member of the Society of Writers to the Signet. He was the first to introduce the doctrines of phrenology into Great Britain; and visited Germany and America, lecturing on his favorite science. He was also a zealous promoter of the cause of popular education and social progress; and was among the first to advocate compulsory education and the establishment of a board of health. Besides the 'Constitution of Man' (1828), which has had an enormous circulation, he was the author of: 'A System of Phrenology' (1825); 'Lectures on Popular Education' (1833); 'Moral Philosophy' (1840); 'The Life and Correspondence of Dr. Andrew Combe' (1850); 'Principles of Criminal Legislation and Prison Discipline Investigated' (1854); 'Relation Between Science and Religion' (1857).

Combe, William, English writer: b. Bristol 1741; d. Lambeth 19 June 1823. His 'Tour of Dr. Syntax in Search of the Picturesque' (1812), was once very popular. Other works by him: 'The Diabolical,' a poem (1776); 'The Devil Upon Two Sticks in England' (1790). After 43 years within the rules of a debtor's prison, and previous fortunes from officer to cook, he died in Lambeth.

Combermere, kŏm'- or kŭm'bėr-mēr, **Sir Stapleton Stapleton-Cotton,** Viscount, English general: b. Denbighshire 17 Nov. 1773; d. Clifton 21 Feb. 1865. He entered the army in 1790, served in Flanders and India, and with the rank of major-general accompanied the Duke of Wellington to the Peninsula in 1808. At Salamanca, in 1812, he headed the brilliant cavalry charge which greatly contributed to the decisiveness of that victory, and was subsequently present at the battles of the Pyrenees, Orthez, and Toulouse. Shortly after the last battle he was raised to the peerage with the title of Baron Combermere. From 1817 to 1820 he was governor of Barbadoes; and in 1825 was sent to India as commander-in-chief of the forces there, to put down the usurper Doorjun Sal. After a siege of less than two months, Bhurtpore, the chief city of Doorjun, was taken by storm on 6 Feb. 1826, for which Combermere was raised to the rank of viscount. The remainder of his life was passed in England. In 1852 he was appointed constable of the tower; and in 1855 made a field-marshal.

Combes, koomz, **Justin Louis Emile,** French statesman: b. Roquecourbe, Tarn, France, 6 Sept. 1835. He was educated in a Roman Catholic seminary for the priesthood, but subsequently studied medicine, and began practice in Pons, where he filled various posts of responsibility, such as those of mayor and county councilor. In 1885 he was elected to the Senate, of which he was vice-president 1893–4, becoming minister of public instruction in 1895. He has been active in the re-organization of primary and secondary education. In June 1902 he succeeded Waldeck-Rosseau as President du Conseil des Ministres. In this capacity he has enforced the Association Act, abolishing liberty of teaching in France and aimed at the clergy. His opponents have claimed that this has been done with needless severity. It has caused widespread disturbances throughout the country. On his becoming prime minister M. Combes announced his intention to reduce the period of military service to two years, and to establish a general income tax.

Combination, in mathematics, the selection, from a given set of objects, of a stated number without regard to their arrangement. Each combination can, by varying the arrangement of the constituent objects, be made to give rise to several permutations. Thus, of the four letters, *a, b, c, d,* four combinations, three at a time, are possible; namely, *a b c, a b d, a c d, b c d.* Each of these combinations, however, produces six permutations, according to the order of the letters. For example, the combination *a b c* yields the six permutations *a b c, a c b, b c a, b a c, c a b, c b a.* Thus, of the four letters *a, b, c, d,* the number of permutations three at a time is 24. It is easy to prove that the number of permutations of n objects two at a time is $n\ (n-1)$; three at a time $n\ (n-1)\ (n-2)$; four at a time $n\ (n-1)\ (n-2)\ (n-3)$; and so on, the number when r at a time are taken being $n\ (n-1)\ (n-2)\ldots\ldots (n-r+1)$. The number of permutations of n things n at a time is therefore $n\ (n-1)\ (n-2)\ldots\ldots$ 4, 3, 2, 1, a product usually represented by $\lfloor\underline{n}$ or $n!$, and read as "factorial n." The theory of permutations and combinations is of very great importance in higher mathematics, and may be studied in any text-book of algebra, such as those by Chrystal, Todhunter, and Smith.

Combination, a union of individuals, companies, or corporations formed for the purpose of accomplishing a particular object or purpose. At common-law combinations were unlawful, but in the United States a combination is not unlawful in itself, though it becomes so if it seeks to obtain its ends in an unlawful manner. Combinations may be divided into two general classes, those formed by employees or "labor," and those formed by employers or "capital." Combinations formed by employees, or labor, are generally designated unions. The

purpose of a union is to better the condition of its members in relation to the work in which they are engaged, by securing higher wages, less working hours, different methods of doing the work, and similar changes. A union generally tries to enforce its demands by striking, or threatening to strike. A strike is a combination effected by employees whereby at a prearranged time they all stop working unless their demands are granted. A strike is usually organized through a union.

A boycott is a combination to cause a loss to a particular person by restraining others from doing business with that person. It is often so conducted that the person is affected socially as well as in his business. When a boycott has been declared against a person, any one having either business or social relations with that person is also boycotted.

When the objects of such combinations are effected in a peaceful and lawful manner there is no legal means by which they can be interfered with; but it generally happens that when a number of working-people strike there is a breach of contract or a conspiracy, in which case there is a legal redress. The usual action is for the injured party to proceed in equity and ask for an injunction restraining the former employees from committing certain acts. Sometimes damages are asked for, and it makes no difference what the status is when the cause is heard, as damages can be recovered for acts committed during a strike, although the strike may have ended long before the demand for damages.

Combinations formed by employers, or capital, are usually known as trusts. Trusts are generally formed with the object of regulating the supply or price of a product, or both, or for the purpose of reducing expenses or competition.

It is very difficult to frame a law which will be effective against all the different arrangements under which a trust can do business. The State courts have no jurisdiction outside the limits of the State to which they belong, and it is very seldom that a trust would be formed whose business would be confined to any one State. The Federal government has passed several anti-trust laws, and up to the present time the most effective way of dealing with this class of combinations is by laws passed under the clause in the Federal Constitution (Art. I., § 8, cl. 3), which provides that Congress shall have power "to regulate commerce with foreign nations, and among the several States, and with the Indian tribes."

In recent years a great many combinations called trusts have been formed, and one of the most recent instances is that of the Northern Securities Company, which was decided by the United States circuit court of appeals in April 1903. In this case there were two parallel and competing railroad companies doing an interstate commerce business. These roads were controlled by a very few people, and they formed a corporation called the Northern Securities Company, which gave its stock in exchange for that of the competing railroads. The result was that the Northern Securities Company owned the two competing roads, and it naturally follows that the roads would be run as one line instead of, as formerly, competing lines. The court decided that the anti-trust laws covered such a case, and granted an injunction, declaring that the stock of the Northern Pacific Railroad and the Great Northern Railway companies (the two competing roads), held by the Northern Securities Company, was acquired in view of a combination among the defendants in restraint of trade and commerce among the several States, such as the anti-trust law denounces as illegal, and restrained the Northern Securities Company from exercising any control over either of the parallel and competing railroads.

Combustion. In consequence of the combination of the carbon and hydrogen in fuel with the oxygen of the air being the universal method of getting heat and light, and as when the action takes place the fuel is said to burn or undergo combustion, the latter term has been extended to those cases in which other bodies than carbon — for example, phosphorus, sulphur, metals, etc. — burn in the air, or in other substances than air — for example, chlorine. It is therefore but a special case of chemical action which, partly on account of its frequency and importance, partly on account of its obviousness, has attracted greater attention than the more recondite but not less potent manifestations of the same force. It is besides of peculiar interest in the history of chemistry, because all along it was felt to be of great importance to understand in what combustibility actually consists. The older chemists ascribed to bodies a combustible principle which assumed different shapes at different epochs, but continued till Lavoisier, in the end of the 18th century, pointed out the part which oxygen gas performs in the combustion of a body. One result of this was that the idea of a combustible principle quickly disappeared from chemical theory, and there grew up in its place a separation of bodies into combustibles and supporters of combustion, which is still retained in common language. The distinction, however, is accidental, for, as it requires the concurrence of a member of both classes to produce burning, it is plain that each must be regarded as supporting the combustion of the other; and it is experimentally possible to reverse the ordinary conditions, and exhibit that body as the combustible which is usually defined as the supporter of combustion, and as a necessary consequence the other acting as the supporter, which is usually regarded as a combustible.

For many years subsequent to Lavoisier his views were dominant, but increase of facts led to most important modifications of them. By degrees, combustion and oxygen, which was the chief element concerned, have lost their theoretical predominance, and have merged in ideas which are not limited to one set of actions, but which will ultimately attempt to comprise all the manifestations of chemical action in a general theory. See HEAT; LAVOISIER; METAL; OXYGEN; PHLOGISTON.

Combustion, Spontaneous, the ignition of bodies by the internal development of heat without the application of an external flame. It not infrequently takes place among heaps of rags, cotton, and other substances strongly lubricated with oil, when, if the oil is freshly made, it is very ready to combine with the oxygen of the atmosphere and give out carbon and hydrogen. The heat thus developed, diffusing itself through

a mass of highly inflammable substances, will in certain circumstances be sufficient to set them on fire. A remarkable instance of spontaneous combustion among hemp was afforded in June 1861, being the cause of the terrible conflagration in Tooley Street, London. Bituminous coal, piled up in heaps, is apt to ignite by the decomposition of the sulphuret of iron which it contains. In ships laden with coal impregnated with sulphur and iron in the form of bi-sulphuret of iron (pyrites), decomposition of this substance is sometimes occasioned by the access of moisture, and heat is evolved to such a degree as to cause the combustion of the coal, especially if air is admitted freely. Water poured upon the burning material only adds to the intensity of the action. The most singular instances, however, of spontaneous combustion are those of which human beings become the victims in their own persons — if we really can believe that such cases have occurred. Those whom it is alleged to have befallen have been individuals grossly addicted to intemperance, fat, and advanced in years. The chemical changes producing such a result are not well understood, and from the difficulties attending its explanation some eminent chemists, such as Liebig and others, have been led to reject the theory altogether as untenable, and maintain that none of the instances adduced are well authenticated. Among other hypotheses regarding the origin of this extraordinary phenomenon, it has been surmised to be owing to the development of phosphuretted hydrogen, which takes fire on coming into contact with atmospheric air, and might be formed and exhaled under certain conditions from the living body. The proximate cause of the ignition appears always to have been some burning substance, such as a candle, the fire, or a spark from a tobacco-pipe. The flame in cases of human combustion is described as having been of a bluish color, faint, and extinguished with difficulty by water. It is said to be the trunk which is first consumed, the extremities being the last to be destroyed. Dickens, in his 'Bleak House,' has introduced a gruesome case of spontaneous combustion.

Comédie Française, kō-mā-dē frăn-sāz, the official name of the national theatre of France which is supported from public funds, for the purpose of advancing dramatic art. After Molière's death, in 1673, the rivalries existing between the two factions into which his company of actors had divided, caused the decree of Louis XIV. of 21 Oct. 1680, that made this a national institution. This decree has remained in force with but slight modifications down to the present.

Comédie Humaine, ü-mān, La, a series of novels by Balzac, so classified by their author, and intended to form a picture of the manners and morals of the period.

Comedietta, kō-mā-dĭ-ĕt'ta, a dramatic composition of the comedy class, but not so much elaborated as a regular comedy, and generally consisting of one or at most two acts.

Comedones, kŏm'ę-dōnz, a name applied to the little cylinders of sebaceous and epithelial substance which are apt to accumulate in the follicles of the skin and to appear on the surface as small round black spots. When squeezed out they have the appearance of minute maggots or grubs with black heads, and thence have derived their name. They are generally associated with a weak state of the skin as well as of the individual. Generous diet and tonic treatment with soap-and-water cleansing and friction will be useful; as an astringent to invigorate a debilitated skin, a lotion of corrosive sublimate (two grains) in emulsion of bitter almonds (one ounce) and dilute alcohol will be effective. See ACNE.

Com'edy, a dramatic representation of a light and amusing nature, in which are satirized pleasantly the weaknesses or manners of society and the ludicrous incidents of life. Comedy took its origin in the Dionysian festivals, with those who led the phallic songs of the band of revelers (Gr. *kōmos*) who, at the vintage festivals, gave expression to the exuberant joy and merriment by parading about, dressed up, and singing jovial songs in honor of Dionysus. These songs were frequently interspersed with extemporized jokes at the expense of the bystanders. Comedy first assumed a regular shape among the Dorians. The first attempts at it among the Athenians were made by Susarion, a native of Megara, about 578 B.C. Epicharmus first gave comedy a new form and introduced a regular plot. That branch of the Attic drama known as the Old Comedy begins properly with Cratinus. It lasted from 458 B.C. to 404 B.C. The later pieces of Aristophanes belong to the Middle Comedy. The chorus in a comedy consisted of 24. The Middle Comedy lasted from 404 B.C. to 340 B.C., and the New Comedy till 260 B.C. Middle Comedy found its materials in satirizing classes of people instead of individuals. New Comedy answers to the comedy of the present day. The most distinguished of Roman comic writers were Plautus and Terence, whose plots were mainly derived from the Greek. See DRAMA.

Comedy of Errors, The, a play by Shakespeare, first acted at Gray's Inn 28 Dec. 1594. It is one of the shortest of the Shakespearean plays, and one of the very earliest written. The main story is from the 'Menæchmi' of Plautus, and the plot turns upon a series of mistakes caused by the wonderful likeness between two sets of twin brothers: Antipholus of Ephesus and Antipholus of Syracuse, and their two servants, each named Dromio. In recent years two American actors, Robson and Crane, have frequently presented the play with great success, their roles being those of the two Dromios.

Comenius, kō-mē'nĭ-ŭs (originally **Komensky), Johann** (yō hän) **Amos,** Moravian educational reformer: b. Nivnitz, Moravia, 28 March 1592; d. Amsterdam 15 Oct. 1671. In 1616 he received an appointment as teacher in Fulnek, on the plunder of which by the Spaniards after the battle of Prague, in 1620, he lost all that he possessed, including his books and manuscripts. He then went to Poland, where, in 1632, he was elected bishop of the Moravian and Bohemian Brethren in Lissa. In 1631 he published his 'Janua Linguarum reserata,' a work translated into many European languages, also into Persian, Arabian, and Mongolian. In this he laid down a new system for teaching languages to children by the use of visible signs in order to facilitate the learning of words. His 'Orbis Pictus,' or the 'Vis-

ible World,' an abridgment of the 'Janua Linguarum reserata,' with the addition of a large number of cuts, was published in 1657. In the latter part of his life he gave himself up to religious dreams, after the fashion of that time, and revered Bourignon as a prophetess. Comenius' place in the history of education is now generally recognized. Consult Laurie, 'John Amos Comenius' (1881); Payne, 'Lectures on the History of Education' (1892).

Comet (Greek, "hair," alluding to the luminous appendage or tail with which the brighter comets are always associated, and which formerly won for them the name of "hairy stars"). Comets may for convenience be divided into two classes, periodic and unexpected. From 2 to 3 of the former, and from 3 to 4 of the latter, appear on the average every year, but the number varies greatly. In 1898 as many as 10 were discovered, 5 being found in 12 days. Of the 10, 7 were unexpected.

Every comet, no matter how magnificent it may subsequently be, when first discovered, if remote from the sun, appears as a small, very faint, hazy ball. As it comes nearer it becomes brighter, and generally larger, although sometimes it contracts in size. If it is going to be a fine comet it gradually lengthens out, and develops a short tail. The tail rapidly brightens and lengthens as the comet approaches perihelion, as the point in its orbit is called when it is nearest the sun. If the earth is favorably situated the comet appears at its best a few days after the passage of perihelion, and then gradually fades out and disappears as it came. About one unexpected comet in five is visible to the naked eye. The periodic comets move in elliptical orbits about the sun in planes not in general greatly inclined to the ecliptic. The longest period so far definitely known, that of Halley's comet, is 76 years. The unexpected comets have still larger orbits, lying in all planes, with much longer periods. Many of them have a retrograde motion, and occasionally one visits the sun never again to return to it. When an unexpected comet arrives, its orbit is first computed from three observations made on different nights, on the assumption that it is moving in a parabolic orbit. If we are able to observe it through a long period we frequently find that its path differs slightly from a parabola. It is not likely that any comet moves in an exact parabola. If it moves a little slower than the parabolic velocity, its orbit is an ellipse, and the comet really becomes periodic, although it is not classed as such until it has been certainly identified at another return. If it moves a little faster than the parabolic velocity, its orbit is a hyperbola, and the comet will recede into space never to return.

Should a comet happen to pass near one of the larger planets, its orbit may be somewhat changed by the approach and its speed may be either increased or diminished. In this manner new members of the periodic class of comets are from time to time added to the list. On the other hand, its velocity may be so far accelerated as to change its orbit, or even drive it out of our system, never to return to it. In this way some of the members of our periodic family of comets are subject to change; others, however, have apparently come to stay for good. Out of 33 well-known periodic comets 24 have, or did have, periods lying between five and nine years. Many of these were doubtless brought into our system by the giant planet Jupiter. Some of them have already disappeared, owing to a change in their orbits, while some have lost a large part of their gaseous constituents and thus become invisible.

This last statement naturally brings us to the question, What is a comet? In early times they were supposed to be objects within our own atmosphere, presaging famines, wars, and the death of kings. It was first shown by Tycho Brahe that they were celestial bodies independent of the earth, and Newton proved that, excepting their tails, they were bodies subject to the law of gravitation. In the middle of the last century it was shown by H. A. Newton, Schiaparelli and others that our chief meteoric showers, those of 10 August and 14 November, were due to great swarms of meteoric bodies moving in elliptical orbits, practically coincident with the orbits of two well-known periodic comets, 1862, iii. (Tuttle's), and 1866 i. (Temple's).

In several instances two or more comets are known to be following practically the same path, and it was but a step from this to see that the head of a comet was only a concentrated swarm of meteors. It is only within the last few years, however, that we have begun to understand the nature of a comet's tail. That it is matter in a state of extreme tenuity is obvious, since, when millions of miles of it is interposed between us and the faintest stars, they are still visible and practically undimmed. What has puzzled astronomers since the time of Newton, however, is the fact that while all other bodies in the sidereal universe, as far as we are aware, obey the law of gravitation, comets' tails are clearly subject to some strong repulsive force, which drives the matter composing them away from the sun with enormously high velocities. The tail, therefore, always lies outside of the comet's orbit, being somewhat behind the comet when the latter is approaching the sun, and somewhat in advance of it when the comet is receding.

That the tail is gaseous is proved conclusively by the spectroscope, also that it is in an extremely rarified condition; but why the extremely small particles which constitute a gas should act in any way differently under the law of gravitation from the larger meteoric masses which constitute the head of the comet is not at first sight obvious. If, however, we consider the matter carefully, we shall see that if all objects are attracted to the sun in proportion to their mass, and repelled from it in proportion to their surface, then the attraction will vary as the cube of the diameter of the objects and the repulsion as the square. For objects of ordinary size the repulsion is so slight that we cannot detect it; but if the object becomes gradually smaller, the attraction of the mass will diminish much more rapidly than the repulsion on the surface, and a time will come when they will be equal, and if the particle becomes still smaller, the repulsion must exceed the attractive force. It therefore becomes evident that if such a repulsive force existed, and if the gaseous molecules were sufficiently small, we should have an effect exactly like that which we observe.

It has been shown by J. J. Thomson ('Proceeding of the Royal Society,' LVIII. No. 350)

that if hydrogen gas is electrified positively, the green line in its spectrum will be brighter than the red, and, on the other hand, if negatively charged, the red will be brighter than the green. In the case of the sun the red is the brighter line, so that we may infer that the solar surface is charged negatively.

It is a well-known fact that if the ultra-violet rays of the spectrum be allowed to fall upon a metallic body little corpuscles or electrons leave the atoms forming the metallic body and fly away from them with enormous velocity. These corpuscles either carry a negative charge of electricity, or what is perhaps more probable, constitute the negative electricity itself. The atoms lacking these corpuscles are as we usually express it positively charged.

Surrounding the meteor swarm and with it forming the comet's head is a mass of gas. When a flying corpuscle comes in contact with a molecule of this gas the two unite, the molecule becomes negatively charged, and both being repelled by the negatively charged sun, recede from it. The subject will be found treated in more detail by R. A. Fessenden, 'Astrophysical Journal,' III., 36. He there computes the potential of the sun's surface at about 15,000 volts. According to Arrhenius and Thomson the corpuscles which constantly deliver a negative charge to the earth, and would therefore also deliver it to a comet, proceed directly from the sun. The tail probably receives a charge from both these sources, but the latter would seem to be much the more effective of the two.

The question may now naturally be asked, since there is an abundance of extremely rarefied gas at an altitude of a few hundred miles above the earth's surface, and since we too are exposed to the flying corpuscles, why is not the earth itself provided with a comet-like tail? In answer we reply that at certain times it is. 'Annals of Harvard Observatory,' XXXII., 288. Our great auroras are indeed nothing else than the appearance of a small cometary tail. These great auroras, which exist at an altitude of several hundred miles, and envelope the whole earth, must not be confounded with the small but intensely brilliant local auroras always existing at low altitudes in the polar regions.

The reason that these great auroras only reach an altitude of a few hundred miles, instead of several millions, like the tail of a comet, is on account of the great mass of the earth, which does not permit the electrified gases to escape from it. The great auroras exhibit two notable characteristics. They appear only when the electro-magnetic condition of the sun is greatly perturbed, and they are most conspicuous at those times when the earth is approaching or receding most rapidly from it; that is, at the end of March and September. The same appears to be true of comets. The longest tails belong to those comets that approach closest to the sun's surface, and accordingly approach and recede from it with the greatest rapidity. Of the comets that do not approach remarkably close to the sun's surface, those which come during years of great solar activity are more likely to be provided with long tails than those coming when the solar surface is quiescent. Of the past 62 years during which sun spots have been recorded, 31 have been classed as of greater, and 31 as of less solar activity. If the sun's activity had no influence upon a comet's tail, we should expect that an equal number of comets provided with long tails would have appeared in each of these intervals of 31 years. During the 62 years 10 comets have appeared that were furnished with long tails, and yet did not pass within 10,000,000 miles of the sun's surface. Of these, 7 came during the years of great solar activity, and only 3 during those of less. From this we see that comets' tails, like our auroras, other things being equal, appear to be more pronounced during years of great solar activity.

Since the electric current spreads out from the nucleus on all sides as it recedes from the sun, there must, by the well-known laws of currents, be a rotation produced by the magnetic force of the sun acting upon the current ('Annals of Harvard Observatory,' XXXII., 275). The tendency would be for the tail to revolve about its axis, in one direction, if located north of the sun's magnetic equator, and in the other direction if located south of it. Such a rotation has in fact been observed in the case of the bright comets of 1825 iv., 1835 iii. (Halley's), and 1892 i. (Swift's).

Quite recently another explanation of comets' tails has been given by Arrhenius. He attributes the recession of the particles forming the tail, however, to the repulsion of light. It was first shown mathematically by Maxwell that light must exert a slight mechanical pressure upon all bodies above a certain size that are exposed to it. Gaseous molecules are too small to be affected by it. In the case of large bodies it would be concealed by the overwhelming attraction of gravitation. In order to be repelled from the sun, particles having the density of water must have diameters lying between 1-1000 and 1-14000 of a millimetre, or between 1-25000 and 1-350000 of an inch. For particles of greater specific gravity the dimensions will have narrower limits.

It is most likely that several causes combined produce the observed repulsion of the tail. Several of these are suggested by Nichols and Hull in their article describing their attempt to produce an artificial cometary tail ('Astrophysical Journal,' 1903, XVII. 352). It was shown in the 'Harvard Annals,' XXXII., 288, that the gaseous spectrum persisted in the tail of Swift's comet to a distance of 3,000,000 miles from the head. The presence of dust would be indicated by reflected light giving the solar spectrum. On account of the faintness of the tail we should hardly expect to distinguish the solar lines, but a distribution of photographic intensity in the spectrum similar to that which we find in the sun might be accepted as evidence of the presence of dust in the tail. Such a distribution was found in the case of the bright comet of 1881 iii.

We may therefore say that the most probable explanation of a comet is that the head consists of a more or less concentrated swarm of meteors enveloped in gas and dust and that the tail is a current of gas and sometimes dust proceeding from the head, being most pronounced when the comet crosses the greatest number of electro-magnetic equipotential surfaces.

The shape and size of the tail enable us to compute the intensity of the repulsive force causing the tail to recede from the sun. This

was done by Bredichin, who divided all comets' tails into three classes according to the sharpness of their curvature, and suggested that the sharpness of the curve indicated the atomic weight and therefore the general chemical constitution of the matter forming the tail. This last suggestion is open to doubt.

More recently, by means of photography, we have been enabled to detect condensed areas in the tails of certain comets, and by comparing the photographs upon successive nights we have measured directly the speed of recession of the particles forming the tail from the head of the comet. Two comets so far have been measured in this manner, that of 1892 i. (Swift's), by the writer, and that of 1893 ii. (Rordame's), by Hussey. For the comet of 1892 the repulsive force was 39.5 times that of gravity. In the case of the comet of 1893, the repulsive force was 36 times as great ('Pub. Astron. Soc. Pac.,' VII., 185).

Since the gaseous particles receding from a comet's head can never again return to it, and since a comet is visible to us chiefly, and generally wholly, by the electrical illumination of this gaseous medium, it is clear that a comet must become less and less luminous after each return to the sun. But not only does it become less luminous on account of the loss of the material forming its tail, but the meteors composing its head likewise become more and more widely distributed along the course of its orbit. This is in part due to the positive charge left by the tail, which neutralizes the gravitation — or pull of the various portions of the comet's head for one another — and therefore permits those portions of the meteoric swarm which are nearest to the sun to move at a higher speed than those portions which are more remote.

In some cases, like our August meteors, the distribution extends throughout the orbit, with but one luminous condensation, known as the comet of 1862 iii. In some cases there are two or more condensations. Thus Biela's comet was seen to split into two parts. Four distinct comets were found following in the track of the great comet of 1668.

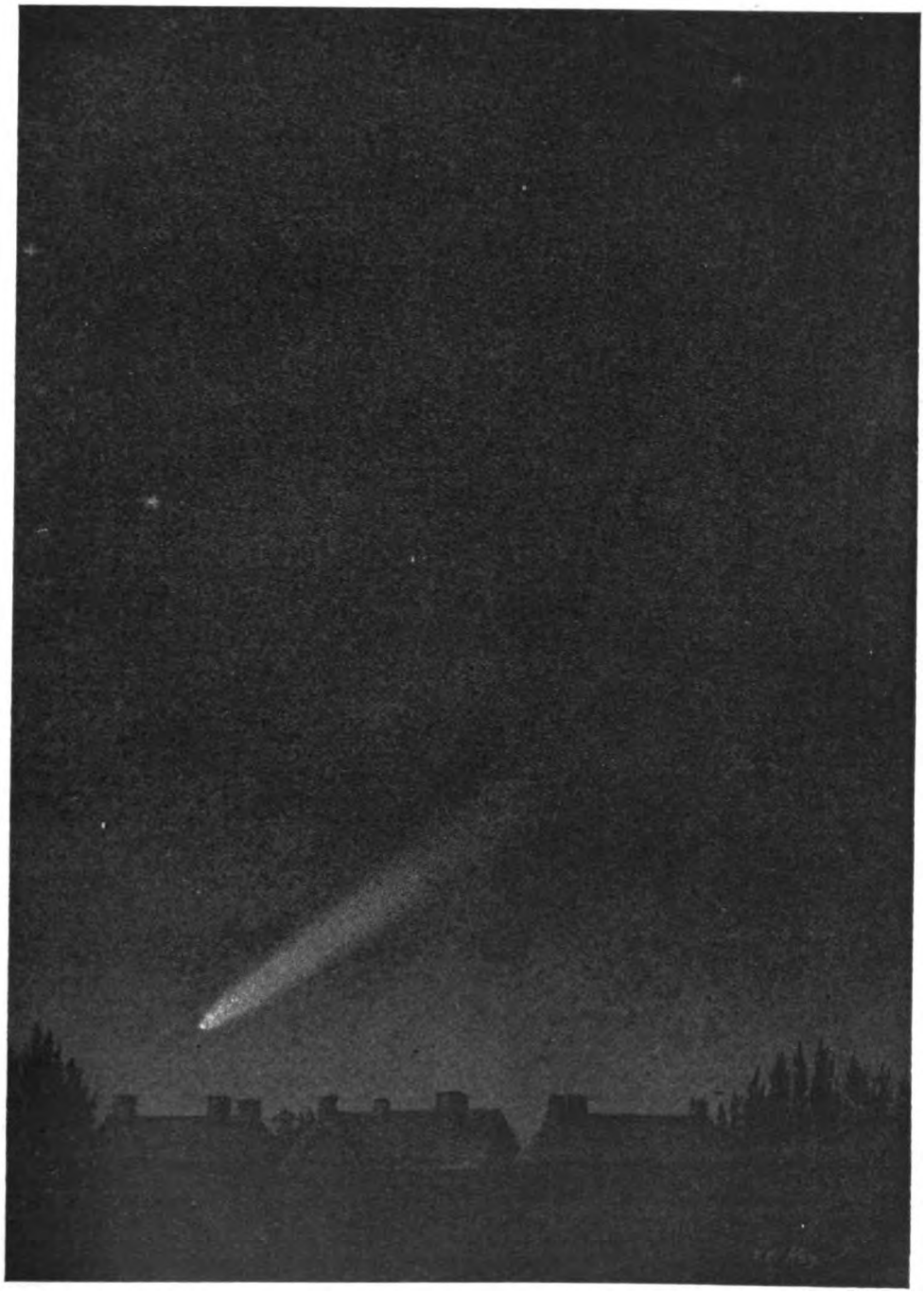
We must now discuss the important question, what is the origin of comets? It is known that the sun, with its attendent planets, is traversing space in the direction of the constellation Lyra at a speed about 12 miles per second. If comets come from remote interstellar space, or from the other stars, it is obvious that we should meet more comets coming from Lyra than would overtake us coming from the opposite direction. Also that those comets we met would have a greater velocity relative to the sun than would those that might overtake us. Nothing of the sort is found, however — the distribution is uniform in all directions. There is but one conclusion to be drawn from this, and that is that all the comets that we have observed possess the same common speed as the sun, omitting relative motion, and travel in the same direction. In short, they are all of them parts of the same original gaseous mass from which the solar system condensed, being merely those portions which were originally left on the outside, before the great common rotation was established, and which now occasionally drop in toward the centre, and then fly back again to their original position on the outskirts of the system. The normal path of every comet is therefore an ellipse. If the paths of some comets have become slightly hyperbolic through the action of some outside body, they can never again visit the sun. As we have just seen, a comet not belonging to our system would be most likely to approach us from the general direction of the constellation Lyra, with a high hyperbolic velocity. We are acquainted with the orbits of about 400 comets, but no such body is found among them.

From this point of view it is interesting to determine of what chemical elements comets are composed. To this the spectroscope gives a ready answer, and shows that by far the most common elements are hydrogen and carbon in chemical combination. This answer, however, is only a partial one, because most comets do not approach sufficiently near to the sun to enable their more refractory elements to be volatilized. The bright small comet of 1882 i. (Wells') approached so close to the solar surface that the distance at perihelion amounted to only about 5,000,000 miles. Some of its metallic constituents were accordingly vaporized, the most prominent of them being sodium. The great comet of 1882 iii. approached within 300,000 miles of the sun's surface. This was so near that not only the sodium, but even some of the iron lines appeared in its spectrum. This is what we should have expected, judging by the chemical composition of most of the meteors that reach the earth's surface. We thus see that incidentally comets are able to give us information regarding the temperature that bodies would attain at different distances from the sun. When the metallic lines are present in the spectra of these comets the carbon bands vanish. This is precisely the effect that is produced in our laboratories when the cause of the illumination is an electric current. The current by preference selects the molecules which are the best conductors. If the illumination of the comet were due merely to heat, there is no reason why the carbon bands should have disappeared.

Few persons now living remember distinctly the great comet of 1843. It appeared suddenly in the northern hemisphere about the middle of March, and was not long visible. It was notable for the great length of its tail and its small perihelion distance,— the smallest on record. This amounted to only 511,000 miles. Its centre therefore came within 78,000, and the nearer side of its head within 32,000 miles of the sun's surface.

The great comet of 1858, known generally as Donati's, was a magnificent object. Not only was it a fine comet in itself, but it seems as if everything conspired to enable it to be well seen from the earth. It was a most conspicuous object in the northern sky during the early evenings in October, and was nearest us shortly after the passage of perihelion. Its tail reached a length of 60° and swept as a broad curved plume across the heavens. It was visible for several months, which enabled it to be carefully observed, and there is no doubt but that it moves in an elliptic orbit. Its period is about 2,000 years.

The great comet of 1861 was discovered by Tebbutt in Australia. It appeared suddenly in the northern hemisphere at the end of June and, according to Sir John Herschel, was the brightest comet of the century up to that time. It was not long visible.



THE COMET OF 1882,

The great comet of 1882 was remarkable on many accounts. In the first place it was shown to be one of a group of five comets all following nearly in the same orbit. The four others were those of 1668, 1843, 1880, and 1887. The last was comparatively inconspicuous, but the others were all notable. The nucleus of the comet of 1882 moreover showed a tendency to fall apart, five different condensations in it being visible at once. Schmidt, Barnard, and Brooks all noticed small companion nebulesities in the immediate vicinity of the comet and moving with it. It was visible for about nine months — an unusually long interval, and in this time it traversed 340° of its orbit. It clearly follows an elliptical path with a period which lies between 772 and 1,000 years. The tail was very extraordinary. It measured about 200,000,000 miles in length, and was strongly forked at the end. Moreover it was accompanied by a clearly seen but filmy sheath of light, extending 3° or 4° towards the sun. The whole comet was surrounded by an elliptical envelope of enormous dimensions and of a still more filmy nature. That this most remarkable object was not more generally observed by the public is due undoubtedly to the fact that it was visible only in the early morning hours. It was certainly the brightest comet of the century, and it was so bright that it was watched in perihelion passage until in contact with the sun's limb, when it suddenly disappeared, being of too filmy a nature to be detected upon the sun's surface. For three days it was visible to the naked eye with the sun above the horizon. There have been so far 14 different comets placed on record which were bright enough to be seen under these circumstances.

Turning now to the periodic comets; by far the finest is Halley's. Our first record of it is in the year 11 B.C. Since then it has appeared regularly every 76 or 77 years, in all 25 times. We have a drawing of it as it appeared in 684, and another drawing of it in 1066. During its latter appearance it was considered to be the precursor of the conquest of England by William of Normandy. It was a magnificent object in 1145, and again in 1223, when it was supposed to foretell the death of Philip Augustus of France. In 1456 it was a superb object appearing shortly after the Turks had taken Constantinople. In 1682 it was observed by Halley, who computed its orbit, and showed that it was identical with the great comets of 1531 and 1607, and predicted its return for the end of 1758 or the beginning of 1759. This is the first time that the return of a comet was ever predicted, and although Halley knew that he could not expect to live to see his prediction fulfilled (he was born in 1656), yet he left a somewhat plaintive appeal to posterity, that in case the comet should reappear, it should be remembered that this first prediction was made by an Englishman. The comet appeared Christmas day 1758. At its next appearance, in 1835, the comet was a fine object, but did not correspond in brilliancy to the descriptions of some of its earlier apparitions. This may perhaps be explained by the fact that it was but two years after a sun-spot minimum. Its next appearance is scheduled for 1911 or 1912, also unfortunately very near a sun-spot minimum. But very likely the chief reason for its relative faintness in 1835 is that the material which formed the tail has been largely used up by its frequent visits to the sun, and that it will thus never again present the brilliancy of its past appearances.

The following table of the elements of the orbits of the periodic comets has been condensed and brought up to date (1 Jan. 1904) from Holden's tables of periodic comets given in the 'Encyclopedia Britannica':

TABLE OF THE MOST IMPORTANT PERIODIC COMETS.

T	ω	Ω	i	q	a	U	e	
1901 II. Sept. 15.....	184°	335°	13°	0.34	2.22	3.30	0.85	Encke.
1899 IV. July 28.....	186	121	13	1.35	5.28	5.28	0.54	Tempel II.
1884 II. Aug. 16.....	301	5	5	1.28	3.08	5.40	0.58	Barnard.
1879 I. Mar. 30.....	15	101	29	0.59	3.10	5.47	0.81	Brorsen.
1891 V. Nov. 15.....	107	296	5	1.09	3.13	5.53	0.65	Tempel—L. Swift.
1886 IV. June 7.....	177	54	13	1.33	3.15	5.60	0.58	Brooks.
1898 II. Mar. 20.....	173	101	17	0.92	3.24	5.72	0.72	Winnecke.
1894 IV. Oct. 12.....	297	49	3	1.39	3.25	5.86	0.57	De Vico—E. Swift.
1879 III. May 7.....	160	79	10	1.77	3.30	5.98	0.46	Tempel I.
1892 V. Dec. 11.....	170	207	31	1.43	3.38	6.23	0.58	Barnard.
1890 VII. Oct. 26.....	328	45	13	1.97	3.45	6.40	0.47	Spitaler.
1896 VII. Nov. 25.....	164	247	14	1.11	3.46	6.44	0.68	Perrine.
1896 V. Oct. 26.....	140	192	12	1.48	3.50	6.55	0.58	Giacobini.
1852 III. Sept. 23.....	223	246	13	0.86	3.53	6.62	0.76	Biela (I. and II.).
1893 III. July 12.....	316	52	3	0.99	3.53	6.62	0.72	Finlay.
1897 II. May 24.....	173	146	16	1.32	3.55	6.68	0.63	D'Arrest.
1898 IV. July 5.....	173	206	25	1.60	3.60	6.82	0.56	Wolf.
1900 III. Nov. 28.....	172	196	30	0.93	3.62	6.66	0.74	Giacobini.
1899 II. Apr. 28.....	14	332	21	2.14	3.62	6.87	0.41	Holmes.
1895 II. Aug. 21.....	168	170	3	1.30	3.68	7.06	0.65	L. Swift.
1896 VI. Nov. 4.....	344	18	6	1.96	3.69	7.10	0.47	Brooks.
1894 I. Feb. 10.....	46	84	6	1.15	3.80	7.42	0.70	Denning (II.).
1896 II. Mar. 19.....	201	210	11	1.74	3.85	7.57	0.55	Faye.
1889 VI. Nov. 30.....	70	331	10	1.35	4.18	8.53	0.68	L. Swift.
1881 V. Sept. 13.....	312	66	7	0.72	4.23	8.69	0.83	Denning (I.).
1899 III. May 4.....	207	270	54	1.02	5.74	13.66	0.82	Tuttle.
1866 I. Jan. 11.....	171	231	163	0.98	10.32	33.18	0.90	Tempel.
1867 I. Jan. 20.....	358	78	18	1.58	11.71	40.09	0.86	Stephan.
1852 IV. Oct. 13.....	57	346	41	1.25	15.44	60.7	0.92	Westphal.
1884 I. Jan. 26.....	199	254	74	0.78	17.2	71.56	0.96	Pons-Brooks.
1887 V. Oct. 8.....	65	84	45	1.20	17.4	72.65	0.93	Olbers.
1846. IV. Mar. 6.....	13	78	85	0.66	17.90	75.7	0.96	De Vico.
1835 III. Nov. 16.....	111	55	162	0.59	17.99	76.29	0.97	Halley.

The question is often asked the astronomer, what would happen if the earth should come into collision with a comet? As far as the tail is concerned, that is probably a frequent occurrence. It happened twice during the last

century, in the case of the comets of 1819 ii. and 1861 ii., but in neither case was it known until after the encounter had occurred. Should we come into contact with the head of a small comet there would undoubtedly be a fine meteoric display. That is in fact what probably happened in 1833, and also on a number of previous occasions, notably in 472, 902, 1029, 1202, and 1799, although the comet itself was not luminous. If the comet were moving rapidly with regard to the earth, as in these cases, the meteors would be consumed at a great altitude in our atmosphere, and no harm would be done. If the comet were moving in the same direction as ourselves, however, and at about the same speed, the matter would then become more serious, as many of the meteors might reach the earth's surface.

The self-luminous, and therefore visible comet, which has come nearest to the earth, as far as we are aware, was that of 1770 i. (Lexell's). It approached within 1,400,000 miles, or six times the distance of the moon. Its head appeared about four times the diameter of the moon, but its mass was imperceptibly small. Should the earth strike the nucleus of a great comet, like that, for instance, of 1858, it is impossible to foretell what would happen, but possibly the temperature and shock would be such that all life within several thousand miles of the point of contact would become extinct. Considering the vast recesses of celestial space, however, and the insignificant size of our earth, the probability of such an encounter may well be likened, as someone has suggested, to the chance that if a man should shut his eyes and fire a gun into the air, he would bring down a bird.

For a more detailed account of the individual peculiarities of the more interesting comets, see Clerke's 'History of Astronomy'; Chambers' 'Handbook of Astronomy.'

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Comet, in ornithology, one of a group of humming-birds with long forked tails. One of the most imposing of all humming-birds is the Sappho comet (*Cometes Sappho*), or bar-tailed humming-bird, native to Bolivia, but migratory, and in the winter generally visiting eastern Peru. Specimens are secured only with great difficulty, owing to the rapidity of the complex evolutions of the bird when on the wing. Mounted examples, gorgeous as they are, do not convey an adequate idea of the brilliancy of the plumage. The Phaon comet (*Cometes Phaon*) is equally magnificent, but larger, inhabiting also Peru and Bolivia. It is distinguished from the Sappho comet by the fact that the tail is wholly crimson red, while that of the Sappho comet is ruddy brown at the base and is tipped with a black band. See HUMMING-BIRDS.

Comet-seeker (also called COMET-FINDER), a telescope of low power but optically so contrived as to have a wide field, used in searching for comets.

Cometas, called SCHOLASTICUS, Greek author, generally assigned to the 9th century A.D., although his time is doubtful. There are extant of his works a paraphrase of part of the eleventh chapter of Saint John's Gospel, in 57 hexameter verses, and six epigrams in the Greek Anthology. It appears from some of these epigrams that he made a new recension of the Homeric poems, effecting radical changes for the better in the punctuation. Clemens Alexandrinus refers to a Cometas of Crete as a commentator on Homer. By some he has been identified with the Cometas who was made professor of grammar at Constantinople in 856.

Comète, Pensées sur la, a work by Pierre Bayle, published in 1682, on the occasion of the appearance of the comet of 1680. It is a discussion of various questions of metaphysics, morals, theology, history, and politics, and is written with a boldness of thought unusual in those times. Its general thesis is that atheism is less to be feared than idolatry and superstition.

Comettant, Oscar, French musician, composer, and author: b. Bordeaux 18 April 1819; d. Montivilliers 1898. He was a pupil of Elwart and Carafa at the Conservatoire, and first became known as a pianist; he also wrote several works for the piano, duets for violin and piano, and choruses and songs. Among the piano compositions were 'Robert Bruce' and 'Le Juif Errant'; the vocal included 'L'Alboni' and 'L'Inde Révoltée.' For many years he was musical critic of the *Siècle,* and he was also a contributor to the 'Ménestrel,' the 'Gazette Musicalé,' and other journals of music. A great traveler, he visited the United States and wrote a book of impressions, 'Trois Ans aux Etats-Unis' (1857). Among his further works, most of which are marked by a humorous and brilliant style, are : 'Les Civilisations Inconnues' (1863); 'Le Danemark tel qu'il Est' (1865); 'La Musique, les Musiciens, et les Instruments de Musique' (1870); and 'Francis Planté' (1874).

Comez, or Comes, Juan Baptista, Spanish composer: b. province of Valencia about 1560. He was director of the music at Valencia in the Cathedral and in the Church del Patriarca. His reputation in Spain is very high. His compositions are preserved in manuscript at the Escurial and various churches. A two-volume collection of them appeared at Madrid in 1889.

Comfort, Samuel, American manufacturer: b. Morrisville, Bucks County, Pa., 5 May 1837. He enlisted for the Civil War in an independent cavalry company, subsequently recruited and equipped a cavalry company, and in 1865 was made major and mustered out. After the war he became interested in petroleum refining at Titusville, Pa., his business finally being merged with the Standard Oil Company. He was made representative of the company in western India, with headquarters at Bombay. In 1894–6 he was United States vice-consul, and in 1896–8 consul, at Bombay. He patented several mechanical devices.

Comfort, George Fisk, American scholar and educator: b. Berkshire, Tompkins County, N. Y., 20 Sept. 1833. Graduated from Wesleyan University in 1857, he studied archæology and the history of the fine arts in Europe, in 1865–8 was professor of modern languages and æsthetics in Allegheny College (Meadville, Pa.), and in 1868–72 lecturer on Christian art and archæology in the Drew Theological Seminary (Madison, N. J.). In 1872 he was appointed professor of modern languages and æsthetics in the newly-established Syracuse University, where he organ-

ized the college of fine arts, of which he was dean from 1873 to 1893. He organized the Syracuse Museum of Fine Arts in 1896, and became its director. He was also one of the chief organizers of the American Philological Association, and from 1869 to 1874 its secretary. From 1872 to 1893 he was editor of the art department of the 'Northern Christian Advocate.' He has also contributed extensively to periodicals, and published 'Art Museums in America'; 'Modern Languages in Education,' and other works.

Comfrey, kŭm'frĭ, the common name of the genus *Symphytum* of the natural order *Boraginaceæ* or *Borage* family. There are about 15 species, all natives of the Old World, where they are used in household medicine or for forage plants. Attempts have been made to naturalize them in America for commercial purposes, but the experiments have not given much promise of success. There is but one American species growing wild, *S. officinale,* naturalized from Europe or Asia. It is a coarse perennial weed, from two to three feet high, with flowers in long racemes. The roots are mucilaginous, and are supposed to have medicinal virtues as a cure for diarrhœa. It is known also as blackwort, bruisewort, and boneset. In England the leaves, gathered while young, are sometimes used as a substitute for spinach, and some people of unrefined taste eat the young shoots after blanching them by forcing them to grow through heaps of earth. Comfrey stewed in sugar, with a small amount of paregoric added, makes a highly prized domestic remedy for coughs and bronchial irritations.

Comines, kō-mēn, **Commines,** or **Comynes, Philippe de,** French statesman and historian: b. Comines near Lille 1445; d. Argenton 18 Oct. 1509. He stood high in the favor of Charles of Burgundy, afterward Charles the Bold, and on occasion of Louis XI.'s imprisonment by Charles at Péronne, succeeded in bringing about a treaty of peace between them. In 1472 he forsook the cause of the Duke of Burgundy and became councilor and chamberlain of Louis XI., who compensated him so amply for the loss of his property, which had been confiscated by Charles, that he soon became one of the most wealthy and influential noblemen in France. The death of Louis, however, proved fatal to his fortunes. He was no favorite with Anne de Beaujeu, the regent, and was imprisoned on a charge of conspiracy against her. On the accession of Charles VIII., however, he was again employed in the public service, but went into retirement after the advent of Louis XII., who seemed reluctant to favor him, although he left him in possession of a pension. The fame of Comines rests not only upon his astuteness as a statesman, but still more upon his 'Mémoires,' which give a complete view of the political affairs of his time, and present a vivid picture of the character of Louis XI. They have been frequently printed. Lenglet Dufresnoy's edition (London 1747), is still sought for, especially on account of its annotations; but the best are those published by Mlle. Dupont (Paris 1840–7); and Chantelauze (1881). Comines figures in Sir Walter Scott's romance of 'Quentin Durward.'

Coming Race, The, a story by Edward Bulwer-Lytton, published in 1871. It was a skit at certain assumptions of science; but its clever invention and brilliant treatment, added to the craving wonder of humanity as to what its evolution is to be toward, gave it a large popularity.

Comitat, kŏm'ĭ-tạt (L. *comitatus*), which means county, the name given to administrative districts of some size into which Hungary and Transylvania are divided.

Comitia, kō-mĭsh'ĭ-ạ, with the Romans, the assemblies of the people in which the public business was transacted, and measures taken in conformity with the will of the majority. They existed even under the kings. In the time of the republic they were convoked by the consuls; in their absence often by the dictator, the tribunes, and in extraordinary cases even by the pontifex maximus. There were three comitia among the Romans, which were called *comitia curiata, comitia centuriata,* and *comitia tributa.* The oldest of these was the *comitia curiata,* so called because in it the people voted by *curiæ* or wards. It consisted exclusively of the patricians, the original ruling class at Rome, and the class to which the name of populus was at first restricted. They were divided into three tribes, the Luceres, Ramnes, and Tities, each of which was divided into 10 curiæ, so that there were 30 curiæ who voted in the comitia curiata. The comitia centuriata was a mixed assembly of the patricians and plebeians, in which the people voted by centuries, as these had been formed by Servius Tullius. On the institution of this comitia the principal privileges of the comitia curiata were transferred to it, and in course of time the functions of the latter became a mere formality, so that even before the time of Cicero these were not performed by the curiæ themselves, but by 30 lictors representing them. The rights of the comitia centuriata were thus very important, comprising the right of electing the higher magistrates, the right of passing or rejecting laws proposed to them, the right of deciding upon war on the ground of a *senatus consultum* or decree of the senate, and the highest judicial power. This comitia could be held only on certain days, and it must be summoned 17 days before the day of meeting. On the day of the comitia itself the presiding magistrate, with an augur, went into a tent before the city in order to observe the auspices. If the augur declared them unexceptionable, the comitia was held; if not, it was postponed to another day. Before sunrise and after sunset no business was transacted in the comitia. The presiding magistrate, on his curule chair, opened the assembly by a prayer, which he repeated after the words of the augur. In earlier times, first the equites, then the centuries of the first class, etc., were called upon to vote. In later times lots were cast for the order of voting. The opinion of the century which first voted was usually followed by all the rest. In the earliest times every century voted verbally; in later times by ballot. What was concluded in each century by the majority, was proclaimed by the herald as the vote of this century. The comitia was interrupted if any one in the assembly was attacked by a fit of epilepsy (which was called for this reason *morbus comitialis*), or if a tribune of the people pronounced his veto, and under some other circumstances. The other comitia, the comitia tributa, which was also an institution of Servius Tullius, was essentially plebeian in its nature, for if the patricians were not, as some

think, entirely excluded from it, they were in so small a minority that their influence was scarcely felt. It was based upon the division which Servius Tullius made of the whole Roman territory into 30 local tribes, which were afterward increased to 35. Its power was at first very limited, being merely local, but it gradually increased, so that it in the end it came to possess the right of exercising electoral, legislative and judicial functions, though not so extensive as those of the comitia centuriata. It had the right of electing only the inferior magistrates; legislatively, it was merely entitled to pass resolutions proposed by the tribunes, which before becoming law had to be sanctioned by the senate; judicially, it had the right of trying only those who had committed offenses against the majesty of the people, and the only punishment it could inflict was a fine. It might assemble either within or without the walls of the city, but not at a greater distance than 1,000 paces, which was the limit of the power of the tribunes. The comitia centuriata, on the other hand, always met in the Campus Martius. Sometimes the comitia centuriata was mixed with the comitia tributa, but in what manner it is not known. The emperors retained these assemblies for the sake of appearance, but used them only as instruments for the accomplishment of their purposes.

Comitlan, kō-mēt-lān', or **Comitan,** kō-mē-tān', Mexico, a town in the state of Chiapas, on the Grijalva River, 35 miles southeast of Ciudad Real. It has a magnificent church, and is a place of considerable trade. It is supported chiefly by contraband trade, as the duties on foreign goods are excessive. Pop. 10,000.

Comitium, a square in the ancient city of Rome between the Curia and the Forum, where the comitia curiata (q.v.) met. It contained the original rostrum or speakers' platform.

Com'ity of Nations (more frequently mentioned by its Latin equivalent, *comitas gentium*), the international courtesy by which effect is given to the laws of one State within the territory and against the citizens of another State. "In the silence of any positive rule," says Story, "affirming, or denying, or restraining the operation of foreign laws, courts of justice presume the tacit adoption of them by their own government, unless they are repugnant to its policy or prejudicial to its interests." Consult Story, 'Conflict of Laws.'

Comma, the stroke or mark used in writing and printing to separate from each other phrases and clauses in a sentence. The word is of Greek origin and is the noun of the verb *kopto,* to cut; hence literally comma is section, and in grammatical works written in Greek and Latin *comma* or its diminutive *kommation* means a clause in a period as well as the punctuation mark, and in prosody the cæsura. In German typography the punctuation mark comma is a downward short stroke from right to left (/).

Comma Bacillus. See CHOLERA.

Commagene, kŏm-a-jē'nē, in ancient times a district in the north of Syria, bounded on the east by the Euphrates, on the north by Mount Amanus, and on the west by Cilicia, for some time attached to the kingdom of the Seleucidæ, but afterward for more than 100 years an independent state. It seems to have become independent about 100 B.C., and on the death of its fifth king, Antiochus III., in 17 A.D., it was made a Roman province. It was again for a time allowed by the Romans to hold a position of nominal independence, but was reduced to a Roman province by Vespasian, 73 A.D.

Commander-in-Chief, the supreme commander of the united forces of any country. In the United States the President for the time being is commander-in-chief of the army and navy, and of the militia of the several States when the latter is in the national service and forms part of the national provisional army. In all other cases the governor of each State is the commander-in-chief of the State troops. In England he is officially called the officer commanding-in-chief. He is the head of a department of the military administration. He acts, under the secretary of state for war, as the head of the army, and when military operations are undertaken on a sufficiently large scale to require his presence, is charged with the duty of commanding the army in the field, though, as a matter of fact, this very rarely occurs.

Commander Islands, two islands belonging to Russia lying east of Kamchatka in Bering Sea. The larger, Bering Island (q.v.), lies nearest the coast; the other island of the group, Miedni, is nearly 30 miles long but narrow; it is sometimes called Copper Island, because copper is found there in small quantities. The climate is mild and there are a few inhabitants.

Commander of the Faithful, a title assumed by the Caliph Omar, and retained by his successors. See CALIPH.

Comman'dery. (1) Among the Knights Templar, Hospitallers, etc., a district under the administration and control of a member of the order, called the commander or preceptor, who received the income of the estates within that district, expending part for his own use, and accounting for the rest. In England more especially applied to a manor belonging to the Knights Hospitallers or Knights of St. John of Jerusalem. These establishments formed at the same time branches. . . . On the first creation of these (branch) establishments, they were denominated Preceptories; the superior being called the preceptor; but eventually the name became changed to that of commandery, by which they were always afterward known. The council reserved to themselves the power of at any time recalling a commander from his post, and substituting another in his place, at their pleasure; he being merely considered as the steward of their property. Time, however, gradually wrought a great change in the relative position which the commanders held to the council; and, eventually, a nomination to a commandery came to be considered in the light of a legal acquisition, subject only to the payment of a certain amount of annual tribute to the public treasury, which tribute received the name of Responsions. (2) A regular assembly of Knights Templar, which confers certain degrees. Consult 'History of Knights of Malta.'

Commandite, kŏm-mŏn-det', a term used in France, primarily for a partnership or firm, in which one advances the funds, while another devotes his skill and assiduity; but by extension, a co-partnery en commandite oftener means a

company for manufacturing or trading, "with limited liability." In terms of French commercial law, those whom we would call the sleeping partners or silent partners in such associations are denominated commanditaires. Their names do not appear in the nominal title of the firm; they may assist it with their counsel, but they cannot order or sign for its behoof, nor act overtly for it in any way; on the other hand, they are not bound to incur a final loss in case of its failure, beyond that of the entire sum they have advanced, should indeed such be needed to satisfy the claims of agents and creditors. For all details on the rights and obligations of commanditaires, see the French 'Code de Commerce,' articles 23–28.

Commelin, kŏm-lăn, **Casper,** Dutch botanist; d. 1731. He was a nephew of Jan Commelin (q.v.).

Commelin, Hieronymus, hī-ē-rŏn'ĭ-mŭs. See COMMELIN, JEROME.

Commelin, Isaac, Dutch historian: b. Amsterdam 1598; d. there 1676. Among his works the history and description of Amsterdam is still much valued.

Commelin, Jan, yän, Dutch botanist: b. Amsterdam 1629; d. 1692. He was for many years a professor of botany in the university of his native city, where with his nephew, Casper, he founded the botanical gardens renowned throughout Europe.

Commelin, Jerome, Flemish printer: b. Douay; d. Heidelberg 1598. He was distinguished by his excellent editions of Greek and Latin classics. His emblem is a figure of Truth, and on many editions the words *Ex Officina Sanct. Andreana.*

Commelin, kŏm'mĕ-lĭn, **or day-flower,** is a genus of the spiderwort family (*Commelinaceæ*). It contains about 95 species widely distributed in warm and temperate zones. There are about eight species found in the United States, along streams and in waste places, from New Jersey to Missouri, southward to Florida and Texas. It is also common in Asia and Africa. The fleshy rhizomes of the plant may be eaten when cooked, as they contain much starch and mucilage. In Asiatic countries some species are used for medicinal purposes. The plant receives its name from Jan and Casper Commelin, two noted Dutch botanists.

Commencement. In the colleges of the United States this term denotes the day when the students are made bachelors of arts, and when the degree of master of arts and the honorary degrees of doctors in the professions are also conferred. The term is given also to the closing exercises of secondary and even elementary schools.

Commendam, kŏm-mĕn'dăm (Lat. *commendare,* that is, to intrust), used in ecclesiastic law to denote the administrative or provisional management of a benefice during a vacancy. The person intrusted with the management is called *commendator.* The grant or benefice was sometimes converted into a regular fief and was then said to be in *perpetuam commendam.* The practice gave rise to great abuses, and is now almost unknown.

Commensal, kŏm-mĕn'sal (Lat. *con,* together, and *mensa,* a table), literally, a messmate. This term is applied in zoology to animals which live on or in other animals for part or the whole of their life, simply sharing the food of their host without being parasitic on him: thus the pea-crabs live within the cavity of shell-fish, and find their food in the water introduced for the benefit of their host. There are various forms or degrees of commensalism. Sometimes the relation is more or less accidental, and of little, if any, use to either organism, or again it may be advantageous in a greater or less degree to one of the animals only, or yet again both host and guest may be benefited. In still higher cases the guest is, as it were, not only welcomed, but invited and induced to cling to a host. See SYMBIOSIS.

Commen'salism, the intimate connection or partnership between animals of quite different affinities; thus commensals, messmates, or fellow-boarders take up their abode together for their mutual benefit. A good example is a large sponge, whose canals and passages shelter innumerable worms, crustacea, etc., which lodge there without expense to their host. Floating jellyfish shelter certain pelagic crustaceans (*Hyperina*) and little fishes. The oyster-crab (*Pinnotheres*) is a typical case of commensalism; it does no harm to the oyster or mussel in whose shell it lives, and which protects it from danger; while, as the result of its sheltered life, its shell is soft and thin. The pearl-oyster, besides taking in a *Pinnotheres* as a boarder, admits a kind of shrimp. Certain small slender, eel-like fishes (*Fierasfer*) insinuate themselves into the body of holothurians, which also keeps open house for *Pinnotheres* and shrimps; hence a holothurian has been compared to a hotel with its *table d'hôte.* Other crustaceans board in different animals; thus a little crab (*Fabia chilensis*) lodges in the end of the intestine of a sea-urchin; another (*Porcellana*) lives on the Brazilian coast in a starfish. Polyps and corals shelter various species of crabs, snails, etc., all being of the same color, while a crinoid (*Comatula*) takes in as a permanent lodger a decapod crustacean (*Galathea*). Hermit crabs, taking up their abode in an empty snail-shell, are obliged to admit a variety of intruders who come to stay. Certain mollusks live in starfishes and other echinoderms and, as the result of their semi-parasitic life, become more or less modified and degenerate. Thus *Stylina* lives on a crinoid (*Comatala*); a species of *Stilifer* becomes encysted on the rays of a starfish (*Linckia*), and on the underside of the arms of the same *Linckia* lives a limpet-like snail (*Thyca*), while *S. astericola* lives in the body of a Bornean starfish, and so on with a number of similar cases. Ascidians throw their "front hall" (*atrium*) wide open to a variety of forms, such as small worms, polyps, mollusks, crustaceans of different orders, sea-spiders, brittle-stars. The "Venus flower-basket," a silicious sponge of the Philippine Islands, gives shelter to three different kinds of crustaceans: a prawn, a *Pinnotheres,* and an isopod.

Rising to the higher animals there occurs on an island off the New Zealand coast the case of the interesting lizard "tuatara," which shares its deep burrows with a petrel, though the latter

may at times be the work of the bird. Each builds its nest on opposite sides of the chamber, the lizard almost invariably choosing the right, and the petrel the left side. The former sits with its head close to the entrance ready for any attack; it feeds partly on worms and beetles, and in part on the remains of fishes and crustaceans brought to their common table by the petrel.

By far the most numerous assemblage of messmates are the different kinds of beetles and other insects which live in ants' nests, the number of kinds of which amount to upward of 1,500. See ANT; COCKROACH; SYMBIOSIS.

Commen'surable, among geometricians, an appellation given to such quantities or magnitudes as can be measured by one and the same common measure. Commensurable numbers, whether integers or fractions, are such as can be measured or divided by some other number without any remainder; such are 12 and 18, as being measured by six or three.

Com'mentary, a term used (1) in the same sense as memoirs, for a narrative of particular transactions or events, as the 'Commentaries' of Cæsar. (2) A series or collection of comments or annotations. These may either be in the form of detached notes, or may be embodied in a series of remarks written and printed in a connected form.

Commentry, kō-mäṅ-trē, France, a town in the department of Allier, eight miles south-east of Montluçon, in the midst of a vast coal field, to which the town owes its prosperity. There are important iron works in the vicinity. Pop. 9,200.

Commerce, a term which in its primary significance relates to an interchange of goods, merchandise or property of any kind. In its usual acceptance it relates to interchange of merchandise between countries or different parts of a country, distinguished respectively as "foreign commerce" and "internal commerce"; the commerce between the United States and other countries, for example, being of the class designated foreign commerce, that between the Atlantic seaboard and the Mississippi valley or the Pacific coast, internal commerce.

The earliest form of interchange was naturally that of man with his neighbor, the exchange of the products of the chase for those of the soil or of natural products for those ready for use; and when this was a mere exchange of article for article, and passed from hand to hand, it is more properly designated by the word "barter." But with the utilization of a common measure of value by which goods were purchased, usually to be sold again, the transactions are called commerce, especially when they occur between citizens of different localities. Among the early examples of commerce is that of the Phœnicians with the people and cities scattered along the coast of the Mediterranean, the caravans carrying the silks and spices of the far East to the Mediterranean countries, and later the markets and great fairs of the Middle Ages. With the introduction of a common and generally accepted measure of value, money, arose the class of middlemen, or merchants, who purchased the goods offered for sale and resold them. Following this came the establishment of trade centres, and when states or countries were formed and duties collected on goods entering or leaving them, a record of the international commerce began to be established. In England there is a record of commerce as early as the year 1355, in which the imports are reported at 120,000 pounds sterling and the exports at 294,000 pounds sterling; in 1573, imports, 2,100,000 pounds sterling, and the exports, 1,180,000 pounds sterling; in 1701, imports, 5,900,000 pounds sterling, and exports, 6,900,000 pounds sterling. In France official returns date continuously from 1716, the annual average of imports for that year to 1720, being 65,000,000 francs, exports, 1,050,000,000 francs. Mulhall presents figures of the commerce of 12 European countries in 1720, making the total recorded commerce of Europe for that date 62,000,000 pounds sterling; that of Spanish-America, 10,000,000 pounds sterling; India, 9,000,000 pounds sterling; British colonies, 2,000,000 pounds sterling; and "various," 5,000,000 pounds sterling, thus making the total recorded commerce of the world at that date 88,000,000 pounds sterling, or $428,252,000 of imports and exports combined. Accepting his figures as probably the best approximation possible for the earlier dates when official records of commerce of many of the countries were not available, the international commerce of the world from 1720 to 1900, including both imports and exports, may be stated as follows:

Year	Total Commerce	Year	Total Commerce
1720.....	$ 428,000,000	1850.....	$ 4,049,000,000
1750.....	681,000,000	1860.....	7,246,000,000
1780.....	905,000,000	1870.....	10,662,000,000
1800.....	1,470,000,000	1880.....	14,760,000,000
1820.....	1,660,000,000	1890.....	17,519,000,000
1830.....	1,980,000,000	1900.....	20,715,000,000
1840.....	2,788,000,000		

It will be seen from the above figures that by far the most rapid growth has occurred in the last half of the 19th century, the increase in the 80 years from 1720 to 1800 being, in round terms, but one billion dollars, and that of the 50 years from 1800 to 1850 but two and a half billions, while that of the 50 years from 1850 to 1900 was 16 billions. Meantime values of merchandise of all kinds have greatly decreased, so that the increase in the volume of merchandise exchanged is really much greater than that indicated by the mere figures of value. This increase is chiefly due to the facilities for transportation and communication which were developed in the later period. At the beginning of the 19th century there were no railroads to carry the products of the interior to the seaboard, no steam vessels to carry them from continent to continent, and no telegraphs for intercommunication. In 1850 there were but 24,000 miles of railway in the world, and this consisted of fragmentary lines not furnishing continuous communication for considerable distances; the steam vessels of the world had a tonnage of less than 1,000,000 tons; the land telegraph lines were but 5,000 miles in length, and the submarine cables of the world, 25 miles. In 1903 the railroads of the world are 500,000 miles in length, and have been brought into such relation that they furnish great through transportation systems from the interior of continents to the water's edge; the steam vessels of the world have a tonnage of 17,000,000 tons; the land telegraphs are 1,200,000 miles in length, and the submarine cables 200,000 miles. With this enormous increase in steam-carrying power on land and sea have come great reduction in charges

for transportation, a great increase in the currency of the world, and such improvements in its financial systems as to greatly facilitate international commerce.

FOREIGN COMMERCE OF THE PRINCIPAL COUNTRIES OF THE WORLD, 1900.

Year	Countries	Imports (000 omitted)	Exports (000 omitted)	Excess of exports (+) or imports (—) (000 omitted)
		Dollars	Dollars	Dollars
1901	Argentina	109,971	161,846	+ 51,875
1900	Australia	*a*201,125	*a*223,477	+ 22,352
1901	Austria-Hungary	325,486	382,748	+ 57,262
1901	Belgium	428,651	352,839	— 75,802
1901	Bolivia	7,561	16,760	+ 9,199
1901	Bulgaria	13,519	15,975	+ 2,456
1901	Brazil	96,175	197,687	+ 101,512
1900	British colonies, n. e. s. *e*	*dd*400,595	*dd*283,732	— 116,863
1901-2	Canada	196,480	172,611	— 23,869
1901	Chile	50,845	62,723	+ 11,878
1901	China	190,763	120,626	— 70,137
1898	Colombia	10,695	18,487	+ 7,792
1901	Costa Rica	4,411	5,793	+ 1,382
1901	Cuba	66,584	63,278	— 3,306
1901	Denmark	106,371	78,290	— 28,081
1900	Ecuador	6,541	7,509	+ 968
1901	Egypt	75,356	77,754	+ 2,398
1901	France	843,254	774,498	— 68,756
1901	German Empire	1,290,254	1,054,685	— 235,569
1901	Greece	26,782	18,100	— 8,862
1900	Guatemala	3,127	1,212	— 1,915
1900-1	Honduras	2,047	3,036	+ 989
1901-2	India, British	264,319	403,805	+ 139,486
1900	India, French	36,576	30,513	— 6,063
1901	India, Dutch	86,895	98,723	+ 11,828
1901	Italy	331,592	264,429	— 67,163
1901	Japan	127,397	125,670	— 1,727
1900-1	Mexico	*f*65,084	*f*77,307	+ 12,223
1901	Netherlands	818,377	695,762	— 122,615
1901	New Zealand	55,267	53,779	— 1,488
1900-1	Nicaragua	3,445	3,888	+ 443
1901	Norway	76,981	41,456	— 35,525
1900	Paraguay	1,839	2,064	+ 225
1900	Peru	11,276	21,890	+ 10,614
1901	Philippine Isds.	30,162	24,503	— 5,659
1901	Portugal	62,449	30,545	— 31,904
1901	Rumania	56,440	68,289	+ 11,849
1901	Russia	*s*269,493	*s*375,726	+ 106,233
1901	Servia	8,460	12,677	+ 4,217
1901	Siam	13,626	21,211	+ 7,585
1901	Spain	*dd*182,076	*dd*152,575	— 29,501
1901	Sweden	*dd*123,195	*dd*94,736	— 28,459
1901	Switzerland	194,142	159,984	— 34,158
1899	Turkey	117,134	59,072	— 58,062
1901	United Kingdom	2,540,264	1,362,727	—1,177,537
1901-2	United States *q*	*q*903,321	*q*1,355,482	+ 452,161
1901	Uruguay	24,498	28,674	+ 4,176
1898	Venezuela	*dd*8,560	*dd*14,900	+ 6,340
	Total	10,869,458	9,674,063	—1,195,395

a Exclusive of commerce between the Australasian colonies, but inclusive of precious metals.
dd Including bullion and specie.
e Except Australasia, Canada, and British India.
f Includes imports and exports of precious metals, namely, $2,618,000 and $44,271,000, respectively.
h Includes dependencies.
q Figures for 30 June 1902.
s Trade over the European frontier only.

With this increase of facilities for transporting the products of the interior to the seaboard and from continent to continent came a great increase in production and a reduction in cost of both production and transportation, and this reduction in cost to the consumer was followed by a great increase in the quantity and variety of the articles utilized by man, for food, clothing, and in household and business affairs. The per capita of the world's international commerce is now about six times as great in value as a century ago, having been about $2.35 per capita in 1800 and $13.25 per capita in 1900, while the reduction in prices meantime indicates that the quantity represented by the per capita figures of 1900 is probably 20 times as great as that represented by those of 1800.

The commerce of the world at the latest available date, including all countries for which statistics are available, is given by the bureau of statistics of the treasury department in the table which follows, the figures being in most cases for the year 1901. It will be noted that, although the exports of one country always become the imports of some other country, the figures of total imports exceed those of total exports. This is accounted for in part by the fact that the cost of transportation is added in many cases to the stated value of the merchandise when it becomes an importation, while the fact that revenues are more generally collected on imports than on exports probably results in a more nearly complete record of the imports than of the exports.

United States Commerce.— The official record of the foreign commerce of the United States begins with the year 1790. During the existence of the Colonies the most of their commerce was with Great Britain, and during the period of confederation each State regulated its own commerce. It was not until the beginning of the present form of government that satisfactory statements of the foreign commerce of the United States became available. A record of the exports of the Colonies to Great Britain from 1697 to 1790, compiled by Mr. Charles H. Evans, shows a total of 279,852 pounds sterling, or $1,362,000 of exports from all the Colonies to Great Britain in 1697; 415,650 pounds sterling, or $2,023,000; in 1725, 814,766 pounds sterling, or $3,965,000 in 1750; 1,105,170 pounds sterling, or $5,403,000 in 1763; 1,373,846 pounds sterling, or $6,685,000 in 1774. In 1790, the first record under the Constitution, the total imports of the United States were $23,000,000, and the exports $20,205,156. The period of wars in Europe which began during that decade increased the figures of the commerce of the United States greatly, by reason of the fact that merchandise from the British, French, and Dutch colonies, although subject to seizure under the blockades if passing from the colony to the mother country, was not subject to seizure if first brought to the United States by American vessels, entered as an import and then sent forward to its destination as an export from the United States. Goods from those countries destined for their colonies sometimes also evaded the blockades by a similar process. As a result, the figures of both imports and exports of the United States from 1769 to 1807 showed during that period exports of foreign merchandise actually in excess of exports of domestic merchandise, while exports of foreign merchandise are now less than 2 per cent of the total exports. The domestic exports, which were $18,500,000 in 1791, never reached as much as $50,000,000 until 1819, and did not reach $100,000,000 until 1835. In 1854 they for the first time exceeded $200,000,000, and in 1860 for the first time passed $300,000,000. In 1871 they for the first time exceeded $400,000,000, but from that time rapidly increased, being over $800,000,000 in 1881, more than $1,000,000,000 in 1892, and since 1897 have never been below the $1,000,-

000,000 limit, the highest figure reached being in 1901, $1,460,462,806.

This rapid increase in exportations, beginning with 1870, was coincident with the opening up of the interior by railroads, and the development of the manufacturing industry. In 1870 there were 52,992 miles of railway in the country; the number of farms was 2,659,985, and the gold value of their products, $1,958,030,927, while the value of the manufactures of the country was $4,232,325,442, and the exports of manufactures but $68,279,764. In 1880 the number of miles of railway was 93,262, having nearly doubled in 10 years; the number of farms, 4,008,907, and the value of their products, $2,212,540,927; while the value of the manufactures was $5,369,579,191. In 1890 the number of miles of railroad was 166,654, the number of farms 4,564,641, the value of farm products $2,460,107,454, and the value of the manufactures $9,373,437,283. In 1900 the number of miles of railroad was 194,321, the number of farms 5,739,657, and the value of their products $3,764,177,706; while the value of manufactures had reached $13,039,279,566. During this period of 30 years in which the number of miles of railroad nearly quadrupled, the value of farm products doubled, the value of manufactures more than trebled, the exports of agricultural products grew from $361,188,483 in 1870 to $835,858,123 in 1900, and those of manufactures grew from $68,279,704 to $433,851,759, manufactures forming but 15 per cent of the total exports in 1870 and 31 per cent in 1900. The result of this rapid growth in exports is that the United States, which in 1870 stood fourth in the list of the world's exporting nations, being surpassed by the United Kingdom, Germany, and France, was in 1901 at the head of the list, the domestic exports of the United States in that year exceeding those of any other country. The imports into the United States usually exceeded the exports prior to the great increase in exports which began with 1870. In 1874 the exports began to exceed the imports, and have so continued during nearly the entire period since that date. There was during that period, however, a comparatively slow but steady growth in imports, from $436,000,000 in 1870 to $668,000,000 in 1880, $789,000,000 in 1890, and $850,000,000 in 1900, and in 1902 they for the first time exceeded $900,000,000. This growth is largely due to the increased demand for manufacturers' materials, the imports of which in 1870 amounted to $120,000,000 and formed 28 per cent of the total imports, and in 1902 amounted to $418,000,000 and formed 46 per cent of the total imports. This increase in manufacturers' materials imported is chiefly in articles not produced in the United States, such as raw silk, hemp, jute, rubber, tin, etc.

The foreign commerce is chiefly with Europe but is growing rapidly with other parts of the world. In 1880 55 per cent of the imports were from Europe, and 86 per cent of the exports went to Europe. In 1902 53 per cent of the imports were from Europe, and 73 per cent of the exports went to that continent. The exports to Asia and Oceanica have increased from $14,000,000 in 1870 to $116,000,000 in 1902, including in this statement the shipments to the Hawaiian Islands, which are not now stated as exports, but which should be so included in a comparative statement of this character. The commerce with the Hawaiian Islands, the Philippine Islands, and Porto Rico has grown rapidly since their annexation to the United States, the total imports from those islands having increased from $20,252,563 in 1897, to $39,610,551 in 1902, and the exports to them, from $6,733,530 in 1897, to $34,971,311 in 1902.

The tables which follow show the annual average of imports and exports in each decade from 1790 to 1900, and the total imports and exports for each fiscal year from 1790 to 1902. They are from the annual publications of the Bureau of Statistics, and are thus the official record of the foreign commerce of the United States.

COMMERCE OF 1901 AND 1902 COMPARED WITH AVERAGE OF DECENNIAL PERIODS, 1790 TO 1900.

Ten-Year Periods	Annual Average of Ten-Year Periods of		Annual Average of Excess of	
	Imports	Exports	Imports	Exports
	Dollars	Dollars	Dollars	Dollars
1790–1800	59,184,545	46,774,236	12,410,309	.....
1801–1810	92,766,351	74,531,506	18,234,845	.....
1811–1820	80,811,927	58,989,222	21,822,705	.....
1821–1830	72,948,879	69,431,024	3,517,855	.....
1831–1840	119,520,679	103,550,201	15,970,478	.....
1841–1850	118,094,779	119,554,936	.....	1,460,157
1851–1860	284,475,036	248,887,460	35,587,576	.....
1861–1870	331,867,029	254,326,410	77,540,619	.....
1871–1880	535,221,512	589,300,719	.....	54,079,207
1881–1890	692,186,522	765,135,498	.....	72,948,976
1891–1900	763,327,858	1,024,869,210	.....	261,541,352
1901.....	823,172,165	1,487,764,991	.....	664,592,826
1902.....	903,320,948	1,381,719,401	.....	478,398,453

HISTORICAL TABLE.— TOTAL VALUE OF IMPORTS AND EXPORTS OF MERCHANDISE INTO AND FROM THE UNITED STATES, 1790–1903.

Fiscal Year*	Imports	Exports	Excess of imports (roman) or exports (italics).
	Dollars	Dollars	Dollars
1790.....	23,000,000	20,205,156	2,794,844
1791.....	29,200,000	19,012,041	10,187,959
1792.....	31,500,000	20,753,098	10,746,902
1793.....	31,100,000	26,109,572	4,990,428
1794.....	34,600,000	33,043,725	1,556,275
1795.....	69,756,268	47,989,872	21,766,396
1796.....	81,436,164	58,574,625	22,861,539
1797.....	75,379,406	51,294,710	24,084,696
1798.....	68,551,700	61,327,411	7,224,289
1799.....	79,069,148	78,665,522	403,626
1800.....	91,252,768	70,971,780	20,280,988
1801.....	111,363,511	93,020,513	18,342,998
1802.....	76,333,333	71,957,144	4,376,189
1803.....	64,666,666	55,800,033	8,866,633
1804.....	85,000,000	77,699,074	7,300,926
1805.....	120,600,000	95,566,021	25,033,979
1806.....	129,410,000	101,536,963	27,873,037
1807.....	138,500,000	108,343,150	30,156,850
1808.....	56,990,000	22,430,960	34,559,040
1809.....	59,400,000	52,203,233	7,196,767
1810.....	85,400,000	66,757,970	18,642,053
1811.....	53,400,000	61,316,832	*7,916,832*
1812.....	77,030,000	38,527,236	38,502,764
1813.....	22,005,000	27,856,017	*5,851,017*
1814.....	12,965,000	6,927,441	6,037,559
1815.....	113,041,274	52,557,753	60,483,521
1816.....	147,103,000	81,920,052	65,182,948
1817.....	99,250,000	87,671,569	11,578,431
1818.....	121,750,000	93,281,133	28,468,867
1819.....	87,125,000	70,142,521	16,982,479
1820.....	74,450,000	69,691,669	4,758,331
1821.....	54,520,834	54,596,323	*75,489*
1822.....	79,871,695	61,350,101	18,521,594
1823.....	72,481,371	68,326,043	4,155,328
1824.....	72,169,172	68,972,105	3,197,067
1825.....	90,189,310	90,738,333	*549,023*
1826.....	78,093,511	72,890,789	5,202,722
1827.....	71,332,938	74,309,947	*2,977,009*
1828.....	81,020,083	64,021,210	16,998,873
1829.....	67,088,915	67,434,651	*345,736*
1830.....	62,720,956	71,670,735	*8,949,779*
1831.....	95,885,179	72,295,652	23,589,527

Fiscal Year*	Imports	Exports	Excess of imports (roman) or exports (italics)
	Dollars	Dollars	Dollars
1832	95,121,762	81,520,603	13,601,159
1833	101,047,943	87,528,732	13,519,211
1834	108,609,700	102,260,215	6,349,485
1835	136,764,295	115,215,802	21,548,493
1836	176,579,154	124,338,704	52,240,450
1837	130,472,803	111,443,127	19,029,676
1838	95,970,288	104,978,570	*9,008,282*
1839	156,496,956	112,251,673	44,245,283
1840	98,258,706	123,668,932	*25,410,226*
1841	122,957,544	111,817,471	11,140,073
1842	96,075,071	99,877,995	*3,802,924*
1843	42,433,464	82,825,689	*40,392,225*
1844	102,604,606	105,745,832	*3,141,226*
1845	113,184,322	106,040,111	7,144,211
1846	117,914,065	109,583,248	8,330,817
1847	122,424,349	156,741,598	*34,317,249*
1848	148,638,644	138,190,515	10,448,129
1849	141,206,199	140,351,172	855,027
1850	173,509,526	144,375,726	29,133,800
1851	210,771,429	188,915,259	21,856,170
1852	207,440,398	166,984,231	40,456,167
1853	263,777,265	203,489,282	60,287,983
1854	297,803,794	237,043,764	60,760,030
1855	257,808,708	218,909,503	38,899,205
1856	310,432,310	281,219 423	29,212,887
1857	348,428,342	293,823,760	54,604,582
1858	263,338,654	272,011,274	*8,672,620*
1859	331,333,341	292,902,051	38,431,290
1860	353,616,119	333,576,057	20,040,062
1861	289,310,542	219,553,833	69,756,709
1862	189,356,677	190,670,501	*1,313,824*
1863	243,335,815	203,964,447	39,371,368
1864	316,447,283	158,837,988	157,609,295
1865	238,745,580	166,029,303	72,716,277
1866	434,812,066	348,859,522	85,952,544
1867	395,761,096	294,506,141	101,254,955
1868	357,436,440	281,952,899	75,483,541
1869	417,506,379	286.117,697	131,388,682
1870	435,958,408	392,771,768	43,186,640
1871	520,223,684	442,820,178	77,403,506
1872	626,595,077	444,177,586	182,417,491
1873	642,136,210	522,479,922	119,656,288
1874	567,406,342	586,283,040	*18,876,698*
1875	533,005,436	513,442,711	19,562,725
1876	460,741,190	540,384,671	*79,643,481*
1877	451,323,126	602,475,220	*151,152,094*
1878	437,051,532	694,865,766	*257,814,234*
1879	445,777,775	710,439,441	*264,661,666*
1880	667,954,746	835,638,658	*167,683,912*
1881	642,664,628	902,377,346	*259,712,718*
1882	724,639,574	750,542,257	*25,902,683*
1883	723,180,914	823,839,402	*100,658,488*
1884	667,697,693	740,513,609	*72,815,916*
1885	577,527,329	742,189,755	*164,662,426*
1886	635,436,136	679,524,830	*44,088,694*
1887	692,319,768	716,183,211	*23,863,443*
1888	723,957,114	695,954,507	28,002,607
1889	745,131,652	742,401,375	2,730,277
1890	789,310,409	857,828,684	*68,518,275*
1891	844,916,196	884,480,810	*39,564,614*
1892	827,402,462	1,030,278,148	*202,875,686*
1893	866,400,922	847,665,194	18,735,728
1894	654,994,622	892,140,572	*237,145,950*
1895	731,969,965	807,538,165	*75,568,200*
1896	779,724,674	882,606,938	*102,882,264*
1897	764,730,412	1,050,993,556	*286,263,144*
1898	616,049,654	1,231,482,330	*615,432,676*
1899	697,148,489	1,227,023,302	*529,874,813*
1900	849,941,184	1,394,483,082	*544,541,898*
1901	823,172,165	1,487,764,991	*664,592,826*
1902	903,320,948	1,381,719,401	*478,398,453*
1903	1,001,596,683	1,414,786,954	*413,190,271*
Total	34,255,140,956	37,859,980,715	*3,602,839,759*

Note.— Figures include specie prior to 1821.
*Fiscal year ended 30 September prior to 1843; since that date 30 June.

In 1903 a Department of Commerce and Labor was created by the Congress of the United States, its chief officer to be a member of the cabinet, the province and duty of the department being to "foster and develop the foreign and domestic commerce, the mining, manufacturing, shipping, and fishery industries, the labor interests, and the transportation facilities of the United States." The Bureau of Statistics, Bureau of Navigation, Steamboat Inspection Service, Light House Establishment, Coast and Geodetic Survey, Bureau of Standards, Bureau of Immigration, Department of Labor, Census Office, and Fish Commission were transferred from other departments to the Department of Commerce and Labor; also the Bureau of Foreign Commerce of the State Department, which was consolidated with the Bureau of Statistics; and two new bureaus, Bureau of Corporations and a Bureau of Manufactures, created as a part of the department. Hon. George B. Cortelyou, former secretary to the President, was nominated by the President and confirmed by the Senate as the secretary of Commerce and Labor. The other governments which have similar governmental organizations devoting their attention to commerce are Germany, France, Belgium, Austria-Hungary, Spain, Portugal, Italy, and the United Kingdom; the organization of the latter being designated the Board of Trade, its president, however, being a member of the cabinet.

Oscar P. Austin,
Treasury Dep't, Washington, D. C.

Commerce, a card game in which each player contributes an equal sum to the pool, and a full pack of cards is dealt to the players. The eldest hand, that is, the one who received the first card on the left of the dealer, then exchanges one of his cards with his left hand player, who, in turn, exchanges one with his left hand player, and so on, until some one finds that his hand consists entirely of cards of one suit, when he calls out "My Ship Sails." Aces count 11, court cards 10, the rest according to "pips." Each player, through all the exchanges, is aiming to hold a tricon, three cards alike; a sequence, three following each other in the same suit; or a point, the smallest number of pips on three cards. The winner of the pool is the player who has the highest tricon, or, if none is displayed, the highest sequence, or in its place the holder of the best point. See Cassell, 'Book of Pastimes.'

Commerce, Chambers of. See Chambers of Commerce.

Commerce, Interstate. The colonies, under the lead of Massachusetts, early attempted to provide roads; yet for more than two hundred years nothing existed in this country that by any stretch of the imagination could be called a postal service. The only carriers of commerce for nearly two hundred years after the first settlers sought these shores were the simple sailing vessels, that crossed the ocean only at the greatest hazard. Courageous attempts to navigate the ocean waters and the almost unknown rivers and lakes were numerous before 1800, and canals, even, were attempted. It can hardly be said, however, that anything deserving the name of interstate commerce existed in this country at the beginning of the 19th century, since at that time the total effects of the government were transported from Philadelphia to Washington in a frail sloop, and President John Adams and his wife lost their way, as tradition has it, in the woods beyond Baltimore, as they proceeded in their carriage toward the new capital. The Alleghanies constituted an almost impassable barrier between the East and the West, and such necessary products as the colonists could not obtain in their immediate neighborhoods were mostly brought from over seas.

There was another difficulty in the way of trade. The high price of labor rendered it impossible to manufacture linen, cotton, or woolen cloth, except at a cost 20 to 50 per cent greater than the same stuffs could be turned out for in England. The trade of New Hampshire was principally in lumber and fish, which were exported. In Massachusetts a little wool and flax were worked into a coarse cloth, and a few hats were made, but it was cheaper to import them. In the province of New York the export of furs, whalebone, oil, pitch, tar, and provisions included everything. So it was in New Jersey. Virginia produced nothing for intercolonial trade. Tobacco was a permanent staple, but it became chiefly an export. The early colonists were inevitably sailors. Therefore a considerable coasting trade grew up, but there were no means of internal transportation except by wagons and the rude craft plying the natural waterways. In spite of this the Constitution, which went into operation 4 March 1789, embraced the right to regulate domestic commerce,—a right not conferred by the previous Articles of Confederation,—and from that year one may find exhibits of the tonnage employed in the coastwise trade. In 1789 this tonnage was 78,607; in 1812 it was 477,971.

The Americans of those early times had only a vague knowledge of the country west of the Allegheny mountains; yet the hardy settlers along the coast soon beat out for themselves paths to this unknown region. The act to provide for the Cumberland road was passed March 29, 1806, and the first stage-coach driven from Cumberland to Wheeling in 1818. The length of the line first opened was 130 miles, and its cost $1,700,000. In those years, too, were tried the first experiments with steam-craft. Livingston and Fulton built the Clermont in 1807, and Fulton claimed under his patent a monopoly of transportation on the Hudson and other rivers. His claim was carried to the courts and defeated, so that after 1815 the rivers of the country were free to steam-vessels. In 1812 steamboats made their appearance on the western rivers. The first craft, the New Orleans, built at Pittsburg by Fulton at a cost of $40,000, a stern-wheeler of between 300 and 400 tons, put out for New Orleans. Others followed, but none proved able to ascend the river, until 1815, when the Enterprise, a stern-wheeler of 70 tons, made the trip from New Orleans to Cincinnati in 28 days. It was later than this, again, that steamships came gradually to ply up and down the coast.

The first charter for canal building was granted to the James River Company by the legislature of Virginia in 1785. Another of these projects was the Dismal Swamp Canal, begun in 1787, under a joint charter from Virginia and North Carolina, and opened in 1794. The owners of its stock included George Washington and Patrick Henry, and it was originally designed to facilitate the movement of lumber out of the Dismal Swamp. The Chesapeake and Ohio Canal, the Delaware and Chesapeake Canal, and the Union Canal, of Pennsylvania, intended to connect the Delaware and Susquehanna rivers, were only forerunners of the Erie Canal, 363 miles long, completed in 1825. A canal from Lake Champlain to the Hudson River was completed in 1823. On the opening of the Erie Canal the cost of freight fell, according to its class, all the way in amount from $15 to $25 per ton, and the time of transit from 20 to eight days. Wheat was worth $33 per ton in western New York, and it did not pay to send it to market, down the Susquehanna to Baltimore. The canal changed all that. Indeed, it has been said that the Erie Canal added $100,000,000 in value to the farms of New York State. It made New York city the commercial metropolis. Freight which had gone overland from Ohio to Pittsburg and Philadelphia, at a cost of $120 per ton, now went to New York by way of the lakes, the great canal, and the Hudson. The opening of the Erie Canal excited also a fever of enterprise in canal building in Ohio, Pennsylvania, Massachusetts, Maryland, and Virginia.

The first voyagers on the Great Lakes, La Salle and Hennepin, set sail in 1678 in a schooner of 10 tons, which they had launched near the present city of Kingston, Ontario. From the mouth of the Niagara River they continued their journey by land, and in the following May launched the Griffin, the first sailing vessel to navigate the upper lakes. In September they reached their destination at Green Bay. From 1700 until 1756 the construction and navigation of sailing vessels on the lakes was largely confined to Lake Ontario. Then the English began to build and sail vessels upon Lake Erie and Lake Ontario, and the commerce of Lake Ontario increased so fast, that in 1800 it exceeded that of all the other lakes together. The first American vessel to sail Lake Erie was launched at Erie in 1798. The first steam-vessel that navigated the lakes was built at Sackett's Harbor in 1817, and measured 240 tons. The next year the first steamboat above Niagara Falls was launched at Black Rock, and made voyages between that place and Detroit. The schooner Illinois, 100 tons, was the first vessel to arrive at Chicago from the lower lakes. "This event," writes one, "occurred 12 July 1834, when all the male inhabitants of the village, amounting to nearly 100, assisted in dragging the craft across the bar."

Gibson and Linn, according to Ringwalt, in 1776, descended the Ohio and the Mississippi from Pittsburg to New Orleans, and brought back a cargo of 136 kegs of gunpowder for the use of the continental army. When they reached the falls of the Ohio River they were obliged to unload their boats and carry the cargo around the falls; but the success of their trip gave an impetus to the flatboat trade which has continued in one form or another up to the present time. The first regular packet line between Pittsburg and Cincinnati was established in 1794, and consisted of four keel-boats of 20 tons each. They were much like the modern canal-boats, and could be either propelled by sails, pushed by poles, or towed by horses. Freight charges were high, the following rates for steamboats on the Mississippi having been established by the legislature of Louisiana in 1812: From New Orleans to Louisville, four and one-half cents per pound for heavy goods, and six cents for light, averaging five cents per pound, or per ton $112; from New Orleans to Natchez, three quarters of a cent per pound, or $1.50 per barrel; and the same rate for all intermediate landings from New Orleans to Louisville. Passage, $125 for the full trip, and $30 to Natchez. Half-rates were allowed for tonnage going down the river.

Hon. Levi Woodbury, who made a trip down the Mississippi in 1833, says: "At every village we find from 10 to 20 flat-bottom boats, which, besides corn on the ear, pork, bacon, flour, whiskey, cattle and fowls, have a great assortment of notions from Cincinnati and elsewhere. Among these are corn brooms, cabinet furniture, cider, apples, plows, cordage, etc. They remain in one place until all is sold out, if the demand be brisk; if not, they move further down. After all is sold out they dispose of their boat, and return with their crews by the steamers to their homes."

By 1856, however, the steam-tonnage of the Mississippi and its tributaries equaled the steam-tonnage of the whole of Great Britain. Until 1850 the boats measured from 200 to 400 tons; but the builders enlarged their vessels from year to year, until, in 1878, they attained the size of the transatlantic liners. The steam-tonnage of the inland and coast lines of the United States increased from 24,879 tons in 1823 to 1,172,372 tons in 1876, as follows:

INLAND AND COASTWISE FLEETS, 1876.

	Number of Vessels	Tonnage
Atlantic and Gulf coasts	2,081	665,879
Pacific coast	270	78,439
Northern lakes	921	201,742
Western rivers	1,048	226,312
Total	4,320	1,172,372

In 1891 there were on the Great Lakes 3,700 steam- and sail-vessels, with a net registered tonnage of 1,250,000 tons. In that year they carried 63,250,000 tons of freight, while in 1890 the ton-mileage carried by this fleet was 18,849,348 ton-miles, or 24.7 per cent of the ton mileage of all the railroads of the United States. The tonnage of the lake marine more than doubled during the five years from 1887 to 1892. On the 16,000 miles of the navigable waters of the Mississippi River and its tributaries there were afloat, in 1890, 7,445 crafts of all kinds, with a registered tonnage of 3,400,000 tons. During the year this fleet carried 30,000,000 tons of freight and 11,000,000 passengers. The Hudson River had, in the same year, a traffic of 5,000,000 passengers and 15,000,000 tons of freight, exclusive of 3,500,000 tons that passed through the canals of New York by way of the Hudson River to tide-water. The total for these four divisions of waterways alone was 111,750,000 tons. The Mississippi Valley rivers furnish transportation facilities for 24 States, embracing an area of 1,240,000 square miles. In 1903 about 23,255 vessels of 5,198,569 tons were engaged in our domestic trade.

The average freight rate on wheat from Chicago to New York in 1902 was 5.3 cents per bushel by lake and canal, and 17½ cents per bushel by rail, the water cost being $1.76 per ton, and the rail cost $5.82 per ton. The Erie Canal is only a little over 300 miles long, yet Mr. Albert Fink says that it regulates the freight rates of all the railroads east of the Mississippi River, not only on those whose tracks run parallel with the canal, but upon those in every part of that territory.

The development of the railway system of the United States has been without a parallel. Time and distance have been overcome, and the products of the farmers, the lumbermen, the miners, and the artisans now reach in successful competition the markets of the world. The railway had its inception less than 70 years ago in the little four-mile tramway constructed to the granite quarries in the town of Quincy, Mass., and operated by horses. The first really important railway was the Baltimore and Ohio, 14 miles of which were opened in 1830. In the same year the South Carolina Railway was begun; in 1833 it was completed for 136 miles, and was then the longest railway in the world. It was also the first railway to carry the United States mails. In 1834 the opening of the Philadelphia and Columbia Railroad, as part of the system of internal improvements of Pennsylvania, gave that State a continuous line of railways and canals from Philadelphia to Pittsburg. In 1835 the Washington branch of the Baltimore and Ohio road was opened. The completion of the Boston and Albany road in 1841, and a connecting-link composing the line from Albany to Buffalo in 1842, marked the opening of the first great railway line. The real beginning of interstate commerce in this country may be said to date from this time.

The total railway mileage of the United States in 1902 was above 200,000 miles, or nearly one half the railway mileage of the world. The total mileage of all tracks reaches 274,195.36 miles, representing a capital of nearly $13,000,000,000 — an amount equal to one sixth of the entire wealth of the country, and five times greater than the entire circulating currency of the United States. The annual gross earnings and other income of this capital is more than $1,900,000,000 — an amount more than three times the entire annual revenues of the government; and it operates lines having an annual traffic of nearly 650,000,000 passengers and more than 1,200,000,000 tons of freight. An idea of the magnitude of this single branch, concerned with the transportation of freight, may be conveyed when it is stated that 1,000,000,000 tons means that a train of cars long enough to reach more than six times around the earth would be required to transport it all at a single load. The average distance over which this freight was hauled by the railroads was about 128 miles. Set a single team to the task, and it would take it something like 1,400,000 years to move the same amount 25 miles.

The total number of tons of freight carried by the steamers and sailing vessels of the rivers, lakes, and coastwise transportation routes of the United States in 1902 may be reckoned one third that of the railways. Add to this amount the freight traffic of the railways during the year 1902, namely, 1,200,315,787 tons; this would make the total average tonnage of the railways and waterways of the country more than a billion and a half tons, or 20 tons for every inhabitant of our continental possessions.

As late as 1850 there seems to have been little conception of the influence which the railways were to wield in the development of the interstate traffic of this great country, and of the country itself. It was thought that they could not successfully compete with waterways and canals, except where a speedy carriage was essential. The solution of the problem of cheap transportation from Pittsburg, for example, was not reached until the railroads threatened to take away all traffic from the traders; so that Pittsburg coal can now be delivered in New Orleans for about $2.60 per ton, although New

Orleans is 2,000 miles away by river. Cow Island, on the upper Missouri, is 4,300 miles from Pittsburg; yet coal is carried to market there, a distance as great as from New York to the Baltic Sea. Not less than 20,000 miles of inland navigable waters are accessible to these Pennsylvania coal traders. The aggregate number of vessels engaged in this business is more than 4,000, and of the 13,000,000 tons of coal that were mined in 1893 in the counties near Pittsburg about 4,500,000 tons were carried to market by water. Yet let me illustrate further the growth of domestic trade in a part of our country which was only lately as remote and undeveloped as the westernmost provinces of Brazil. This growth, due to the transition from the pony express to the transcontinental steam-car, quickened the activities of California and of the whole Pacific slope like the inspiration of a new life. The assessed value of all property within California rose from $260,563,886 in 1869 to $584,578,036 in 1879. In 1889 shipments were made over the lines of the Southern Pacific system of 1,140,596,010 pounds from San Francisco, and of 1,571,347,605 to San Francisco. The probable duration of an overland journey from the Missouri River to California before the continental railways were constructed was about 110 days.

Chittenden in his early steamboat navigation on the Missouri River says the traffic reached high-water mark in 1867. That profits on a single voyage of a boat between Saint Louis and Fort Benton had reached as high as $65,000.

Freight rates were 12 cents a pound in 1866, or $240 a ton. Insurance rates 6½ cents on sidewheel and 8 cents on sternwheel steamers; a cabin passenger paying $300, and the salary of a pilot whatever he might be pleased to ask, as high as $1,200 per month being paid.

It is claimed that the practically unobstructed competition which has prevailed among railways has been a main cause of many consolidations of railway interests. On the other hand, in defense of consolidation and combination, it is asserted that these result in better and swifter service and lower rates. Whatever the cause or causes, rates generally are much lower than they were 10 years ago. On 30 June 1894, 44 railways, each with an operated mileage of over 1,000 miles, out of a total of 1,039 operating corporations, controlled and operated 56.30 per cent of the total railway mileage in the United States. Extend the classification to include all roads operating over 400 miles of line, and it appears that 90 corporations operate 72.90 per cent of our total railway mileage. In 1837 the superintendent of motive power of the Columbia and Philadelphia Railroad reported that the following charges were imposed on the railroads named:

FREIGHT RATES ON RAILROADS IN 1837.

Railroad	Per Ton per Mile Cents
Baltimore & Ohio	4½
Baltimore & Washington	4
Winchester & Potomac	7
Portsmouth & Roanoke	8
Boston & Providence	10
Boston & Lowell	7
Mohawk & Hudson	8
Petersburg	10

These rates seem preposterous when compared with the .757 of one cent per ton per mile, which was the average charge on all the railroads of the United States during the year 1902.

The growth of lake commerce in this country is something marvelous. The increase of freight shipments through the Saint Mary's Canal, both east and west bound, was from 1,560,000 tons in 1881 to 28,403,065 tons in 1901. There was an increase in the valuation of this tonnage from $28,965,612.92, in 1881, to $290,000,000 in 1901. During the season of 225 days in 1901 in which this canal was open there passed through it 14,372 steamers and 4,482 sail-vessels — a total, with unregistered craft, of 20,041 vessels, or an average of about 90 per day during the entire season. The total registered tonnage for the season was 8,400,680. The freight which passed through the canal in 1900 was carried an average distance of about 825 miles, at a cost per mile per ton of 1.18 mills. The size of the vessels passing through the canal continues to increase. The average registered tonnage per vessel in 1867 was 626.3 tons, while in 1891 it was 962.1 tons, and in 1901 there were over 100 vessels, steam and sail, of from 5,000 to 8,000 tons and 10 above 8,000 tons. This freight-tonnage during the season of 1889 amounted to 19,717,860 tons. The tonnage passing through the same canal during the season of 1890, including the foreign and coastwise traffic, amounted to 21,888,472 tons, while the tonnage of all vessels of the Atlantic coast engaged in foreign trade during 1890 was but little more — 22,497,817 tons. All the vessel-tonnage engaged in the foreign trade, entering and clearing at London, England, during the same year was 13,480,767 tons, and at Liverpool the same year it was 10,941,800 tons; so that the vessel-tonnage passing through the Saint Mary's Canal in 1890 was more than 8,000,000 more than that of London, about double that of Liverpool, and nearly equal to that of the two combined. Another comparison: The tonnage passing through the Suez Canal in 1900 was 13,699,237 — less than one half of that passing through the Saint Mary's which was open for navigation during the season of 1890 only 228 days, while the Suez Canal was open during the entire year. The total tonnage, entrances, and clearances, of the foreign and coastwise trade of Chicago and Buffalo for the season of 1901, as compared with the total foreign trade tonnage of the four great British ports, was as follows:

CHICAGO AND BUFFALO TRADE.

	Tons
Chicago	13,831,882
Buffalo	10,455,032
London	17,275,645
Liverpool	12,636,225
Glasgow	3,825,890
Hull	4,425,356

Carrying the comparison still further, the volume of this inland trade is again shown in the figures giving the foreign trade of the following great commercial ports in 1901–2:

FOREIGN TRADE TABLE.

	Tons
New York	12,646,555
Hamburg	16,441,470
Antwerp	14,967,921
Marseilles	9,563,544
Havre	4,406,159
Bremen	4,377,824
Boston	4,498,785
Philadelphia	3,871,928
San Francisco	2,562,655

It will be seen that the commerce of the two inland cities, Chicago and Buffalo, consisting almost wholly of a coastwise trade within the confines of the Great Lakes, compares most favorably with the tonnage movement of the great maritime cities of the world. In 1867 the average rate for carrying iron ore from Escanaba to Lake Erie was $4.25 per ton; in 1870 the average rate was $2.50 per ton; in 1891 the average rate was 82 cents per ton; and at one time in that year it was as low as 55 cents per ton.

The benefit of these great reductions in lake transportation rates appears very forcibly in the movements of the huge cargoes of coal that are sent from ports on Lake Erie to the harbors of the upper lakes. In 1887 the average rate per ton for lake transportation of coal from Buffalo to Chicago was $1.05; in 1891 the average rate was 50 cents per ton; and from 10 Nov. 1891 to the close of navigation, coal was carried from Buffalo to Duluth, a distance of 1,000 miles, for 10 cents per ton. Using the common unit (cost per ton per mile) for comparison, and taking the official report of the movement of freight through the St. Mary's Falls Canal, the ton-mileage rate has decreased as follows: 1887, 2.3 mills; 1888, 1.5 mills; 1889, 1.5 mills; 1890, 1.3 mills. The average revenue per ton of freight per mile on all the railroads of the United States was given at 9.4 mills in 1890, or more than seven times as much as the cost of freight carriage through the St. Mary's Falls Canal.

The regulation of interstate commerce before the Declaration of Independence was by Parliament. Under the Articles of Confederation trade was controlled, where it was controlled at all, by the legislatures of 13 distinct sovereignties. It soon became evident that the several States would not unite in any general or fixed rule to govern commerce. Discriminations naturally followed, which resulted in confusion and discord among the different parts of the confederacy. Accordingly one of the reforms demanded under the old confederacy, and introduced in the Constitutional Convention, was that "Congress shall have power . . . to regulate commerce . . . among the several States." The dissatisfaction among the States in respect to the interchange of trade, and the urgent demand for a uniform and general principle controlling their commerce, were clearly shown in the debates of the Constitutional Convention. The following contemporaneous opinions are of interest:

"The want of authority in Congress, under the confederation, to regulate commerce had produced in foreign nations, particularly Great Britain, a monopolizing policy injurious to the trade of the United States. . . . The same want of a general power over commerce led to an exercise of the power, separately, by the States, which not only proved abortive, but engendered rival, conflicting, and angry regulations." (Madison Papers, Vol. V., p. 119.)

"The oppression of the uncommercial States was guarded against by the power to regulate trade between the States." (Mr. Sherman, Deb. on Fed. Cons., Mad. Pap., Vol. V., p. 434, 1787.)

"Mr. Carroll and Mr. L. Martin expressed their apprehensions, and the probable apprehensions of their constituents, that, under the power of regulating trade, the general legislature might favor the ports of particular States, by requiring vessels destined to or from other States to enter thereat." (Ibid., p. 455.)

To cover this defect, Art. I., Sec. 9, Cl. 6, of the Constitution was enacted, to wit: "No preference shall be given by any regulation of commerce or revenue to the ports of one State over those of another, nor shall vessels bound to or from one State be obliged to enter, clear, or pay duties in another."

Gen. Washington, in a letter to a friend on the weakness of the confederation, and pleading for a stronger government, wrote: "We have abundant reason to be convinced that the spirit of trade which pervades these States is not to be repressed. It behooves us, then, to establish just principles, and this cannot, any more than other matters of national concern, be done by 13 heads differently constructed and organized. The necessity, therefore, of a controlling power is obvious, and why it should be withheld is beyond my comprehension."

Alexander Hamilton, in the 'Federalist,' Letter VII., wrote: "The competition of commerce would be another fruitful source of contention. The States less favorably circumstanced would be desirous of escaping from the disadvantages of local situation, and of sharing in the advantages of their more fortunate neighbors. Each State or separate confederacy would pursue a system of commercial probity peculiar to itself. This would occasion distinctions, preferences, and exclusions which would beget discontent. The habits of intercourse on the basis of equal privileges, to which we have been accustomed from the earliest settlement of the country, would give a keener edge to those causes of discontent than they would naturally have, independent of the circumstances." Also, in Letter XXII.: "The interfering and unneighborly regulations of some States, contrary to the true spirit of the Union, have, in different instances, given just cause of umbrage and complaint to others; and it is to be feared that examples of this nature, if not restrained by a national control, would be multiplied and extended till they became not less serious sources of animosity and discord than injurious impediments to the intercourse between the different parts of the confederacy."

In the debates of the Constitutional Convention, the clause regulating commerce, etc., was agreed to *nem. con.*, not even a yea-and-nay vote being taken. When the grant of this power to regulate commerce among the States was made by the Constitution, the traffic which might be controlled under it was quite insignificant. On the land there was nothing that could approach the dignity of interstate commerce, and its regulation, as also of that which was exclusively State traffic, was for the most part left to the rules of the common law. The exceptional regulations, if any seemed to be called for, were made by the State laws. For the regulation of commerce on the ocean and other navigable waters, Congress very promptly passed the necessary laws; but its jurisdiction within the limits of the States was not very clearly understood, and it was not until the celebrated case of Gibbons *v.* Ogden, decided in 1824, that it was authoritatively and finally determined that the waters of a State, when they constituted a highway for foreign and interstate commerce, are, so far as concerns such commerce, as much

within the reach of Federal legislation as are the high seas, and consequently that exclusive right for their navigation cannot be granted by States whose limits embrace them. But while providing from time to time for the regulation of commerce by water, Congress still abstained from undertaking the regulation of commerce by land. The reasons were the same. The land commerce was insignificant, and the rules of the common law were in general found adequate for the settlement of any questions. When Congress provided for the construction of the Cumberland road, it was thought undesirable to regulate its use by national law, or to take national supervision of the commerce upon it; and it was left to the supervision and care of the States through or into which the road was built. With the application of steam as a motive power for propelling vessels, conditions were immediately changed. But even then the circumstances were favorable to a prolongation of State control. The first improved highways were turnpikes, the next in grade canals; but the highways by water, as well as the highways by land, were provided for by the States. It was not unnatural that they should be left in charge of the regulation of trade upon them, especially as no complaint was made that their regulations were unjust, or that they discriminated unfairly as against the citizens or the business of other States. When, in 1830, steam-power began to be applied to the propulsion of vehicles upon land, the same conditions continued to prevail. The power of the Federal government in the regulation of commerce between the States was put forth negatively rather than affirmatively; that is to say, it was put forth in restraint of excessive State power, instead of by way of affirmative national regulation.

The subject of the management of railways in respect to interstate commerce had been more or less discussed in Congress, when in March 1885, a resolution was adopted by the United States Senate empowering a select committee, known subsequently as the Cullom Committee, to investigate it. On 18 Jan. 1886, this committee submitted a report based upon testimony contained in more than 1,450 printed pages. On page 40 the committee says: "Unjust discrimination is the chief cause of complaint against the management of railroads in the conduct of business, and gives rise to much of the pressure upon Congress for regulating legislation."

In summing up the testimony, on pages 180–2 the committee says: "The complaints against the railroad systems of the United States expressed to the committee are based upon the following charges: (1) That local rates are unreasonably high, compared with through rates; (2) that both local and through rates are unreasonably high at non-competing points, either from absence of competition or in consequence of pooling agreements that restrict its operation; (3) that rates are established without apparent regard to the actual cost of the service performed, and are based largely upon what the traffic will bear; (4) that unjustifiable discriminations are constantly made between individuals in the rates charged for like service under similar circumstances; (5) that improper discriminations are made between articles of freight and branches of business of a like character, and between different quantities of the same class of freight; (6) that unreasonable discriminations are made between localities similarly situated; (7) that the effect of the prevailing policy of railroad management is, by an elaborate system of secret special rates, rebates, drawbacks, and concessions, to foster monopoly, to enrich favored shippers, and to prevent free competition in many lines of trade in which the item of transportation is an important factor; (8) that such favoritism and secrecy introduce an element of uncertainty into legitimate business that greatly retards the development of our industries and commerce; (9) that the secret cutting of rates, and the sudden fluctuations that constantly take place, are demoralizing to all business except that of a purely speculative character, and frequently occasion great injustice and heavy losses; (10) that in the absence of national and uniform legislation the railroads are able, by various devices, to avoid their responsibility as carriers, especially on shipments over more than one road, or from one State to another, and that shippers find great difficulty in recovering damages for the loss of property or for injury thereto; (11) that railroads refuse to be bound by their own contracts, and arbitrarily collect large sums in the shape of overcharges, in addition to the rates agreed upon at the time of shipment; (12) that railroads often refuse to recognize or be responsible for the acts of dishonest agents acting under their authority; (13) that the common law fails to afford a remedy for such grievances, and that in case of dispute the shipper is compelled to submit to the decision of the railroad manager or pool commissioner, or run the risk of incurring further losses by greater discriminations; (14) that the differences in the classifications in use in various parts of the country, and sometimes for shipment over the same road in different directions, are a fruitful source of misunderstandings, and are often made a means of extortion; (15) that a privileged class is created by the granting of passes, and that the cost of the passenger service is largely increased by the extent of this abuse; (16) that the capitalization and bonded indebtedness of the roads largely exceed the actual cost of their construction or their present value, and that unreasonable rates are charged in the efforts to pay dividends on watered stock and interest on bonds improperly issued; (17) that railroad corporations have improperly engaged in lines of business entirely distinct from that of transportation, and that undue advantages have been afforded to business enterprises in which railroad officials are interested; (18) that the management of the railroad business is extravagant and wasteful, and that a needless tax is imposed upon the shipping and traveling public by the unnecessary expenditure of large sums in the maintenance of a costly force of agents engaged in a reckless strife for competitive business."

The report of Senator Cullom's committee formed the basis of the law commonly known as the Interstate Commerce Act, which became effective 3 April 1887. The supreme court in the case of the Union Pacific Railway Company against Goodridge, October term, 1892, in speaking of a similar act of the State of Colorado, said: "This act was intended to apply to interstate traffic the same wholesome rules and regulations which Congress two years thereafter applied to commerce between the States, and to

cut up by the roots the entire system of rebates and discriminations in favor of particular localities, special enterprises, or favored corporations, and to put all shippers on an absolute equality."

The statute recognizes the fact that it is no proper business for a common carrier to foster particular enterprises or to build up new industries; but, deriving its franchise from the legislature, and depending upon the will of the people for its very existence, it is bound to deal fairly with the public, to extend reasonable facilities for the transportation of persons and property, and to put all its patrons upon an absolute equality. The laws making the giving of transportation privileges a criminal offense are at present difficult of enforcement. Public opinion has not yet been roused to the energetic condemnation which is necessary to make these special favors as completely unknown as they are at the post-office window, where the value of every stamp must be paid.

At the head of all the vast machinery employed in moving interstate commerce are men of integrity, and of ability rarely developed in other walks of life, broad-gauged men, to whom the public is indebted for the efficiency with which they carry on their stupendous enterprises. Under the railway presidents are the traffic managers, the passenger and freight agents. The feeling of these men that they must serve solely the corporations which employ them has grown to be a second nature with them. Their duty to the government and to the public, therefore, is sometimes obscured, and it is hard for them to realize that many practices which they have come to regard as ordinary business methods are wrong. So also the shipper and the merchant find it hard to realize that the push and barter and dicker that have made them successful must be abandoned when they ship their merchandise; that it is no longer to be bargained for, and cannot be carried except at a rate open to every competitor.

On 4 Feb. 1887, the Act of Congress creating the Interstate Commerce Commission, and investing it with authority to regulate certain matters with respect to commerce which were detrimental to the public interest, and with authority to require annual reports from all carriers engaged in carrying interstate commerce, was passed. This act, being in the nature of experimental legislation, has not accomplished all that its framers hoped or intended, but that great good has been accomplished cannot be denied. Various defects in its practical application have from time to time been brought to the attention of Congress, and amendments to remedy some of them have been adopted. The statistics compiled from the reports required under the provisions of this act have marked a new era in railway statistics in this country. Being compiled from sworn reports made up on a uniform plan and for a uniform period, in compliance with a requirement of law, and published as official documents of the government, they are accepted as authority, and eagerly sought after by the public and by railway officers.

I may observe in closing that within the last two or three years the courts have taken advanced ground in asserting the power of the Federal government over interstate commerce. It was held by the supreme court in the case of Debs that "the government of the United States is one having jurisdiction over every foot of soil within its territory, and acting directly upon each citizen; that while it is a government of enumerated powers, it has within the limits of those powers all the attributes of sovereignty; that to it is committed power over interstate commerce and the transmission of the mail; that the powers thus conferred upon the national government are not dormant, but have been assumed and put into practical exercise by the legal action of Congress; that in the exercise of those powers it is competent for the nation to remove all obstructions upon highways, natural or artificial, to the passage of interstate commerce or the carrying of the mail; that while it may be competent for the government (through the executive branch, and in the use of the entire executive power of the nation) to forcibly remove all such obstructions, it is equally within its competency to appeal to the civil courts for an inquiry and determination as to the existence and character of any alleged obstructions, and if such are found to exist, or threaten to occur, to invoke the powers of those courts to remove or restrain such obstructions." In this case the extent and nature of the power of the Federal government over interstate commerce, and the methods by which that power can be applied, were discussed. It was decided that the United States circuit court, sitting as a court of equity, has power to enjoin, at the instance of the attorney-general of the United States, acts of obstruction to interstate commerce, notwithstanding that the acts enjoined, or some of them, might amount to offenses against the criminal law of the United States.

While it is clearly the fact that, under our form of government, the national authority has no excuse for interfering with the relations existing between employer and employee in ordinary business transactions, it is maintained by many that as the government has control of the agencies engaged in interstate commerce, those who are employed by such agencies are also engaged in the public service, and for that reason an obligation exists on the part of Congress to enact such legislation as will tend to settle differences which may arise between railroads and their employees without causing inconvenience to the public.

EDW. A. MOSELEY,
Secretary Interstate Commerce Commission.

Commercial Courts are tribunals distinct from the ordinary civil courts, and in some countries are established in various commercial towns, or within certain districts, to settle disputes with regard to rights and obligations between persons engaged in trade, with the assistance of experienced merchants, by a brief process, according to equitable principles. The general introduction of tribunals of this sort began in the Middle Ages. The first was probably that established at Pisa in the 11th century, and the basis of its decisions was the code of maritime laws of Pisa, confirmed by Pope Gregory VII. in 1075. At first the commercial tribunals were not so much courts established by government as arbiters of disputes, freely chosen by the merchants and confirmed by the governments. Under the name of commercial consuls such committees of arbitration were appointed in all the great commercial cities of Europe; and in the

course of time they really became tribunals of justice, and were, in part at least, administered by men of legal learning and experience. Pope Paul III. confirmed the commercial consuls in Rome. Francis II. in 1560 granted to the Parisian merchants particular arbiters for the adjustment of commercial disputes; and in 1563 was established the Parisian Court of Commerce, consisting of a judge and four consuls. The same thing soon followed in all the important commercial towns of France. In London Henry VII. appointed particular commercial judges. The president of the commercial tribunal for the Hanse towns, established in 1447, bore the name of alderman. At Nuremberg, in 1621, a similar tribunal was instituted under the name of inspectors of the markets. The diets of the empire even called upon the German princes and commercial cities to follow this example, as the decrees of the empire in 1654 and 1668, and the decree of the imperial commission of 10 Oct. 1663, show. In many of these cities, as in Frankfort-on-the-Main, and in Leipsic, they were not so much independent authorities as delegates from the city councils. When commercial courts take cognizance particularly or solely of disputes relating to maritime affairs, they may be called courts of admiralty. Such a court was erected in Hamburg in 1623. The internal regulations of commercial courts commonly require that a part of the members, or at least the presidents, should be lawyers; the rest are for the most part experienced merchants, who are better adapted than regular judges to give counsel on commercial affairs, with which they are more acquainted, and which very often are not to be reduced to simple principles of law, but are to be decided according to commercial practice. Their jurisdiction commonly extends over all commercial disputes, matters of exchange, insurance, freight, bottomry, average, etc.; and further, over bankrupts, the hiring of shops and stores, clerks, and apprentices; the debts of those who receive goods from merchants upon credit; and all natives and foreigners who traffic in the place, and are found there; all shipowners, contractors for transporting goods, brokers, factors, etc., are obliged to submit to their decisions. They do as much as possible by oral investigation; and the intention of their institution is that they shall avoid the long and formal process of other courts. But when the difficulty and confusion of the matters in dispute occasion the necessity of an investigation in writing, recourse is had thereto. The greater despatch of these courts consists principally in this — that the defendant is orally summoned, once or several times, to appear before them at an early day, and if he fails to come, he can be brought by force. The complaint is then made orally, both parties are heard, and sentence is given, if possible, immediately after. But as this can seldom be done, and most cases require reference to written documents, a day not far distant is appointed for the answer to the complaint and for the evidence on both sides, and the time is seldom or never prolonged. The remedies against a sentence must be sought from the same judges, and are not easily obtained. Appeals are only allowed in very important cases, and upon the deposit of a large sum as a pledge that the final decision shall be obeyed without delay. The principal features of this process form the basis of most commercial codes. From the sentence of these tribunals appeal is made to the court of appeal within whose jurisdiction they happen to be. The other countries where these tribunals exist are Belgium, Spain, Portugal, and Italy. See COMMERCIAL LAW.

Commercial Education. It is not known when commercial education was begun in the United States, and the facts about its subsequent development are difficult to ascertain. The opportunities for formal school preparation for a business career which are now offered in the United States may be roughly divided into four classes. First: The "commercial college" of the well-known type. Second: The business courses of the public high school. Third: Private endowed schools, more or less technical in character. This class might include business courses in the unclassifiable, but increasingly important and popular correspondence schools. Fourth: College and university courses.

The "commercial college" is the best known and almost the only well-known method of business training. Its almost spontaneous origin, its rapid and wide diffusion, its rough adaptation of primitive material to the satisfying of immediate and pressing needs, its utter disregard of all save the direct answer to current demand, its gradual recognition of present inadequacy, and its determination toward broader, fuller usefulness, mark it as a product of a young, eager and gradually maturing people. It is claimed that Bartlett of Cincinnati was the first American to assume for his undertaking the name of business "college," and he was unquestionably one of the earliest and most successful workers in this field. He gave commercial instruction to private pupils in the forties. About the middle of the fifties there were not more than a dozen commercial schools scattered in the large cities from Boston and Philadelphia to Chicago and St. Louis. They had arisen with the idea of facilitating the entrance of young men into minor positions as clerks and bookkeepers. The instruction offered was very meagre,— commercial arithmetic, a little practice in keeping accounts, and a certain amount of ornamental penmanship made up the total. A school of this kind did not require a large force of teachers,— in many cases the entire instruction was given by one man. The equipment was not elaborate and the fees were low, $40 being an average charge, not for one term or for one year, but for an indefinite or life scholarship, and often valid at any of a large number of schools, embraced in single "chain." In those early days there were no text-books for the "commercial colleges"; and arithmetic and bookkeeping were taught by manuscript prepared by actual accountants engaged in business. The students also came primarily from business houses, a fact which necessitated the institution of evening classes. The average time spent in a business college was not more than three months. Poor as such education was, it filled a need, for commercial colleges throve and multiplied and with success became still more successful. Increased popularity led to higher fees and longer courses, to the preparation of printed texts; life and interchangeable scholarships were abolished; the teaching force was increased; day classes largely took the place of evening instruction; school equip-

ment improved and gradually these institutions grew into the apparently permanent place in public favor which they enjoy to-day.

But apart from mere numerical increase, considerations of the lengthened course of study, improved teaching, and better average preliminary preparation, there is evidence of broadening views and sounder conceptions among the business college teachers. Of course, even in the limited field of preparing for subordinate mechanical labor, good work may be done and the business college accomplished excellent results. But to-day the directors of commercial schools realize that for clerical positions more technical instruction is necessary; that a broader education pays, even if no higher position is ever won; and that the business college can equip the student through liberal and fundamental studies for subsequent promotion. These ideas produce their logical outcome, a course of study which is at once broader and more technical. The process is slow, but evidences of advance are apparent in the printed announcements of various schools, in the discussions of business teachers' conventions, and in the periodicals, weekly and monthly, issued in the interests of business education. Secondly, the necessity of pedagogical training has been recently forced upon the consciousness of business school directors. So that to-day there is a growing proportion of men and women of collegiate or other special preparation in this work. A third favorable influence on the work of the business college has been the recent and marked growth of a new form of competition, that of the public high school, a rivalry which can only prove to the advantage of each. It is not too hazardous to predict that the commercial college may hereafter be glad to see much of its work go over to the system of public education, thus giving it better equipped students and freedom to evolve a still higher course of instruction. The probability of this further evolution of the business college into a supplementary educational instrument of a somewhat better type is foreshadowed in a fourth fact favorable to commercial training, its formal recognition as a factor in public education by the University of the State of New York, whose regents trusted that this standard would create a demand for higher qualifications and lead to a repetition of the experience with the professional schools of medicine and law, when similar actions led to a large increase in the attendance at secondary schools. Conditions of recognition of a business school are in brief: Instruction by at least six teachers giving all their time to the work; an equipment worth not less than $5,000, exclusive of buildings and fixtures; and a satisfactory one-year course, supplementary to the high school and consisting of at least 500 hours of actual instruction, in preparation for the State business diploma. Out of 30 schools in the State reported by the bureau of education, the regents granted full recognition to 11 and provisional registration to 13. Besides granting registration to business schools on these conditions, the university decided to issue business credentials, including a State business diploma and a State stenographer's diploma and corresponding certificates. The distinction between the two is the requirement of graduation from a registered high school in the case of the diploma, but not of the certificate. To obtain the diploma, candidates must be certified as having completed also a full one-year registered business course, and must pass regents' examinations in advanced bookkeeping, commercial law, business English, arithmetic, practice, and office methods, commercial geography, and the history of commerce. If the high school course previously taken did not include United States history, civics, and economics, the regents' examination in these subjects must be passed. The requirements in general are much higher than for the corresponding subjects in the high school course, and require a higher degree of theoretical and practical knowledge.

The annual tuition fee varies in the better commercial colleges from $50 to $150 and even $200 for a school year of 10 months. It is perfectly safe to say that in the quality of the work which they do, and in the equipment for this particular work, the American commercial colleges have no rivals, largely because they are engaged in the mechanical work in which Americans excel the rest of the world. They are not educational institutions in any broad sense of the term at all, but trade schools pure and simple. They train for facilities. That hundreds of the students of the colleges have been successful business men of initiative and independent enterprise simply proves that they had native ability for that sort of thing; not that this sort of training was especially helpful, though it is only fair to say that many of these men trace their start in business to the technical skill in bookkeeping, etc., which they acquired in the schools.

The Packard Commercial College opened in New York, in the spring of 1858, as a link in the Bryant and Stratton chain of business colleges, and may be considered a type of these colleges. In 1867 Mr. Packard bought the interest of his partners, Bryant & Stratton, and changed the name from Bryant, Stratton & Packard's business college to Packard's business college. The most important result of the change of proprietorship was in doing away with the life-scholarship plan under which the "chain" had been conducted, and putting an end to the interchangeability of tuition. Mr. Packard's lead was followed by the other schools, and thus the foundation was laid for individual,— if not competitive work, which has done so much to advance the character of business education in this country. In the first years of the existence of the school, Mr. Packard wrote text-books on bookkeeping for the use of Bryant & Stratton schools, which in revised form are still used. The school was first located in two small rooms in the Cooper Union building, of which it was the first tenant. In the fall of 1863 it was removed to the Mortimer block, corner of Broadway and 22d Street and Fifth Avenue, and in the spring of 1870 to the Methodist building, corner of Broadway and 11th Street, occupying the entire fourth story of the structure. Here it remained for 17 years, until it outgrew its accommodations, and moved to its present quarters. In 1865 commercial law was added to the course, and later practical English and civics. In 1872 stenography was first taught, in classes only. A very small proportion of students studied this branch, and always in connection with the commercial course. The following year the

typewriter was introduced. This was the first school to teach stenography or typewriting. At the present an important feature of the work, from which no student is excused, is public speaking without any attempt at elocution. Another feature is the character record, a brief history of the student's career from the beginning to the end of his course, showing not only progress in study, but also comments by his various teachers on any special characteristics or performance that is deemed worthy of comment. It has proved not only efficacious as discipline, but is useful as reference after the student has passed out from the school and refers to it for recommendation in business. This record is never destroyed. A specimen of the student's work is also preserved. The commercial course now covers about a year and a half, or 15 months, the students entering at any time and being graduated not in classes, but as they finish the course, in greater or less time, according to their ability. The instruction is largely individual. The school graduates yearly about 150 pupils, the number in recent years being almost equally divided between the stenographic and commercial departments.

The career of Thomas May Pierce, of Philadelphia, illustrates in a similar way the growth of this department of our educational system. Starting in 1865 with the meagre curriculum then offered, he increased the scope of the work, improved the equipment, introduced regularity and system into the instruction until, when he died in 1896, he had built up what might fairly be called a typical school of the better sort. He employed some 25 instructors, and occupied quarters in one of the best office buildings in Philadelphia, where he used 15 rooms containing 10,000 feet of actual floor space. The charge for tuition was $15 per month, or $100 for a course of seven months.

Commercial instruction in the American public school system is only beginning to attract general attention, despite the fact that a certain amount of this work has been carried on for many years. A commercial course was not infrequently announced, although it differed from other courses in the same school only by the inclusion of a little typewriting, bookkeeping, and possibly stenography. Of late years a considerable change has come about, and high schools which had offered some business training have improved the course of study. Commercial instruction has been introduced for the first time into many schools, and gradually distinct and separate courses are being established in connection with city systems to give opportunities for the future business man, comparable to the aid already furnished to those looking forward to higher studies of a professional or technical kind. The natural order of development in this matter can be seen in a glance at the course of high school study in some typical cities. Omaha represents one stage, presenting a commercial course in which commercial arithmetic is substituted for elementary science and botany in the 9th grade of the regular English course, bookkeeping for zoology and mediæval history in the 10th, commercial law and bookkeeping for chemistry and French history in the 11th, and stenography and typewriting for American history and political economy in the 12th grade. Some question might arise as to the advisability of the substitution in one case or another, yet there remains a fairly liberal plan of study, covering four years. Even if the aggregate of special preparation for business does not exceed the ordinary work of the year, it is preferable from an educational point of view at any rate either to place this late in the high school programme or to distribute it as indicated above. Boston with a two years' commercial course and little special business training, Pittsburg with one year's work in place of the second high school year, and Washington with a two years' course, are all in an early stage of development in this direction. Possibly Washington with a distinct business high school even though the course of study covers only two years, is nearer the final form than Milwaukee with its new four-year commercial course. The evolution of a real secondary business school may come more easily through the addition of successive years to the course than through the gradual specializing of an ordinary high school curriculum. Indeed this view is borne out by the experience of the Hillhouse high school in New Haven with an admirably outlined three years' course and by the development in Paterson, N. J., of a commercial department in the city high school into practically a distinct school operated in a separate building by an entirely independent faculty, with a special course of two years, requiring one year of secondary study for admission. What is desirable seems perfectly clear. First of all the course of study should be at least four years. We cannot successfully defend commercial instruction in the public high school unless the work is as broadly educational as any other of the secondary courses. Secondly, the course should be thoroughly outlined as distinctly commercial. A mere substitution of a few business studies in the usual English course does not make for commercial training and such action is not only an inadequate provision for present needs, but it is destructive of future possibilities. A separate building is strongly desirable, not only on the ground of superior adaptability for the uses of a commercial school, but for absolute independence in fact, and full differentiation in the public thought. When a few such independent schools have solved the problem of commercial instruction, the ordinary schools will have a better basis for «commercial courses.» With these considerations in view, we can readily say that between the two-year, strictly commercial course of Washington, for example, and the four-year course slightly specialized, of some other cities, the choice should be made not on the basis of what is offered now, but of approximation to the real type, namely, a well-planned, fully-specialized scheme of commercial training covering at least four years of secondary grade. This standard of secondary commercial training has been more nearly approximated in Philadelphia than in any other American city. In 1898 a department of commerce was established in connection with the Central high school. For reasons of expedience and economy, the department was housed in the new high school building, and much of the instruction given by the regular teaching force. Under a special director, however, the work promises to grow into an entirely differentiated institution, which may parallel the success of the

manual training high schools of that city. The commercial department in the Pittsburg high school was organized in 1872 for the benefit of those who could not spend four years in the high school and yet desired some scholastic training in addition to that given in an elementary school, and especially such training as will best prepare for business positions. Its commercial studies are essentially those of a so-called commercial college, at the same time it undertakes to give general training. The curriculum is two years, one given up chiefly to general studies, the second to bookkeeping, typewriting, stenography. Almost one third of the students of the high school were enrolled in the commercial course and of these 50 per cent were girls. The commercial course in the Boston high schools is likewise only two years long. Commercial arithmetic, bookkeeping, and stenography are begun in the first year, occupying about one half of the time, while the rest is devoted to general studies like English, history, drawing, music, etc. The second year is much like the first; about one half the time is given to the study of commercial subjects. In the Hillhouse high school, New Haven, Conn., while all the other courses are four years each, the commercial course is three years. About five hours a week, approximately one third of the time, is given to strictly commercial subjects, the rest are of a general nature. Students who do the regular work well are permitted to take stenography and typewriting extra.

The work in the commercial courses of other high schools is along one or the other of the lines indicated above. It is at present a concession to a popular demand. It does not grow out of a conviction on the part of high school principals and teachers, that it is an essential part of the high school system. It will undoubtedly continue to grow and after a few good commercial high schools have formulated and solved the purpose of this kind of instruction, the average high school, profiting by their experience, will be able to organize commercial courses which will be better than those thus far elaborated. In the opinion of the writer the technical work of the commercial courses in high schools is not as well done as in the better commercial colleges.

The third division of business courses is the private secondary schools with the usual wide variation in what is offered, and a total registration of nearly 20,000. The influence of this form of competition upon the ordinary business college has been already mentioned. How widely it may be felt can, perhaps, best be seen through an outline of what is open to business students in one of the best endowed secondary schools of the country, the Drexel Institute of Philadelphia. Special departments of such schools and new endowments by private or semi-public bodies will, we may expect, play a large part in the work of business training in the United States, if the experience of other countries be a good basis for prophecy.

The Drexel Institute of arts, science, and industry at Philadelphia was founded and endowed by Anthony J. Drexel of that city. It included from the beginning in the scope of its instruction courses in commerce and finance. As the school is well endowed and independent of State control, one may see from an examination of its work in this department a type, and, indeed, a very good type, of the best work which such institutions can do in the field of commercial education. The departments of commerce and finance consist of three special departments: (1) The course in commerce and finance; (2) the office course; (3) the evening course. The course in commerce and finance in its general features resembles the commercial schools of Europe, and is intended to place commercial education in its proper relation to other departments of educational work. The object of the course is to train the young men to do business rather than simply to record business. It has been organized with a view of meeting these conditions. It provides a liberal, and at the same time, thoroughly practical course of study, including two years' training in the knowledge of the world's industries and markets, the law of trade and finance, and the mechanisms and customs of business. The first special department gives a fundamental training including: (1) the production, manufacture, sale, and transportation of articles of commerce; (2) management of stock companies and corporations; (3) buying and selling of securities; (4) importing and exporting of merchandise; (5) borrowing and lending of money and credit; (6) advertising of commercial concerns; (7) keeping of business records. The work of this course is divided into two years. In addition to the general course in commerce and finance, described above, and requiring two years for its completion, three distinct office courses are offered. The bookkeeping course occupies one year and includes the following subjects: Bookkeeping, business forms and customs, typewriting, commercial arithmetic, English and penmanship. Another office course trains stenographers and typewriter operators. It includes stenography, typewriting, English, business forms, and office practice. The private secretary's course has been organized in response to applications that have been made to the institute for clerks fitted to do work of a different character from that required in a purely business office. The subjects included in the course are as follows: Stenography, typewriting, penmanship, English, correspondence, accounts, office practice, and business printing. Applicants for admission must show by examination, or otherwise, that they are prepared to meet the requirements of the course. The course occupies one year, divided into two terms. The department of evening classes is fully organized, and includes the following courses: (1) Beginners' course in bookkeeping and arithmetic. (2) Accountants' commercial course. (3) Office course in stenography and typewriting. The fee for each of the courses, for the entire season of six months, $5. In the course in commerce and finance, the fee is $25 for each of the two terms; and there is the same charge in the office courses.

The work done in the Drexel Institute is paralleled to a greater or less extent by similar work done in many private institutions, such as the Heffley School, formerly of Pratt Institute of Brooklyn, the Armour Institute of Chicago, and other schools founded by private initiative. Many of these schools have the advantage of ample funds, so that they are not as dependent

upon the whims of individual students as are the commercial schools described in previous paragraphs, and on the other hand they are independent of the injurious influences at work elsewhere. I think it is not too much to say that the two years' course offered in the Drexel Institute forms in its way a model, and furnishes the basis for the elaboration of a curriculum which will compare favorably with the best of the European commercial schools of the same grade. The work done in the evening course of this institution corresponds more closely to the work of the ordinary business college as described above. The business courses of the "correspondence schools," although classified with the privately endowed schools, correspond more closely to the "commercial colleges," especially in their attention to the individual, their over-technical and practical purpose, their lack of the ideal of educational value in their work, and their freedom from the bondage of definite curriculum or class-room work. The "correspondence schools" are a factor of growing importance, but from the nature of the case their methods admit of little analysis or examination.

In the fourth class of institutions of commercial instruction, namely, the colleges and universities, the movement for instruction is of comparatively recent origin, and has affected few of these institutions. It is also a matter of interest that the attitude of these higher institutions of learning toward this subject is a radically different one from that of the other classes of institutions which we have been discussing. It has been very difficult indeed in this whole development to get the so-called commercial colleges, the high schools and other commercial courses of the various institutes in their departments of commerce to give any instruction, whatever, except in the so-called practical subjects, and of any kind whatever except of the most immediate, technical, special sort. In the colleges and universities on the other hand, even where they have been willing to accord a certain recognition to the necessity of higher education in commercial and business matters, it has been difficult to get them to give any attention, whatever, to the more practical sides of the work. While the commercial colleges have felt that political economy, commercial geography, and similar subjects were too remote and impracticable to make it worth while for them to admit these subjects into their curricula, the colleges have felt that accounting, commercial arithmetic, and similar subjects were too elementary to deserve any attention, whatever, from higher institutions of learning. The colleges and universities, moreover, have seen scores and hundreds of young men complete the old-fashioned classical courses of study, and enter the ranks of business men with ability and success. They have felt, therefore, that in a certain sense every man who wished to go into business, would find it worth his while to take the old-fashioned course. And they were very slow, indeed, to recognize that there were scores and hundreds of young men in the community who would take a higher education if an emphasis were laid upon subjects in which they were interested and which had to do with their future careers, who could not be persuaded to follow out an old-fashioned classical curriculum.

Four institutions in the United States, the University of Pennsylvania, in Philadelphia; the University of Chicago, in Chicago; the University of California, in Berkeley, Cal.; and Columbia University in the city of New York, deserve special mention for their connection with this subject of higher commercial education. Some other institutions, notably, New York University and the University of Vermont (where a department of commerce and economics opened in 1900), have important commercial schools.

In 1881 Joseph Wharton, Esq., a manufacturer of Philadelphia, gave to the University of Pennsylvania the sum of $100,000 in order to establish a department in that institution for higher commercial training. The Wharton school of finance and economy had a curriculum two years in length and made up largely of political economy, political science, accounting, mercantile law and practice, etc. A bachelor's degree was conferred upon the graduates from this school. To enter as a regular student the candidate must have completed the first two years of the regular four years' college course. After some 10 years' experience it was decided to enlarge the course by extending it downward into the first two years of the college course, and at present the course in finance and economy covers four years and is included together with the other courses in arts and science in the so-called school of arts. The requirements for admission are the same as for other departments and represent the ordinary requirements of first-class American colleges. The faculty is composed of some 13 members. The nucleus of the course is in the study of economics and politics, supplemented by practical courses in accounting, business law, and business practice.

The growing demand for higher instruction in commercial subjects, combined with the success of the experiments in the University of Pennsylvania, turned the attention of several institutions toward the subject about the same time.

The University of Chicago, which opened its doors in October 1892, had included within its plan of work from the beginning a college of practical affairs. But it was not found practicable to undertake the organization of such a department until the year 1898, and students were enrolled in this college for the first time on 1 July of that year. The new department received the title of the college of commerce and politics, and was organized as a co-ordinate department with the other colleges of arts and literature and science. The purpose of the new college, like that of those already existing in the university, is two-fold. First, it aims at the attainment of general culture; in the second place the weight of work is put in the lines of the courses offered in certain specified departments. In the new college those departments include political economy, political science, history, and sociology. It is by no means a technical school, but is intended to give a kind of knowledge and training which may enable those who enter commerce, politics, journalism, or diplomacy to begin their work with a certain degree of equipment. The course of study covers four years. The first two years, however, are essentially the same as the first two years in one or another of the

liberal courses, political economy, or political science being the only subject in these two years having a specific relation to the special work of the college. The other studies of the first two years are history, French or German, English, mathematics, science, and a small proportion of the time (about one sixth) is given to any other subject which the student may desire to pursue from among the courses offered in the university. The admission to the course covers about the curriculum of the typical four years' high school course, including at least four years' work in Latin, two in mathematics, and the usual time devoted to English history, physics, and German or French. It is during the last two years of the work that the special character of the college becomes apparent. The work of the last two years is divided into three groups: Commerce, politics, journalism and diplomacy. In the first group, commerce, there are four special sub-groups: (*a*) Railways; (*b*) banking; (*c*) trade and industry; (*d*) insurance. The student must elect, at the beginning of the third year's work in this college, one of these groups to which he wishes to devote his time. One third of the course for the next two years must be selected from within the group chosen. Another third may be selected by the student from a list of specified courses. The remaining third may be chosen by the student from any course offered by the departments of political economy, political science, history, or sociology. It will be seen that in this work the nucleus consists of economics and politics, using those terms in a large sense. But the University of Chicago has not added special technical courses in accounting, business law, business practice, etc., which forms a characteristic feature of the Wharton school.

About the same time that the University of Chicago determined to adopt a scheme of higher commercial training, a report was made to the board of trustees of the University of California, by one of its members, urging the adoption of a similar course there. After an elaborate discussion, it was decided to erect an additional college in the university, to be known as the college of commerce. The course extends over four years, similar to that of the other colleges in the university. The requirements for admission are essentially the same, and correspond to graduation from the typical high schools with the four years' course. In the first annual report of the president, after work was begun, it was stated that many details were yet to be determined, among others, the question of what degree should be conferred upon students who completed the course. In the same report the following statement is contained as to the scope of the new college: "It is the intention of the authorities of the university to place the course in commerce upon a high scientific plane, otherwise it is not justified in claiming a place in the university curriculum beside those advanced scientific, philosophical and literary courses which have already won recognition." The student will be encouraged to acquire a knowledge of them elsewhere possibly, before entering college. Thus the college of commerce will supplement, not compete with, the work of the older business commercial schools. The courses of the college of commerce of the University of California fall into the general divisions: Economic studies, economic history, legal, political, historical, and geographical studies, technical studies of transportation, and of the materials of commerce, and mathematical, linguistic and philosophic studies related to commerce.

On 3 Nov. 1898, the Chamber of Commerce of the State of New York adopted the report of a committee which had been previously appointed by that body on the subject of commercial education. This report, after strongly commending the establishment of a department of sounder commercial education, both in secondary schools and in higher institutions of learning in this country, advised the appointment of a special committee by the president of the Chamber of Commerce for the further consideration of the subject of commercial education. This committee was appointed and, after various sessions and conferences with authorities of Columbia University, a report was submitted to the Chamber of Commerce recommending that the chamber assist Columbia University in the establishment of a collegiate course in commerce by the grant of certain funds. This report presents in a certain way the most complete scheme of higher commercial instruction which has thus far been submitted for the consideration of the public. It unites the practical elements in the course of the Wharton school with the wider range of the courses and subjects offered at California and Chicago. It was framed upon the plan of utilizing as largely as possible the existing courses of instruction in Columbia University, and supplementing and adding to such courses the subjects necessary to offer a complete and well-rounded scheme of higher commercial instruction. It planned a college course of commerce covering 4 years of 15 hours a week. It presupposes graduation from a secondary school, public or private, in which English, mathematics, history and natural science, and one modern language will have been systematically studied to the extent now required for admission to the college department of Columbia University. In form and in content it is adapted to students of college age, namely, 16 to 20 years. In addition to the training provided in commercial subjects, the course includes two years in writing English, two years in a modern European language, two years in European and American history, and three years in political economy and social science. It offers opportunities for the study of industrial chemistry, of a selection of three modern languages and literature, if any of these be desired.

Of the 60 hours required (4 years of 15 hours each) 4 hours are devoted to instruction in writing English; 6 hours to European and American history; 6 hours to the modern European languages; 10 hours to political economy and social sciences, and 34 hours to the study of commerce itself in its various phases. It will be observed that this curriculum comprises fundamental courses in the principles governing business combined with a detailed course in practice. It is intended that many of these latter courses, as well as some of the former, shall be given by men having an intimate personal acquaintance with actual business life. Among such courses would be those in accounting and transportation, technique of trade and commerce, commercial ethics, com-

mercial credits, insurance and commercial business. Aside from the general subjects included in liberal courses we note a course of three hours per week for one year in accounting and a similar course in economic geography; a course of two hours a week following a course in chemistry on the study of commercial products; a course of three hours a week upon the technique of trade and commerce, such as weights and measures, currency, and banking systems, customs regulations, markets, fairs, etc. There are also courses in banking, accounting, commercial geography, railroad and public accounting, history of commercial theory and merchant-shipping and trade routes, commercial treaties and insurance. No degree is given for this course, but a certificate of graduation testifying that the candidate has completed the work of the four years will be given to all students who pass the requisite examinations after attending the courses.

It is plain from the foregoing account that instruction in commercial subjects is to be introduced into all higher institutions of learning upon a broader scale than ever before. It cannot be maintained, however, up to the present, that our experience has been large enough to afford any accurate indication of what the ultimate form or purpose of such instruction will be. We have as yet established no independent college of commerce in the United States upon an adequate foundation. We have not even established any institution which may be fairly called a commercial high school, that is, a school with an adequate equipment, with a differentiated curriculum and with an opportunity under favorable conditions to show what it can accomplish in an educational and a technical way. None of our colleges and universities have as yet been willing to give such departments a fair opportunity to show what they might accomplish in the same directions. But with every passing year the demand for better facilities on the part of young people who desire to prepare themselves for business careers will force those who have charge of public education to give a larger space in our secondary schools to this branch of work; will lead the managers of our private secondary schools to offer better facilities, and will finally compel our colleges and universities to do something for the education of the future business man which may be compared with what they are doing for the future engineer, or lawyer, or physician, so far as the peculiarities of a business career may render such a scheme feasible.

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Commercial Law, or **Law Merchant,** that branch of law which relates to trade, navigation, maritime contracts (such as those of insurance, bottomry, bills of lading, charter-parties, seamen's wages), bills of exchange, bills of credit, factors, and agents. Lord Mansfield describes it as a branch of the public law, and applied to its universal adoption the language of Cicero respecting the great principles of morals and eternal justice — "*Nec erit alia lex Romæ, alia Athenis*" ("Nor shall there be one law at Rome, another at Athens"). The body of rules constituting this law is substantially the same in the United States and Europe, the rules, treatises, and decisions of one country and one age being in general applicable to the questions arising in any other. The reason is obvious why this law should be common to different nations, for it regulates those contracts and transactions in which they come in contact, being a sort of neutral ground between their hostile interests, institutions, customs, and prejudices. International law, which regulates the conduct of different nations toward each other, is distinguished from maritime law, by which private contracts between individuals are regulated.

The first known collection of marine laws was that of Rhodes, of which some fragments have come down to us in the 'Digest' of Justinian, in the title 'De Lege Rhodia de Jactu'; the collection under the title of 'Rhodian Laws,' published at Basel in 1561, and at Frankfort in 1596, being generally considered as spurious. This title and that 'De Nautico Fænore' recognize the first broad principles on the subject of jettison and maritime law. The law 'De Exercitoria Actione,' in the 'Digest,' also transmits to us their principles as to the liability of the owners for the acts and contracts of the master of a vessel. The remaining rules and principles by which the commercial transactions of the ancients in the Mediterranean were governed have for the most part passed into oblivion. The reason of so small a space being assigned to this branch of jurisprudence in the Roman laws may be the low estimation in which trade was held by the Romans, who prohibited men of birth and rank from engaging in commerce, of which the Code (4, 63, 3) speaks contemptuously; and Cicero says it was not fitting that the same people should be both the porters and the masters of the world. The Greeks adopted the Rhodian laws with modifications. The Athenian law on the subject of maritime loans is stated particularly in Boeckh's 'Economy of Athens' (b. i. § 23), from which it appears that the rules on this subject were very definitely settled. The laws of trade naturally followed the trade which they were designed to regulate. Accordingly we find them first revived in the Middle Ages, on the shores of the same sea, in one of the islands of which they had their origin; a collection of them being made at Amalfi, in Italy, at one time a great centre of Mediterranean trade, about the time of the first crusade toward the close of the 11th century, called the Amalfitan Table, the authority of which was acknowledged throughout Italy.

The origin of the compilation of sea laws which passes under the title of 'Consolato del Mare,' though involved in some obscurity, is most generally assigned to the city of Barcelona in Spain. Some writers, however, and particularly Azuni, claim the honor of this collection also for Italy. But Casaregis, a profound commercial jurist, who published an edition of it in Italian at Venice in 1737; and M. Boucher, who published a French translation in 1808, from what he considers the original edition of Barcelona of 1494, both admit the Spanish claim. These laws are supposed by M. Boucher to have been adopted and in use as early at the 9th century, and their authority was acknowledged in all the maritime countries of Europe, and some of the articles of this collection form a part of the present commercial law of all civilized nations. It has been translated into German also, but no entire English translation has yet

been made. It is an ill-arranged, confused compilation; and, though it is interesting as a historical record of the marine laws and customs of the Middle Ages, a large proportion of its provisions do not apply to the modes of transacting business and making contracts in modern times. The 'Jugemens d'Oléron' ('Laws of Oleron'), are supposed to have been compiled about the time of Richard I.; and the honor of this collection, like that of the 'Consolato,' from which it is partly borrowed, is in dispute being claimed for the French by Valin, Emerigon, and Cleirac, who say it was made by order of Queen Eleanor, Duchess of Guienne, for the use of that province, and adopted by her son Richard I., Duke of Guienne. But Selden Coke and Blackstone assert that it is an English work published by Richard I. in his character of king of England. The maritime codes of Wisby and the Hanse Towns are also of historical celebrity, and constitute a part of the legal antiquities of this branch of jurisprudence. These were the principal marine codes down to 1673, the date of the French ordinance of commerce, which treated largely of bills of exchange and negotiable paper. In 1681 was published also the French 'Ordinance of the Marine,' one of the most glorious monuments of the reign of Louis XIV. It was framed under the influence of Colbert, and merits all its celebrity, being comprehensive and including provisions, not only on many of the subjects of commercial law as we have defined its limits, but also ample regulations on the subject of prizes. These ordinances are the foundation of the present system of marine law in Europe and America. Valin's 'Commentary upon the Ordinance of the Marine,' published in 1760, is a profound, original, comprehensive, learned, and accurate work. In 1763 he also published his commentaries on the provisions of the ordinance in relation to prizes. About 20 years afterward (1782) Emerigon published his masterly treatise on insurance. The two ordinances, with the commentary of Valin and the treatise of Emerigon, made the commercial law a science, of which the principles were now settled, and their application also traced out into a great number of examples. It was now in the power of jurists, judges, and legislators to make every new question and case that should arise only a confirmation and extension, in application of doctrines which had been established upon conclusive reasons and made parts of a harmonious system; and all the commercial nations have adopted the system thus formed. It forms the basis of the French code of commerce and appears everywhere in the British, American, and continental treatises and decisions. The other French writers of greatest celebrity on this branch of law are Pothier, Cleirac, and Boucher. M. Jacobsen, a jurisconsult of Altona, has published a useful work on the subject of sea laws. The earlier English writers on commercial law were Malynes (a merchant), Molloy (a lawyer), Beawes (a merchant), Postlethwaite, Magens (a *dispacheur*, or adjuster of marine losses, originally of Hamburg, afterward of London), and Wiskett (a merchant). But the marine law cannot be considered as having become a branch of the general science of jurisprudence in Britain until the time of Lord Mansfield, who appears to have had some considerable acquaintance with the treatise of Valin, from which he drew principles and reasons and incorporated them into the reluctant common law. By degrees during his judicial career this branch of jurisprudence gained popularity, and from that time has occupied an important part of the British legal administration, though very few legislative enactments have either disturbed or promoted its progress. Though the maritime law in Great Britain continued in a very rude and undigested state long after it was arranged into an admirable system in France, yet the assiduity with which it has been cultivated since its introduction, and the splendid talents which have been brought to its illustration, have contributed to advance it with a rapid progress. Among the ornaments of this branch of law was Lord Stowell, judge of the British high court of admiralty. Lord Tenterden, chief justice of the court of king's bench, by his learned and well-arranged 'Law Relative to Merchant Ships and Seamen,' contributed very materially to the present advanced state of British commercial jurisprudence. The other principal writers on this law are Millar, Park, Marshall, Bayley, Chitty, Levi, Smith, Tudor, etc. Nor have the Americans been idle spectators of this improvement in a branch of law in which their industry and prosperity are so deeply interested. Though they have supplied but few original systematic treatises and digests, yet in the numerous, important, and interesting questions that have been brought under discussion before the legal tribunals, the research, comprehensive views, and logical power displayed by both the counsel and the courts, will support a comparison with those of their European contemporaries, who might derive very useful additions to their own adjudications, particularly on the subjects of merchants' shipping and insurance, from the American reports. Among the most eminent of those who have contributed to the elucidation of the commercial law are Chief Justice Marshall and Justices Washington, Story, and Blatchford, of the Supreme Court of the United States, and Chancellor Kent, of New York.

Commercial Organizations. In the early part of the 19th century the commercial organizations then existing which had any material influence upon the home and foreign commerce of the nations of the earth were exceedingly few. Indeed, it is doubtful if at that period there were more than 14, namely, 3 in Great Britain, 7 in France, and 4 in the United States. All of these, save two notable exceptions,— The Board of Trade of England and the Council General of Commerce of Paris,— were largely synonymous in their vocations and operations.

In France chambers of commerce had been instituted at a very early date — notably at Marseilles, at the close of the 14th or the beginning of the 15th century; at Dunkirk, in 1700; at Paris, in the same year; at Lyons, in 1702; at Rouen and Toulouse, in 1703; at Montpellier, in 1704; and at Bordeaux, in 1705. While England had her board of trade as early as 1660, it was not until 1786 that the present department was established in council, being a permanent committee of the privy council for the consideration of all matters relating to trade and the colonies, with functions partly ministerial and partly judicial. Of chambers of commerce, Great Britain then had only two: that of Glasgow, instituted in 1783, and of Edinburgh,

founded in 1785, and incorporated by royal charter in 1786.

In the United States the oldest existing chamber of commerce is that of New York, organized in 1768, and incorporated by royal charter in 1770. Shortly afterward a second was established at New Haven, Conn.; another at Charleston, S. C., about 1775; and that in Philadelphia in 1802. It is true that New York about this time had also a board of brokers, organized about 1792 or 1793, and had erected the Tontine Coffee-house, where merchants and others met and discussed mercantile and semi-commercial questions.

The Chamber of Commerce of New York is in some respects not only the forerunner but the type of many like institutions which have been organized in our leading cities, representing, both locally and otherwise, our multiplying and diversified industrial interests. In some instances, however, it essentially differs from other kindred institutions, since, while caring for local welfare, it is also broadly national in its sympathies and work. In this connection it may be interesting to trace back this time-honored organization to the names of the old and respected merchants who founded it. They were: John Cruger, Elias Desbrosses, James Jauncey, Jacob Walton, Robert Murray, Hugh Wallace, George Folliot, William Walton, Samuel Verplanck, Theophylact Bache, Thomas White, Miles Sherbrook, Walter Franklin, Robert Ross Waddell, Acheson Thompson, Lawrence Kortwright, Thomas Randal, William McAdam, Isaac Low, Anthony Van Dam, John Alsop, Philip Livingston, Henry White, and James McEvers. It also may not be out of place to reproduce the original terms used in its formal organization, reciting its usefulness as follows:

"WHEREAS, Mercantile societies have been found very useful in trading cities for promoting and encouraging commerce, supporting industry, adjusting disputes relative to trade and navigation, and procuring such laws and regulations as may be found necessary for the benefit of trades in general. . . ."

Of the history and character of the persons who are here recorded as the original founders of this chamber the memories of the present generation will not be wholly oblivious. The first public place of meeting of the original chamber was at the house now standing, on the corner of Pearl and Broad streets. This building had been originally erected as a town residence, and had undergone many alterations in size and form. During the period of Washington's first residence in this city it was chiefly remarkable as being a public tavern, where in later days Washington was entertained and took his farewell of the officers of the army on his departure for his home in Virginia at the close of the Revolutionary War. The subsequent meetings of the chamber were held, first, in 1769, in the "great room of the building commonly called the 'Exchange,' at the lower end of the street called Broad"; afterward, in 1779, at the Merchants' Coffee-house, on the south-east corner of Wall and Water streets; in 1817 at the Tontine Coffee-house, on the northwest corner of Wall and Water streets; in 1827 in the original Merchants' Exchange (in a room specially set apart for the purpose), until that building was destroyed by fire in 1835; then for a time in the directors' room of the Merchants' Bank on Wall Street; then in premises on the corner of William and Cedar streets, where the chamber remained for many years prior to its final removal to its present commodious quarters on Nassau Street.

At the close of the Revolution the legislature of New York passed an act (on 13 April 1784) "to remove doubts concerning the corporation of the Chamber of Commerce, and to confirm the rights and privileges thereof." Under this act the title was changed from the "Chamber of Commerce" to the "Chamber of Commerce of the State of New York." From the earlier days down to the present period the membership has been principally confined to citizens engaged in finance and commerce, although at different times our records show that public officers of the highest rank, including presidents, governors, senators, congressmen, foreign ministers, and members of the State legislature, have been either honorary or regular members of the Chamber of Commerce. In the earlier steps taken, almost a century ago, to form a code of commercial laws and regulations, the most prominent merchants of that era determined and bound themselves reciprocally to prevent "the scandalous practice of smuggling." Within two years after the evacuation of the city of New York by the British a strong effort was made in the new State legislature to adopt a plan for issuing paper money, to be made by law a legal tender in the transaction of business. A memorial was adopted by the chamber, setting forth in the most forcible terms the evils and immorality of such an issue, and through its influence the proposed measure was defeated. It may be safely alleged that to the good sense and active management of the chamber may be attributed the policy which the general government adopted at this period of peril, whereby the credit of the nation was maintained. At an early period in the active movements of the chamber in January 1786, a resolution was considered asking the assistance of the legislature of New York for the creation of a fund to connect the city of New York by artificial navigation with the lakes. This action clearly connects the sentiments of the chamber of that early day with the great purpose of Gov. Clinton for the construction of the Erie Canal. A few years later we find the chamber entertaining the project for the construction of a ship-canal around Niagara Falls, and a railroad from Lake Erie to the Hudson River.

The question of tribunals of commerce was also considered at several periods of its history; but the legislature was not friendly to this new departure in commercial jurisprudence until 1874, when an act was passed establishing a court of arbitration, to be presided over by a judge appointed by the governor; and this court continues to this day. Another highly important subject had from time to time occupied the attention of the chamber, that of the pilot laws of New York and New Jersey, resulting in the present excellent system. At the annual meeting in 1848 the chamber took formal measures to assist in organizing a savings bank for the benefit of "merchants' clerks and others"; and a charter was granted by the legislature as the result of this thoughtful action, and since then this institution has grown to be one of the most

successful of similar organizations in the country. In 1849 the chamber was interested in Whitney's project for the construction of a Pacific railroad across the continent, and a report favoring its construction was unanimously adopted and forwarded to Congress. It was also instrumental in getting the United States government to remove the sunken rocks from the channel of the East River and to widen the passage through Hell Gate. In 1852 the chamber took active measures in regard to the reciprocity agreement with the North American provinces for the free interchange of the natural productions of the respective countries, embracing also a full and joint participation in the fisheries and the free navigation of the river St. Lawrence. It also repeatedly declared its sentiments on the subject of privateering, and has at all times maintained its inviolable determination to adhere rigidly to the principles avowed by the government of the United States.

The treaty negotiated with Japan by Commodore Perry, in behalf of the United States, opened up a new pathway to commerce with an almost unknown nation, and the chamber took a prominent part in giving signal testimony of its appreciation of that officer's conduct in a graceful gift of a silver service of plate. At a special meeting of the chamber, held 21 Aug. 1858, the successful result of the united efforts of the English and American nations to lay the first Atlantic telegraph cable to connect the continent of the Old World with the New was announced, and the sum of $10,000 was appropriated and applied to the presentation of gold medals to the prominent officers engaged in carrying out the enterprise. At the meeting of the chamber, 6 Sept. 1860, the following resolution was adopted:

"*Resolved*, That in the judgment of this chamber an urgent necessity exists for the establishment, at an early day, of mail facilities between the cities of San Francisco in California and Shanghai in China, with connections at such intermediate ports as the interests of commerce may indicate."

It seems hardly necessary to add that the above is the germ from which has sprung the magnificent line of American steamships which traverses the Pacific Ocean to-day.

A remarkable epoch in the affairs of this country, and one especially affecting all its business interests, occurred shortly after this period. The southern States of the Union had united in revolt against the government, and the President had issued his proclamation calling for military aid. The chamber responded to this appeal by holding a large and enthusiastic meeting on 19 April 1861, at which an ample sum of money was raised to forward at once for the defense of the national capital two regiments of the State National Guard, and also to organize several additional regiments of volunteers, who left shortly afterward for the seat of war. At this meeting attention was called to the fact that a part of the advertised loan of the government remained untaken. A special committee was appointed, and the balance, amounting to $8,000,000, was at once subscribed, and the Treasury Department notified that the same could be drawn for at once. The great mass-meeting at Union Square — now a matter of history — and the Union Defense Committee were the outcome of the action of the chamber. The valuable aid rendered to the government by this committee, composed, as it was, mainly of merchants and bankers of New York, was frequently acknowledged by the highest military authorities, and 66 regiments were equipped and fitted for service and forwarded in the early stages of the war, as standing evidences of its loyalty and efficiency.

At a special meeting of the chamber held on 15 May 1872, "to give expression to the views of the chamber on the Treaty of Washington (resulting in the Geneva award arbitration), and to urge the ratification by the Senate of an additional article thereto, as proposed by Minister Schenck," the following preamble and resolutions were adopted:

"WHEREAS, The Treaty of Washington, referring the differences between this country and Great Britain to arbitration, has justly been regarded as a measure of great importance to the interests of civilization and peace, and the honor of proposing it belongs to this country; and

"WHEREAS, Differences of opinion have arisen between the governments of the two countries respecting the proper construction of the treaty in regard to the claims for indirect damages, and a supplemental article for settlement of those differences has been proposed by the government of Great Britain, and by the President laid before the Senate for its advice, which article appears to this chamber to be sound in principle, binding the two governments to the adoption of a beneficent rule for the future, and especially beneficial to the United States and its commerce; and

"WHEREAS, The failure of the treaty would be a great public calamity; therefore,

"*Resolved*, That this chamber, without meaning thereby to imply that our government has at all erred in its construction of the treaty, and believing that the supplemental article is more than an equivalent for the claims of our government as originally presented, and feeling the importance of removing all obstacles in the way of the execution of the treaty, earnestly recommends the adoption of the supplemental article, and prays the Senate to ratify it."

As the Senate was "hanging fire" in regard to the ratification of this treaty, and war between the two countries was apparently imminent, the action of the chamber in this matter was not only timely and praiseworthy, but also wise, patriotic, and influential, as the sequel showed.

Thus it will be seen that to outline the history and operations of the New York Chamber of Commerce is largely to portray the political, commercial, industrial, and financial development of the country; for really no great politico-economic question has arisen in the United States from the War of 1812–15 to the present time in which it has not been vitally and patriotically interested. The foregoing are, however, but few of the services which it has so signally performed. It has been concerned in nearly everything which related to the commercial welfare and prosperity, not only of the city and State of New York, but also of the country at large, of which it is in a measure the commercial guardian.

The class of people who possessed the most means and experience before and immediatelv after the Revolution were the merchants and ship-owners, and they were the first to per-

ceive the advantages and value of mercantile or commercial organizations, which, as already outlined, they perfected in New York, New Haven, Charleston, and Philadelphia. These commercial bodies were the initial organizations of the kind in America. Their foundations were broad and deep, and each in its way and time performed substantial service for the public good, both local and general. The Chamber of Commerce of Baltimore, instituted in the early decades of the century, but subsequently reorganized as the Board of Trade, still continues its usefulness. The Merchants' Exchanges of New York and Philadelphia, which were founded at an earlier date, have passed away, probably from having been too heavily handicapped at first with expensive buildings and inadequate revenues.

Succeeding the War of 1812–15, and later, other chambers of commerce, exchanges, and boards of trade were organized in various cities of the Union, which also have done much toward developing the industries, trade, and traffic of their localities, as well as taking more or less active part in promoting the general commercial welfare of the country. But the commercial associations which are the most numerous, and withal the strongest, are those founded by people who deal in like things in towns or cities which are to some extent centres of particular callings, such as cotton in New Orleans, leather or wool in Boston, iron in Philadelphia, crockery in Trenton, paper in Holyoke, or print cloths in Fall River or Providence. Among the earliest of the general boards of trade which still retain their vitality, and form an important element in the town or city in which they are located, is the Chicago Board of Trade, which came into existence 13 March 1848, but did not begin business until 2 May 1850. From the beginning it has been an important centre for grain, animal food products, and lumber. Similar boards were established in Detroit, Milwaukee, Cincinnati, St. Louis, Toledo, Minneapolis, and other western cities. That in St. Louis is also an important centre for the cotton trade. Smaller organizations exist in towns numbering less than 10,000 inhabitants, and have proved valuable adjuncts by the infusion of greater local pride and energy among their citizens.

Next to the New York Chamber of Commerce is the Associated Board of Trade of Boston. This is probably the best representative body among strictly business associations in this country. Founded on a new idea or plan, it has so demonstrated, during the few years of its existence, its great practicability and usefulness as to become the exemplar of the newer boards of trade throughout the country. The Boston Associated Board of Trade is not a promiscuous grouping of business men coming together as individuals, but is made up of delegates from the various regularly organized trade associations of that city, these representatives being duly elected by their own organizations, and attending the Associated Board of Trade meetings, to speak and act not only for themselves, but as voicing the wishes of the associations which send them. Thus, when the members of the Associated Board of Trade make a decision, their action is at once of importance (because of its comprehensiveness) in forming commercial and legislative opinion.

As New York is the commercial metropolis of the United States, her merchants, of necessity, must be equally comprehensive in their dealings, not only in home products, but also in those of all other countries with whom they hold commercial relations. To facilitate the operation of this great concentration of business it was found expedient to organize separate exchanges and boards of trade, which as time passed have grown into large proportions. It is impossible in this short article to describe them all,— some 70 in number,— but a few of the more prominent may be mentioned. The New York Produce Exchange, with its 3,000 members, specially deals in grain, flour, provisions, lard, tallow, etc. It possesses one of the finest exchange buildings in the United States, and its business and influence are proportionally great in the line of its specialties. The Stock Exchange confines its dealings to stocks and bonds and other similar securities of this and other countries, and has given great impetus to the development of transportation in this country. The Cotton Exchange, which deals almost exclusively in that staple, buys and sells more cotton for future delivery than any other cotton exchange either at home or abroad. The Petroleum — now the Consolidated — Exchange first dealt in petroleum and mineral oils, but of late years it has turned its attention to stock securities, and is to some extent a competitor of the Stock Exchange. The Coffee Exchange has lately grown into very great prominence, and now surpasses in the volume of its business that of Havre, France, which is believed to be the largest in Europe. The Mercantile Exchange confines its operations to farm products, such as butter, cheese, eggs, poultry, and the like, and now aggregates an enormous business. The Wool Exchange and the Metal Exchange are other important associations, which, with the foregoing, own their buildings; but besides these there are the Maritime Exchange, the Board of Trade and Transportation, the Coal Exchange, the Mechanics' Exchange, and many more with names indicative of their trade specialties, which have organized from time to time as the city developed.

The approximate numbers of the various commercial associations located in the principal cities, not previously enumerated, are as follows: Philadelphia, 20; Boston, 48; Pittsburg, 11; Baltimore, 21; San Francisco, 15; Indianapolis, 8; Louisville, 9; New Orleans, 11; Minneapolis, 12; Kansas City, 9; St. Louis, 26; Omaha, 9; Buffalo, 16; Cincinnati, 17; Cleveland 9; Milwaukee, 10; and the entire number of such organizations throughout the whole country is about 2,000.

Thus it will be seen that, starting with but four commercial organizations, of the character and scope outlined, at the beginning of the 19th century, their number at its close had increased 500-fold. What they have accomplished for the people of this country is simply incalculable. The record is found in our extensive manufacturing industries; in the products of the soil, forests, and mines; in our enormous interstate commerce; in our foreign trade; in our circulating medium and monetary institutions; and, finally, in the unprecedented increase in national wealth, prosperity, and development.

A. E. Orr.
President New York Chamber of Commerce.

Commercial Traveler, a person whose occupation is to transact business as the accredited traveling representative of a jobbing-house or wholesale commercial establishment to other trading houses or commercial establishments. The commercial traveler, or "drummer" (in England commonly called "bagman" and "rider") is the successor to the chapman, or traveling merchant or peddler, who carried with him not samples merely, but stock. The commercial traveler carries only samples and price lists, and he takes orders for goods which are shipped to the buyer direct from headquarters. He has been the means of bringing the goods of the manufacturer in the large and remote city, not only to other cities, but to the smallest towns and hamlets. The number of commercial travelers in the United States (1903) is estimated at a number not much less than 300,000, but previous to the existence of large trusts, the number was greater. They have several associations, organized for social and business purposes. Among them are the Commercial Travelers' Association of New York; the Northwestern Traveling Men's Association of Chicago; one at St. Louis; an Order of Commercial Travelers, a secret society organized in 1888; also a Travelers' Protective Association for providing against overcharges by railroads, hotels, etc. The American and the German commercial traveler were at one time so successful in introducing their goods into Great Britain that in England a school was established to train the "drummer" in special branches that he might compete successfully with the American and German. Early in 1900 night schools of commerce were opened in London, and departments of commerce were added to some of the existing schools. Consult Jenks, 'The Trust Problem'; Volume IV. of the 'Report of the United States Industrial Commission.'

Commercial Treaties, compacts between countries for the purpose of improving and extending their commercial relations; each country engaging to abolish or to reduce to an agreed rate or otherwise modify the duties on articles of production and manufacture imported from the one country into the other. They are usually for a limited period, but may be renewed and modified according to changing conditions. In these treaties the phrase, "most favored nation," implies concessions equal to the most favorable ones granted under similar treaty. The first treaty of commerce made by England with any foreign nation was entered into with the Flemings in 1272; the second was with Portugal and Spain in 1308. The first commercial treaty made by the United States with China was entered into in 1844, and among other things provided that "If additional advantages and privileges of whatever description be conceded hereafter by China to any other nation, the United States and the citizens thereof shall be entitled thereupon to complete, equal, and impartial participation in the same." This provision has substantially been repeated in all subsequent treaties between the United States and China, and forms the basis on which the United States demanded of the Powers of Europe a recognition of the "open-door policy" in their spheres of influence in China.

The commercial treaties of the United States have been based almost wholly upon the principle of reciprocity. Among the most noteworthy of recent years are the following:

Country	Date	Subject
Brazil	1891	Manufactures.
San Domingo	1891	Foods, manufactures.
Salvador	1891	Foods, merchandise.
Germany	1892	Foods, raw materials.
Great Britain	1892	Manufactures, etc.
Nicaragua	1892	Foods, implements.
Guatemala	1892	Manufactures, etc.
Austria	1892	Cotton goods, etc.
Spain	1892	Miscellaneous.
France	1898	Miscellaneous.
Portugal	1899	
Italy	1900	Miscellaneous.
Germany	1900	Food products, etc.

and several others of wider scope which require confirmation by the Senate.

Commercial treaties have also been concluded with Colombia, Honduras, and Venezuela. The terms upon which the United States negotiates treaties of this character have been twice indicated in tariff bills (1890 and 1897), the last one being known as the Dingley Act; but under the Constitution the President and Senate have full right to make such treaties. Concessions to foreign governments in respect to duties are authorized by the Dingley Act upon certain specific conditions, of a reciprocal character, to be ascertained by diplomatic negotiation. The great expansion of the commerce of the United States in recent years has led the government to extend the application of commercial reciprocity wherever practicable. The last tariff bill provided certain commercial arrangements by the President alone, and for treaties under certain limitations which required approval by Congress. To execute this law the President appointed a special commission plenipotentiary, in whose charge the negotiation of such treaties was placed. John A. Kasson was appointed the first reciprocity commissioner. As a further means of promoting the foreign trade of the country, a movement was inaugurated during the congressional session of 1899–1900 for the creation of a separate executive department to have charge of the purely commercial affairs of the nation. In 1903 a new department of "commerce and labor" was created, and a secretary of commerce and labor was added to the President's Cabinet.

JOHN A. KASSON,
United States Reciprocity Commissioner.

Commercy, kō-mär-sē, France, a town in the department Meuse, on the left bank of the Meuse River, about 180 miles east of Paris. In its ancient castle the Cardinal de Retz wrote his memoirs. The town is tolerably well built, and has tanneries and breweries. The cavalry barrack was once the residence of King Stanislas of Poland. Pop. 7,000.

Commere, Léon François, lā-ôṅ fräṅ-swä kō-mär, French genre and portrait painter: b. Trelon, France, 10 Oct. 1850. He studied under Cabanel and obtained the Grand Prix de Rome in 1875. His famous portrait of a ballet dancer, called 'A Star' (1882), is owned in the United States.

Commerson, kō-mär-sōṅ, **Philibert,** French botanist: b. Chatillon-les-Dombes 18 Nov. 1727; d. Mauritius 1773. At the request of Linnæus he composed a treatise on the 'Fishes of the Mediterranean,' the most important ichthyological work that had as yet appeared. In 1767, at the command of the king of France, he ac-

companied Bougainville on his voyage round the world. He died on the Isle de France (Mauritius), after residing there for about four years. He wrote, among other things, a botanical martyrology — a biography of those who have fallen victims to their efforts in the cause of botany. He left his plants, drawings, and papers to the royal cabinet at Paris. Commersonia, a genus of the family *Sterculiacæ*, was named in his honor.

Commina'tion, an office in the liturgy of the Church of England, appointed to be read on Ash Wednesday (the first day of Lent), containing a recital of God's anger and threatenings toward sinners.

Commines, kō-mēn, or **Comines,** France and Belgium, towns on opposite sides of the Lys, eight miles north of Lille. The one on the right bank is in the department of the Nord, France, and communicates by a drawbridge with the other, which is in the province of West Flanders, Belgium. Anciently they formed a single town, which was fortified and had a castle, in which the celebrated historian, Philip de Commines, was born. The manufactures are chiefly ribbons and cotton goods. Pop. of French Commines, 6,000; of Belgian Commines, 5,829.

Commissariat, kŏm-mĭs-sār-ĭ-at, that department of an army which provides provisions, forage, camp equipage, and all the daily necessaries other than those connected with actual fighting. In the United States army the provisioning, etc., is in the care of the Department of Subsistence, presided over by a commissary-general, assisted by 5 assistant commissary-generals, ranking as colonels and lieutenant-colonels; 9 commissaries of subsistence, ranking as majors, 8 as captains, and 200 commissary sergeants. There are also regimental commissaries of the rank of captain. The transportation of supplies belongs to the quarter-master-general's department. In the British army the duties of the commissariat have been managed by different bodies at different times, and at present there is no department so named. The commissariat duties now partly fall on the Army Service Corps, while there is also an ordnance store department for the supply of warlike stores. It is only in the latter body that there are officers designated commissaries.

Commissary, an officer of a bishop who exercises spiritual jurisdiction in remote parts of a diocese, or one entrusted with the performance of duties in the bishop's absence. For this term in its military sense, see COMMISSARIAT.

Commission. (1) Formal act of trust; a warrant by which any trust is held or authority exercised. (2) A written document investing a person with an office or certain authority. (3) A certificate issued by authority by which a military officer is constituted; as, a captain's commission. (4) A body of persons joined in an office of trust, or their appointment; as, a building commission. (5) Brokerage, allowance, or compensation made to a factor, agent, etc., for transacting the business of another; as one per cent commission on sales. (6) A warship is said to be "in commission" when she is fitted out for service and her commanding officer has taken charge under his commission (see definition 3, above). (7) In an official sense, a commission is a legally created body of persons invested with limited but well-defined jurisdiction, as the Interstate Commerce Commission, the Civil Service Commission, the Anthracite Coal Commission, etc.

Commission of Bankruptcy.—A commission appointed to investigate the facts relative to an alleged bankruptcy and to secure all available assets and effects for the creditors concerned.

Commission Merchant.— One who sells goods on behalf of another, being paid by a certain percentage which is called his commission.

Commissionaire, kŏm-mĭs-sē-ō-nār', the attendant attached to continental hotels, who waits the arrival of the trains to secure customers, to look afer their luggage, etc. They may also be employed as guides or otherwise. In London, Edinburgh, and elsewhere, bodies of commissionaires have been established, the men being drawn from the ranks of military pensioners of undoubted character.

Commis'sioner, a member of a commission. See COMMISSION.

Com'missure, an anatomical term applied to nervous connections between adjacent parts of the nervous system. Though it is not always used in quite the same way, the general signification of the term, and the physiological import of the structure, is that of a uniting bridge.

Commit'tee, one or more persons elected or deputed to examine, consider, and report on any matter of business.

Large deliberative assemblies, with a great variety of business coming before them from time to time, are unable, when sitting as a whole, sufficiently to discuss and investigate many subjects on which they are obliged to act. Committees, therefore, are appointed to examine and report to the assembly from which they are selected. In the legislative bodies of the United States, and in the British Parliament, in fact, in all legislative bodies in representative governments, there are committees for various purposes. What are known as "standing committees" and "grand committees" are regularly appointed at the beginning of every session, and have a definite class of subjects with which to deal, the object being to divide the work of the assembly among several bodies, and so facilitate the progress of legislation. In the British Parliament there were formerly four grand committees — of Religion, of Grievances, of Courts of Justice, and of Trade, but they fell into disuse, and were discontinued in 1832. Another ancient committee is that of Privileges, which is still appointed at the beginning of every session, but has seldom any work to do, questions of privilege being generally laid before a select committee specially appointed. Two grand committees have again been constituted since 1882, to deal respectively with Law and Courts of Justice, and with Trade. In the United States Congress the standing committees are very numerous. Among the most important of them in both Senate and House (though each House has not the same committees) are those on Appropriations, Commerce, Elections, Foreign Affairs, Judiciary, Military and Naval Affairs, Rules, and Ways and Means. (See CONGRESS, UNITED STATES.) "Select committees" are appointed by both Houses of the British Parlia-

ment and of the United States Congress to take up special questions and investigate them previous to legislation. In these witnesses may be examined upon oath, and evidence of all kinds brought forward, the proceedings being such as could not be carried on before the whole House. When their reports are given in, measures may be based upon them and passed into laws. What is known as a Committee of the Whole House can only be regarded as a committee in so far as its procedure is concerned, since it consists of all the members who are present. Matters of great concernment (as supply, ways and means, etc.) are usually referred to a committee of the whole House, in which bills, resolutions, etc., are debated and amended till they take a shape which meets the approbation of the majority. The sense of the whole assembly is better taken in this way, because in all committees every one speaks as often as he pleases. When, in the British Parliament, the House is in committee, the chair is regularly taken by the chairman of committees, a member who receives a salary and holds the post during the duration of the Parliament, acting as deputy speaker. (See PARLIAMENT.) When the House is desirous of forming itself into committee, the speaker, on motion, puts the question whether the House will resolve itself into a committee of the whole, to take into consideration such a matter, naming it. The previous question cannot be put in committee; nor can the House in committee adjourn, as ordinary committees may, but, if the business is unfinished, must hold an entirely new sitting. If the business is finished, the chairman reports, either immediately, or, if the House wish, at a later period.

A committee of the person consists of one or more persons to whom the care of one *non compos mentis* or laboring under any other disability is legally committed. Ordinarily one next of kin, or otherwise closely related to the subject is appointed, if duly qualified, but the appointment rests in the discretion of the court.

Committee of Public Safety (*Comité du Salut Public*), a body elected by the French Convention, 6 April 1793, from among its own members, at first having limited power conferred upon it — that of supervising the executive and of accelerating its actions. Later, its powers became extended; all the executive authority passed into its hands, and the ministers became merely its scribes. At first composed of nine, it was increased to 12 members — Robespierre, Danton, Couthon, St.-Just, Prieur, Robert-Lindet, Hérault de Séchelles, Jean-Bon St.-André, Barrère, Carnot, Collot d'Herbois, and Billaud Varennes. In the terms of its constitution the members should have been elected only for one month, but all the above-mentioned held their seats for a whole year. The prevailing party acted on the ground that France, threatened from within and without, could not be governed as if at peace, but could only be saved by desperate measures, as in times of the greatest danger. But after the downfall of the Girondists, 1 and 2 June 1793, when the Mountain, on the recommendation of the Committee of Safety, declared that the population of France consisted of but two parties — patriots and enemies of the Revolution — and consigned the latter to the persecution of all good citizens, terror took the place of law. From this time the committee governed the Mountain party, and through it the Convention. As the sole rule of his conduct Robespierre declared that the mainspring of a popular government in a state of revolution was *la vertu et la terreur!* Carnot confined himself to the direction of the armies, and left to his colleagues the affairs of the interior. At the motion of these men the new constitution was suspended for a time, and the revolutionary government conferred on the Committee of Safety by a decree of the Convention of 4 Dec. 1793. The committee now instituted in all the communes of the republic, as judges of the suspected, revolutionary committees, composed of the most furious zealots: the number of these new tribunals was as great as 20,000. The last remaining forms of regular process were abolished; their place was supplied by violence, and often by avarice and folly. In this time of internal revolutions, and danger from without, it was not in the power of man to restrain the exasperated fury which probably alone prevented France from being conquered. Finally Danton, who had absented himself for a time from the committee on account of the influence of Robespierre, declared himself against the system of bloodshed; and Robespierre himself acquiesced in the condemnation of the ringleaders of the Paris mob (24 March 1794), among whom was Hébert; but soon after (5 April) Danton, with Hérault de Séchelles, was himself overthrown by Robespierre. Till 28 July 1794 the latter now remained master of the lives of 30,000,000 of men. He appointed Fouquier-Tinville public accuser. Prisons were multiplied and crowded; the prisoners were cruelly treated, betrayed by spies, and condemned without being allowed the privilege of defense; the property of all imprisoned on suspicion was confiscated, and the guillotine remained *en permanence*. The same violence was practised in the provinces by some of the delegates of the committee. Among the numberless victims of the system were the noble Malesherbes and the celebrated Lavoisier. The members of the Committee of Public Safety and of the *comité de sureté générale* at last disagreed among themselves. Each committee contained three parties. These, and not Tallien, were the real causes of the 9th Thermidor (27 July). In the committee of public safety Robespierre, Couthon, and St.-Just (*gens de la hautemain*) formed one party; Barrère, Billaud, and Collot d'Herbois (*les gens revolutionnaires*) another; and Carnot, Prieur, and Lindet (*les gens d'examen*) a third. In the *comité de sureté générale* one party comprised Vadier, Amor, Jagot, Louis (*du bas Rhin*), and Voulland (the *gens d'expédition*); to a second belonged Danton and Lebas (*écouteurs*); to the third Moise Bayle, Lavicomterie, Elie Lacoste, Dubarran (*les gens de contrepoids*). Robespierre attempted to remove the unyielding Carnot from the Committee of Safety. On the other hand Billaud Varennes labored to effect Robespierre's downfall. Couthon, St.-Just, the Jacobins, and the commune of Paris alone adhered to Robespierre. But when St.-Just actually proposed in the committee a dictatorship for the safety of the state an opposition was raised against Robespierre in the National Convention by Vadier, Collot d'Herbois, Billaud Varennes, and especially by Tallien and Fréron; the dictator and his faction were proscribed, and the victory of Barras (q.v.)

on the 9th Thermidor brought Robespierre, his brother, St.-Just, Couthon, and others, 105 in all, to the scaffold, 28 July. The Convention now recovered its authority; the Jacobins and the partisans of terrorism (*le queue de Robespierre*) were completely overthrown; at the same time the Convention gave the Committee of Safety and the revolutionary tribunal a more limited power and jurisdiction. The bloody despotism ceased; and when a new constitution introduced (28 Oct. 1794) a directorial government (see DIRECTORY), the Convention was dissolved, and with it sank into its grave the revolutionary government, the reign of terror, and the Committee of Public Safety.

Committees of Correspondence, in American history, public functionaries of a type first appearing in England, created by the parliamentary party of the 17th century in their struggles with the Stuarts. In 1763, when the English government attempted to enforce the trade and navigation acts on America after the Peace of Paris, the colonial leaders advised the merchants to hold meetings and appoint committees to memorialize the legislature and correspond with each other to forward a union of interests. This was done in Massachusetts, Rhode Island, and New York 1763–4. On 13 June 1764 the Massachusetts General Court appointed a committee to communicate to other colonial governments its instructions to its agent in London, to protest against the Sugar Act and the proposed Stamp Act. When the latter was passed in 1765, the Sons of Liberty formed committees of correspondence to organize resistance. Samuel Adams, during the decade 1764–74, constantly urged the adoption of this plan by the patriots of every town and county in each colony, and moved the general court to that effect in 1770–1. A few public bodies in the country appointed such committees, but there was no general concert. The payment of judges' salaries by the royal government in 1772 was seized upon by Adams as a fresh incitement, at first with scant effect, but on 21 November a slender town meeting at Faneuil Hall, Boston, appointed a correspondence committee of 21 to communicate with other Massachusetts towns concerning infringements of popular rights. It consisted of the foremost popular leaders — Adams, Otis, Warren, Quincy, etc. — and until late in 1774 (see COMMITTEES OF SAFETY) remained the real executive of the town and largely of the province. A report of its first meeting was printed and sent to all the towns and to other provinces, and in a few weeks 80 Massachusetts towns had appointed similar committees, many more doing so in a short time. No fresh places in other colonies joined, though the report was printed in their newspapers. But the royal commission to investigate the burning of the Gaspee in Rhode Island and send the culprits to England for trial effected Adams' purpose — curiously, not in Rhode Island itself, but in Virginia, where the House of Burgesses, on 12 March 1773, appointed a committee of 11 to communicate with other colonies on the doings of the administration, especially in Rhode Island, and report. The plans were characteristically different, the Massachusetts being by the town voters, the Virginia by the legislature, but the latter was immediately effective in eliciting response. Committees were appointed by Rhode Island 7 May, Connecticut 21 May, New Hampshire 27 May, Massachusetts 28 May, South Carolina 8 July. This threat of united opposition daunted the government; the Gaspee prosecutions were not pressed, and the commission found adversely to its commander. There being nothing more to do, the legislative committees stopped for the time, after exchanging proceedings. The Boston committee alone continued its political activities, and the tea question (see BOSTON TEA-PARTY) soon revived the others. The Boston committee, followed by that of Connecticut, sent out circulars urging the defeat of British purposes; and the former, by legal town-meeting, was made the executive of Boston. It called the committees of five surrounding towns into consultation, and sat "like a little Senate," Hutchinson said. Under its direction the tea was thrown into the harbor. The Tea Act roused the remaining colonies: Georgia in September, Maryland and Delaware in October, North Carolina in December, New York and New Jersey in February, chose legislative committees of correspondence; and new municipalities joined the movement — several in New Hampshire and Rhode Island and the city of New York. After the Boston Port Bill came into effect the Boston committee invited those of eight other towns to meet in Faneuil Hall, and the meeting sent circulars to the other colonies recommending suspension of trade with Great Britain, while the legislative committee was directed by the House to send copies of the Port Bill to other colonies, and call attention to it as an attempt to suppress American liberty. The organization of the committees was at once enormously extended; almost every town, city, or county had one, though a few dismissed theirs in fear of the coming storm. The Boston opposition attempted this, but were crushingly defeated. In the middle and southern colonies the committees were empowered, by the terms of their appointment, to elect deputies to meet with those of other committees, to consult on measures for the public good. The history of the committees from this time on is the history of the preliminaries of the Revolution. Consult Frothingham, 'Rise of the Republic' (1872).

Committees of Safety, in American history, these were a later outcome of the committees of correspondence (q.v.). In Massachusetts, as affairs drew toward a crisis, it became usual for towns to appoint three committees of correspondence, of inspection, and of safety. The first was to keep the community informed of dangers either legislative or executive, and concert measures of public good; the second to watch for violations of non-importation agreements, or attempts of loyalists to evade them; the third to act as general executive while the legal authority was in abeyance. In February 1776 these were regularly legalized by the General Court; but consolidated into one, called the "Committee of Correspondence, Inspection, and Safety," to be elected annually by the towns. This possessed all the powers of the other three, but in addition was empowered to notify the proper authorities of all violation of any of the acts, resolves, or recommendations of the legislature; also to send for persons and papers, call out the militia, take charge of confiscated property and prisoners of war, and carry out

the laws against Tories. An appeal lay from them to the legislature, but was not often thought judicious. Previous to this, however, in October 1774, the first Provincial Congress of Massachusetts had appointed a provincial committee of safety, with 11 members, to act as the general executive of the province; and in the next few weeks it made arrangements to raise and support an army. On 9 Feb. 1775 the second Provincial Congress constituted five members a permanent executive, and instructed it to "alarum, muster, and cause to be assembled with the utmost expedition, and completely armed, accoutred, and supplied, such and so many of the militia of the province as they shall judge necessary," such levy to be made when the committee thought a forcible attempt was to be made to carry out the Boston Port Bill. It was this committee's decision to take possession of Charlestown and Dorchester Heights, on the rumor that Gage was to have heavy reinforcements and occupy them, which led to the battle of Bunker Hill. New York had also a committee of safety, of 100 men, but it is characteristic of the undeveloped politics of the time that several of these were conservatives who afterward joined the British side. Partly from this, and partly from the unwieldy size of the committee, an inner committee was formed consisting entirely of Sons of Liberty, and directed its operations. At the news of the battle of Lexington, they called a public meeting in New York at the city hall, and secured the arms and ammunition in the arsenal. John Lamb and Isaac Sears led the action, arrested all British vessels about to sail for Boston, locked up the custom-house, and discharged the cargo of a vessel detained by British authorities as loaded with supplies for the patriots, formed a military company, armed it from the arsenal, surprised and captured the chief depot of British stores at Turtle Bay, and when the British commander ordered his men to join the army in Boston, refused to allow them to take any arms but those in their hands. Otherwise they were to be allowed to embark unmolested. The more ardent members were displeased at this, but kept the letter of the promise and no more. The muskets being carried in wagons, they confiscated them as not "in the hands," the soldiers declaring that they should not be used against their brethren in Boston. Consult the functions of the committees, Sparks, 'Life of Gouverneur Morris,' Vol. I., chap. 2.

Commodore, in the United States navy, formerly an officer ranking next above a captain, and commanding a few ships when they were detached for any purpose from the rest of the fleet. The grade was abolished by Congress in 1899, when all commodores became rear-admirals.

The word is also a title given in courtesy to the president of a yachting club, or to the senior captain of a line of merchant vessels.

Commodus, kŏm mō-dŭs, **Lucius Aelius Aurelius,** Roman emperor: b. 161 A.D.; d. 31 Dec. 192. He was the son of Marcus Aurelius and gave early proofs of his cruel and voluptuous character. On the death of Marcus Aurelius, 180 A.D., Commodus ascended the throne, and showed himself a more execrable monster than even Caligula, Domitian, or Nero. For his amusement he cut asunder persons whom he met, put out their eyes, mutilated their noses, ears, etc. He was endowed with extraordinary strength, and often appeared in imitation of Hercules, dressed in a lion's skin, and armed with a club. To fill the treasury, exhausted by his extravagances, he imposed unusual taxes upon the people, sold governments and offices to the highest bidder, and pardoned criminals for money. To display his strength and skill in arms he appeared publicly in the amphitheatre. He is said to have fought in this way 735 times, and as his opponents were armed with weapons of tin or lead, while he was encased in impenetrable armor, he had naturally an easy victory on every occasion. In his combats with wild beasts he was securely protected by a screen of network, through which he hurled his darts or shot his arrows. A part of the city having been consumed by fire, and the people reduced to despair by famine, disturbances broke out, and the emperor was obliged to consent to the death of his minister, Cleander, who was charged with being the author of these calamities. Commodus was strangled by the gladiator Narcissus, and on the news of his death, which was reported to be the consequence of an apoplexy, the senate declared him an enemy of the state, ordered his statues to be broken to pieces, and his name to be erased from all public inscriptions. Rome was indebted to him for her handsomest baths — the Thermæ Antoninianæ. He established also an African fleet, in addition to the Egyptian one, for the purpose of supplying the city with corn.

Common, that which belongs as a privilege or right equally to more than one, to many, or to the public at large; free to all; general; universal; public; having no separate owner; as, the common weal.

In logic the word is applied to terms or names, in opposition to individual, singular, or proper. "Common terms, therefore, are called 'predicables' (namely, affirmatively predicable), from their capability of being affirmed of others; a singular term, on the contrary, may be the subject of a proposition, but never the predicate unless it be of a negative proposition (as for example, the first-born of Isaac was not Jacob); or, unless the subject and predicate be only two expressions for the same individual object, as in some of the above instances."

The word is also applied to an open and (generally) unenclosed space, the use of which is not restricted to any individual, but is free to the public or to a certain number. In most of the cities and towns in the United States there are considerable tracts of land appropriated to public use. These commons were generally laid out with the cities or towns where they are found, either by the original proprietors or by the early inhabitants.

Common Carriers, such as carry goods for hire indifferently for all persons. The term includes carriers by land and by water. On the one hand they comprise stage-coach proprietors, railway companies, truckmen, wagoners and teamsters, carmen, porters, and express companies, whether such persons undertake to convey goods from one portion of the same city to another, or through the whole extent of the country, or even from one country to another; and on the other hand they include the owners and masters of every kind of vessel or water-

craft, who undertake to carry freight of any kind for all who choose to employ them, whether the extent of their navigation be from one continent to another or only in the coasting trade, or whether employed in lading or unlading goods or in ferrying, with whatever motive power they may adopt. (Story, Bailments, §§484–496.) Common carriers are liable for all damage or loss during the transportation from any cause, except the act of God or the public enemy. Common carriers both by land or water, when they undertake the general business of carrying every kind of goods, are obliged to carry all which offer, and if they refuse without just excuse, they are liable to an action. Common carriers may qualify their common-law responsibility by special contract. The bill of lading is usually the written evidence of the contract between the parties. The responsibility of the carrier begins on receipt of the goods from the owner. Carriers of passengers are not held responsible as insurers of the safety of those whom they transport, as common carriers of goods are. They are, however, bound to a high degree of care in the selection of appliances, employees, etc., in order to secure the safety of their passengers. See COMMERCE, INTERSTATE.

Common Council, the council of a city or corporate town, empowered to make by-laws for the government of the citizens. In American cities the city council is generally composed of two branches, called, respectively, select and common. They are elected by the people.

Common Law in America. See LAW, COMMON, IN AMERICA.

Common Life, Brethren of the, or **The Common Lot,** a religious institute founded about 1376 by Geert or Gerhart Groot at Deventer, in the Low Countries. Groot on a visit to the noted mystic Ruysbroek was so impressed by the spectacle of peace and joyful co-operation shown in the community of Austin friars over which Ruysbroek presided that he resolved to form a society embracing both clerics and laymen who, without taking the monastic vows, should lead an austere Christian life in common. One of the aims of the brotherhood was to conduct schools for the religious and moral education of children, and their labors in that field were so successful and so highly appreciated that their school at Hertogenbosch had 1,200 pupils and another school even a larger number. Establishments of the brotherhood were founded in Italy, Sicily, and Portugal, and in 1430 there were in existence 130 societies of the institute. At the same time there was formed a similar institute for women: here the superior of each society was styled the Martha. Among the eminent characters who were members of the brotherhood or alumni of their schools were Thomas à Kempis, Nicolaus Cusanus and Erasmus. Many of the «obscurantist» letters in the 'Epistolæ Obscurorum Virorum' purported to be written by members of the Deventer Brotherhood, who are made to appear as irredeemable blockheads.

Common Pleas, Court of. See COURT.

Common Prayer, Book of, the book which contains the public form of prayer prescribed by the Church of England to be used in all churches and chapels, and which the clergy are to use under a certain penalty. The Book of Common Prayer is used also by the English speaking Episcopal Churches in Scotland, Ireland, America, and the colonies, as well as by some non-Episcopal bodies, with or without certain alterations. It dates from the reign of Edward VI.; was published in 1549, and again with some changes in 1552. Some slight alterations were made in it when it was adopted in the reign of Elizabeth. In the reign of James I., and finally soon after the Restoration, it was revised.

Common Schools, schools for the common people or the people in general; in the United States the term means schools to which all persons within certain ages, except criminals and those with contagious diseases, may attend. The common schools in nearly all the States and Territories are supported by public funds. At first the term was confined to elementary and secondary schools, but there is a growing tendency to include in the common schools of the United States all grades and degrees from the kindergarten to the university. At present (1903) laws relating to compulsory education have been enacted by 31 States, one Territory, and the District of Columbia. There are enrolled in the elementary and secondary common schools 17,299,230 persons or over 22 per cent of those of school age, namely, between the ages of 5 and 21 years. There are about 420,000 teachers employed in about 300,000 school houses. The common school system in general use in the United States is now being extended into Porto Rico, Hawaii, and the Philippine Islands. Cuba has adopted the same system. See EDUCATION; NATIONAL EDUCATION, SYSTEM OF.

Common Sense, the philosophy of the so-called Scotch school of philosophy founded by Thomas Reid (1710–96), who aimed to establish a series of fundamental truths indisputable as primitive facts of consciousness. He taught that the general consent of mankind as to the existence of an external world, as to the difference between substance and qualities, between thought and the mind that thinks, is sufficient to establish the reality of a permanent world apart from ourselves; and he maintains that sensations are not the objects of our perception, but signs which introduce us to the knowledge of real objects.

The name is applied in colloquial language to that power of mind which arrives at correct conclusions, even if the thinker has no knowledge of laws of thought.

Common-time, time with two beats in a bar or any multiple of two beats in a bar. The beats may be of the value of any note or rest or compound of notes and rests, providing the sum required by the time sign be exactly contained in each bar. Common-time is of two kinds, simple and compound. Simple common-time is that which includes four beats in a bar, or any division of that number, or square of the number of its divisions. The signs used to express simple common-time are the following: $\frac{2}{1}$, $\frac{2}{2}$, $\frac{2}{4}$, $\frac{4}{4}$, $\frac{4}{8}$, and the characters C and ₵. In these signs the upper figure denotes the quantity of notes required in the bar, and the lower figure the quality of the notes. Compound common-time is expressed by the signs $\frac{6}{4}$, $\frac{6}{8}$, $\frac{12}{8}$, such signs meaning two or four beats of three crotchets or quavers to each beat.

Commons, John Rogers, American economist: b. Darke County, Ohio, 13 Oct. 1862. He graduated at Oberlin College 1888, studied at Johns Hopkins University 1888–90, and became professor of sociology in Syracuse University, resigning in 1899 to become director of the Bureau of Economic Research. He is the author of many articles on wealth, social reform, representation, municipal government, etc., which have appeared in the leading American journals devoted to those subjects, and of 'Social Reform and the Church,' 'Proportional Representation,' 'The Distribution of Wealth,' etc.

Commons. The commons of Great Britain, in a general sense, consist of all such men in the kingdom as have not seats in the House of Lords, and every one of whom has a voice in Parliament, either personally or by his representatives. Commons in Parliament are the lower house, consisting of representatives elected by the counties or divisions of counties, and by the cities and boroughs. In the election of representatives anciently all the people had votes; but in the 8th and 10th of King Henry VI., for avoiding tumults, it was enacted that in counties none should vote but such as were freeholders, did reside in the county, and had 40s yearly revenue, equivalent to nearly £20 a year of the present money; the persons elected for counties to be *milites notabiles*, at least esquires or gentlemen fit for knighthood; native Englishmen, or at least naturalized, and 21 years of age; no judge, sheriff, or ecclesiastical person to sit in the House for county, city, or borough. The House of Commons, in Fortescue's time, who wrote during the reign of Henry VI., consisted of upward of 300 members: in Sir Edward Coke's time their number amounted to 493. At the time of the union with Scotland, in 1707, there were 513 members for England and Wales, to which 45 representatives for Scotland were added; so that the whole number of members amounted to 558. In consequence of the union with Ireland, in 1801, 100 members were added for that country; and the whole House of Commons therefore consisted of 658 members. By the reform bill of 1832 the number of members was altered as follows: 500 for England and Wales, 53 for Scotland, and 105 for Ireland. The reform acts of 1867 and 1868 introduced a further alteration, the numbers being 493 for England and Wales, 60 for Scotland, and 105 for Ireland; by the act of 1885 they became respectively 495, 72 and 103. See PARLIAMENT.

Commonwealth, the state or prosperity of a country without any reference to the form of government under which it may be at the time. Owing to the semi-independent position of the States of the American Union the term commonwealth is of frequent application to the various members of the great Federal government, which itself is spoken of as the National or Federal Commonwealth in contradistinction from its constituent autonomies. In many of the States the legal proceedings against criminals, etc., are instituted in the name of the (for example) "Commonwealth of —— *v.* John Doe."

The word is also applied to the period in the history of England during which the parliamentary army and the Protector Oliver Cromwell exercised the power of government. King Charles I. was beheaded on 30 Jan. 1649; but if the beginning of the commonwealth be deferred to the time when Oliver Cromwell became Protector, then its beginning was not till 16 Dec. 1653. It received an all but fatal blow by the death of its great chief, 3 Sept. 1658. On 22 April 1659, Richard Cromwell, his incompetent son and successor, resigned, and on 29 May 1660, Charles II. was restored to the throne.

Communalism, kŏm'mū-nal-izm, the theory of government by communes or corporations of towns and districts, adopted by the advanced republicans of France and elsewhere. The doctrine is that every commune, or at least every important city commune, as Paris, Marseilles, Lyons, etc., should be a kind of independent state in itself, and France merely a federation of such states. This system must not be confounded with "Communism" (q.v.), with which, however, it is naturally and historically allied, though the two are perfectly distinct in principle.

Commune, kŏm'mūn, the unit or lowest division in the administration of France, corresponding in the rural districts to the English parish or township, and in towns to the English municipality. In France there are about 36,000 communes, with a considerable measure of self-government, with the power of holding property, etc. Each commune has a council elected by universal suffrage, and the council is presided over by a *maire* and one or more *adjoints* or assistants. In the larger communes the *maire* is selected by the central government out of the members of the council; in others he is appointed by the prefect of the department. The central government, through its officials, exercises generally a very large control over the affairs of the commune.

The rising of the Commune of Paris in 1871 should not be confounded with "communism" (q.v.). It was a revolutionary assertion of the autonomy of Paris; that is, of the right of self-government through its commune or municipality. The theory of the rising was that every commune should have a real autonomy, the central government being merely a federation of communes. The movement was based on discontent at Paris, where the people found themselves in possession of arms after the siege of the Germans. The rising began on 18 March 1871, and was only suppressed 10 weeks later after long and bloody fighting between the forces of the commune and a large army of the central government; 6,500 Communists having fallen during 20–30 May, and 38,578 being taken prisoners.

Communicatio, Communio, Idiomatum, kŏm-mū-nē-kā'shĭ-o, ĭd-ĭ-ō-mā'tŭm, a term or phrase hardly capable of translation into English, which is used to signify the appropriation mutually of divine attributes to Christ as man, and of human attributes or human affections to Christ as God: this because of the hypostatic union of the divine nature and the human nature in Christ: thus, we say "God died for us," and the mother of Jesus is *theotokos, deipara*, mother of God. *Idioma*, plur. *idiomata*, is Greek equivalent to Latin *proprietas*, and means that which belongs to one, an attribute: the theological phrase in Greek is *antidosis idiomaton*.

Communion, the reception of the Eucharist. In the Roman Catholic Church the Eucharist is administered to the faithful only in one kind, the species of bread: only the priest who performs the act of consecration receives the sacrament in both kinds: in the Protestant churches the laity receive the sacrament in both kinds, and the usage of the Greek and Oriental churches is the same. The withholding of the cup from the laity was not required by the laws of the Latin Church till the Council of Constance ordered it in 1414, though by that time usage had made it an almost universal custom. Yet down to the 11th century communion under both species was universal, and as late as the middle of the 13th century St. Thomas Aquinas notes the communion under one kind as the usage only of "some churches." As it is purely a Church regulation, the Church can and does dispense from it, or the Church can abrogate it and bring back the original usage of communion in both kinds. Even in the earliest times communion under one kind was the rule when the sacrament was to be administered to the sick and infirm in their homes: in that case the one kind was under the species of bread; but in the same early period it was customary to administer the Eucharist to infants immediately after baptism, but only under the one species of wine.

Communism. Although aiming at the abolition of private property, communism must not be understood as including at all times an equal division of all property. In its limited application it may mean the common management of industry and the sharing of the fruits of some of these in common. Socialism is not communism, though some socialistic schools are communistic, that of Edward Bellamy's 'Looking Backward' being purely so.

Communism, or the sharing of things in common, is, in a limited form, practised by every civilized community. There is to-day common management of parks, schools, and other utilities, and practical communism in water, which is supplied free to the poorest inhabitant of our cities. In the case of commodities which are plentiful and cheap, as, for example, matches, there is a kind of communism prevailing among individuals. But perfect communism as a social theory finds few adherents, and practical experiments in the past in such directions have been, save for limited periods, unsuccessful. Even where the communism of certain societies or settlements has succeeded temporarily it has done so largely by their trading with or manufacturing for the greater world of capital and labor that touches them from without. Few of such communities that have remained entirely isolated have attained even a measurable degree of success.

It is not too much to say that in primitive times property was in common, and that individual ownership arose as a natural development out of communism. The Cretans and the Spartans possessed communistic societies, and there seems to be little doubt that communism as a supernatural ideal was practised among the early Christians. That it was successful for a time in the primitive state of society then prevailing among the disciples of Jesus also seems highly probable. The communistic societies that have since been formed have been successful in the measure of religious devotion that inspired sacrifice, and have declined as this religious ardor subsided, or became corrupted by other elements. But whatever their temporary success may have been among the early Christians, the experiments were soon utterly abandoned, and the principle of individual ownership of property finally and fully asserted itself. That even the early Christians adopted without qualification the theory of communism may be doubted. Certainly authorities are disagreed, so that even here we are without the necessary data to conclude that perfect communism was temporarily successful. During the Middle Ages many of the religious orders, notably those that strove to preserve the apostolic simplicity of the early Church, the Franciscans, the Brothers of the Common Lot, and others, taught and practised communism.

The communities that have been formed in the United States, mostly in New England and the West, have nearly all died out, or exist in a moribund condition. We need not speculate upon the reasons, though it would seem that the desire of individual ownership, with the incentive to action which such ownership inspires, is indestructible and therefore fatal to perfect communism. The most famous of all American communistic or semi-communistic societies that arose as a result of the teachings of Charles Fourier (q.v.), was that of Brook Farm (q.v.) because of the intellectual and literary eminence of its founders. Horace Greeley (q.v.) was a warm friend of the Fourierite movement from the first, advocated it powerfully in the New York *Tribune,* and was vice-president of the North American Phalanx, in Monmouth County, N. J., one of the most successful of the Fourierite communities, for it lasted over 12 years, dying in 1856. It was intended as the model of its kind, and at the beginning it prospered. Perhaps no similar movement has ever received anything like the influential support accorded to Fourierism. The teachings of this remarkable man, the insight and value of much that he wrote, as well as the warmth that suffused his prophecies, enlisted the enthusiasm and aid of some of the most eminent men of the time. But feuds and inharmony set in, and slowly the movement began to disintegrate. The noble dreams of Fourierism were either founded upon mistaken generalizations, or were too early anticipations of the industrial and social development of mankind. It was only at a late period of its career that Brook Farm came to be modeled on the Fourier plan, and its simple life became perhaps too systematized. Work was in common, and at the most menial occupations men who became the glory of American letters, and women of the highest New England culture cheerfully took their turns. But with the ebbing of the tide of Fourierism the Brook Farm experiment came to an end. The North American Phalanx outlived it for a short period, but with the death of that settlement a movement which embodied one of the most pretentious and sweeping philosophies of social regeneration perished from the American continent. Fourierism, which in France had died for lack of funds, had received in America as fair and adequate a trial as was ever accorded to any mooted social reform. For years its disciples had taught and experimented, only to end with failure. When

the New York *Tribune* abandoned its advocacy it ceased even to be a topic of general discussion, and in 1856 came its final collapse.

In connection with early attempts in the last century to found communistic settlements in this country the name of Robert Owen (q.v.) is conspicuous. This English manufacturer, an enthusiastic communist, having seen his efforts in Great Britain fail of fruition, visited this country and founded a number of communities, the best known of which was that of New Harmony, Ind. Most of the others were short-lived, and that of New Harmony, born in 1825, expired in 1827. Among the communities that owe their origin to religious fervor, and which still survive at Mount Lebanon, N. Y., Union Village, Ohio, Watervliet, N. Y., and elsewhere are those of the Shakers (q.v.). Their founder, Ann Lee (q.v.), landed in New York in 1774, with eight followers from England. They had fled to escape the persecution which had followed her bold assertion of divine revelation. The Shakers are celibates, and thus their communities have not grown very rapidly, yet 15 are said to exist to-day. The Oneida Community, another of the very few survivals of that communistic spirit which swept over the country in the middle forties, was established in 1848. It ignored the regulation of marriage, founding the union of the sexes purely on the mutual consent of the man and woman. It was because of this that the Oneida Community fell into evil repute, and this reputation extended in many cases to communities less deserving of the stigma. The union of one man with one woman the community expressly discouraged as an "exclusive and idolatrous attachment." When a man and woman were brought together, and showed a tendency to "fall in love," everything was done by the society to discourage such relationship, even to the extent of forcing them apart by publicly expressed condemnation. A more extraordinary view of sex relationship has probably never suggested itself among all the confused and eccentric beliefs of mankind. The Oneida Community was founded by John Humphrey Noyes, in Madison County, N. Y. They practised communism, and a change of occupation (a Fourierite principle). They have, it is said, forbidden the admission of new members.

The Harmony Society, which was succeeded in 1825 by New Harmony, Robert Owen having purchased the land of that settlement from George Rapp (q.v.) and his followers, was a notable experiment. Rapp's notions were queer enough, but he had great influence with his followers, who regarded him as possessed of supernatural powers. They practised communism and celibacy from 1805, the date of the founding of the community in Butler County, Pa., where they remained until 1814, when they changed their location to the Wabash valley. Here the settlement flourished until the purchase of the lands by Robert Owen. The Amana Community, still surviving, was formed in 1842 by emigrants from Germany and Switzerland, who originally belonged to the peasant class. They settled in New York State, near Buffalo, and later removed to Iowa. They were spiritualists who regarded themselves as the subjects of special revelation. This religio-communistic settlement is probably the earliest in origin in this country, for it traces the beginnings of its creed as far back as the early part of the 18th century. Their rules of life are rigid and forbidding; amusements are prohibited; and much that ministers to innocent pleasure is banished as sinful.

To mention even the names of all the communities that exist or have existed in the United States would take more space than can be given to the subject. The appended bibliography will guide to all the information of which the reader may be in search. But special mention ought not to be omitted of the Icarian Community, remarkable as owing its origin to a book, 'A Voyage to Icaria,' by Etienne Cabot (born 1788), who had been a member of the French legislature and a leader of the Carbonari. He sailed in 1848 with a number of his followers from France, and established the community in Illinois in accordance with the ideas contained in his work. They numbered as many as 1,500 at one time. Later they were compelled to seek other settlement in Iowa. This community was peculiar in that it came nearer to the ideal of democratic communism; the rigid regulations of other communities were absent, the point aimed at being to let every one do as he pleased. A settlement in which no community of property save that of land obtains, and in which the government is nearly as purely democratic, is that of Fairhope, Ala., founded a few years ago by a handful of the disciples of Henry George. It is organized as a corporation, by which its real estate is administered. The annual value of the land is taken for communal purposes. It numbers about 300 members, and up to the present time is prosperous.

All these experiments which have been reviewed have failed to demonstrate the feasibility of communal life. Existence within its confines is, for the most part, meagre and unsatisfying. Though these communities sometimes grow rich, progress in its finer sense there is none; they do not rise in culture and intelligence above their original level. Yet some things they have demonstrated, among which are the possibilities of a more peaceful industry, more unselfish lives, together with a fuller leisure, and freedom from the harassing fear of want. Abnormal as they seem, they are really protests against what in our civilization is abnormal. Clothed, as the most successful of them are, in religious guise, the fact that they are impulses, even when most eccentric, of the more profound and imperishable nature of man, is vastly significant.

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Communistic Societies. See COMMUNISM.

Community of Interest. See RAILROADS.

Com'mutator, a piece of apparatus used in connection with many electrical instruments for reversing the current from the battery. There are various forms, which will generally be found described with their proper instruments. See DYNAMO.

Comneni, kŏm-nē'nī, an extinct family of sovereigns, according to an unsupported tradition, of Italian origin, which numbered, on the throne of Constantinople (1057 to 1204) and on that of Trebizond (from 1204 to 1461), 18 emperors, besides 19 kings and numerous independent princes. When the Crusaders had overturned the throne of the Comneni in Constantinople, and established the Latin empire there in 1204, a prince of the ancient house of the Comneni founded an independent state at Trebizond in Asia Minor, where he was governor. The last sovereign of this house was David Comnenus. From him, it is said, was descended Demetrius Comnenus, a French captain of dragoons, who died without children at Paris in 1821, with the title of *maréchal de camp*. But his descent cannot be historically traced. Ducange asserts without hesitation that Mohammed II., the conqueror of Constantinople, after he had obtained the empire of Trebizond, so called (which was scarcely as large as a French department), from the Emperor David, by a treaty, sent for this prince and his seven children to Constantinople. In order to get possession of the income which had been secured to the Greek prince he ordered him to be put to death, with all his children, at Adrianople in 1462, under pretence of a conspiracy. This is confirmed, according to Ducange, by all contemporary writers — Chalcondylas, Ducas, Phranzes. A remarkable member of the family was the Princess Anna Comnena, daughter of the Emperor Alexius I., who flourished in the first half of the 12th century. See ANNA COMNENA.

Como, kō'mō (anciently COMUM), Italy, capital of the province of Como, in Lombardy, 24 miles northwest of Milan in a delightful valley at the foot of Lake Como. It is a bishop's see. The city contains some antiquities, a splendid marble cathedral dating from the 14th century, and 12 beautiful churches; also a cabinet of natural history and natural philosophy. During the 11th and 12th centuries Como was at the head of the Ghibelline party, and the rival of Milan. Here was born Pliny the Younger and Volta and Giovio, writers, also the popes Clement XIII. and Innocent XI. A number of the inhabitants travel about with small-wares, such as mirrors, spectacles, little pictures. Even in the time of the Roman emperors this taste for emigration manifested itself. The inhabitants of Como were then to be found in all parts of Italy in the capacity of masons. Silk and knit wear are manufactured. The province of Como has an area of 1,049 square miles and a population of 515,134. It has fine pastures, and yields grain, olives, wine, and silk. Population of the commune 25,800.

Como, Lake (LAGO DI COMO, lä' gō dē kō'mo, anciently LACAS LARIUS), a lake in the north of Italy, at the foot of the Alps. Toward the middle it is divided into two branches by the point on which is situated Bellagio. The branch extending toward the southwest to the city of Como goes under the same name; that which turns to the southeast to Lecco takes the name of Lake Lecco. The length of the lake to Bellagio is 16 miles, that of the southwest branch 19 miles, and that of the southeast branch 12½ miles. The greatest width is two and a half miles. More than 60 rivers and rivulets flow into it, and the Adda passes through it. It is about 700 feet above the level of the sea, and about 190 feet above Milan. Lake Como, the most delightful of all the lakes in Upper Italy, is surrounded by mountains 3,000 or 4,000, or even 7,000, feet high, which descend toward the lake, and in many parts are clothed with woods. It is bordered by delightful gardens and country seats. Fish, particularly trout, are caught in the lake. The neighboring country is rich in minerals — iron, copper, and lead.

Como Stage, a thin mass of shales and sandstones representing clays and sands deposited in a fresh-water lake that covered southern Wyoming and extended into Colorado. The exact age of the beds is still in dispute; they have been assigned to the top of the Jurassic, though there are good reasons for placing them at the base of the Cretaceous. The beds are remarkably rich in fossils of land reptiles and mammals, including such giant saurians as *Atlantosaurus*, and are typically developed near Como, Wyo. See CRETACEOUS SERIES; JURASSIC SERIES.

Comonfort, Ygnacio, ĭg-nä'sē-o kō-mŏn-fōrt', Mexican general: b. Pueblo 12 March 1812; d. 13 Nov. 1863. He became a captain of cavalry in 1832, in 1834 was made prefect and military governor of the district of Tlapa, and in 1842 he was elected member of the National Congress. This Congress was soon dissolved, and Comonfort resumed his functions in Tlapa, displaying great energy in repelling the aggressions of hostile Indians. Appointed 3d alcalde of the capital, and afterward prefect of western Mexico, he relinquished these positions to engage in the war with the United States; and on Santa Anna's dissolving the army and leaving the capital open for the Americans, Comonfort commenced organizing guerrillas, when he was summoned to the Congress of Queretaro, where a treaty of peace was concluded with the United States. He was now chosen senator by his native state, and served in this capacity until 1851. In 1852–3 he was the representative in Congress of the newly created state of Guerrero, and acted as custom-house director of Acapulco and other places until Santa Anna's return to power, when he was dismissed from office. He now joined Alvarez, raised the standard of rebellion, proclaimed the plan of Ayutla, 11 March 1854, and compelled Santa Anna, who endeavored to seize that town, to retreat. At the end of the campaign in 1855, Santa Anna was finally compelled to abdicate. Alvarez assumed the supreme government, but shortly afterward delegated his authority to Comonfort, who became provisional president of Mexico, 11 Dec. 1855. He soon met, however, with the most strenuous opposition on the part of the clergy, the army, and the large body of the Conservative party. The junta of Zacapoastla declared itself on 19 December against the president, and a little later the seat of revolution was transferred to the city of Puebla. Over 5,000 men assembled there in February 1856. Comonfort marched against them, forced the rebels to surrender on 20 March, promulgated on 31 March a decree ordering the confiscation of the property of the Church, followed on 28 June by another decree forbidding the clergy to hold landed estate. At the same time he sent a Mexican envoy to Rome to settle with the holy see the questions raised by these measures; but the Mexican clergy made

all possible effort to prevent his reception, while at home they labored to undermine the government. Congress, which was opened by the president, 5 Feb. 1857, assembled under very inauspicious circumstances. It proceeded, however, to draw up a new constitution, which vested the legislative power and the control over religious and military affairs exclusively in Congress. The president, finding it impossible to meet the difficulties which agitated the country under such restrictions, was eventually constrained, on October 1857, to apply for extraordinary powers. These were granted by Congress on 4 November and he was proclaimed constitutional president on 1 December. His position, however, became more and more critical. Opposed by the clergy and the army, he found himself isolated, and could only depend upon the brigade of Gen. Zuloaga, which was attached to him personally. By a pronunciamiento at Tacubaya, 17 December, this brigade, too, declared itself against the new constitution, but appointed Comonfort chief of a new government. By a new pronunciamiento, however, of 11 Jan. 1858, they discarded him altogether, and the insurrection which broke out on that day in the capital led to a fierce struggle of several days. Appointing Juarez, president of the supreme court, provisional president, Comonfort attempted to regain his authority by force of arms, but in vain. On the morning of 21 January the capital was in the hands of the rebels. The House of Representatives, convoked on the same day by Zuloaga, appointed that general provisional president, while Juarez convened a congress at Guanajuato, to guard the rights of Comonfort. The latter in the meantime, deserted by his soldiers, and unable any longer to maintain his power, repaired to the United States. He returned in 1862 and was minister of war in the Juarez cabinet.

Comorin. See CAPE COMORIN.

Com'oro Islands, a volcanic group in the Indian Ocean, between the northern extremity of Madagascar and the continent of Africa. They are four in number — Angareja (called also *Comoro*), Mohilla, Johanna, and Mayotta. In 1843 France took possession of the last-mentioned island, and the others were taken under the protection of the same country, by treaty, in 1886. They are extremely fertile, well stocked with cattle, sheep, hogs, and birds of various kinds. They produce, likewise, sweet and sour oranges, citrons, bananas, honey, sugar-canes, rice, ginger, cocoanuts, etc. The people are chiefly engaged in rearing cattle, and in the manufacture of coarse cloths, jewelry, and small arms. They are professed Mohammedans, but fetish worship is customary. Pop, Arabs and negroes, 70,000.

Compagnie des Indes, koṅ-pan-yē dā zard ("Company of the Indias"), an organization which owned Louisiana for several years. See MISSISSIPPI BUBBLE.

Company (Old Fr. *companie,* from Lat. *companirem,* "mess," from *com-,* "with," and *panis,* "bread"), an association of individuals formed for some purpose of mutual advantage, especially for business purposes. The commercial use of the word which bulks most largely now has two separate uses: in general of a firm or corporation; and particularly of the silent members of a business house whose names do not appear in its style but are comprehended by the affix "and Company." Historically the earliest occurrence of the term in connection with business enterprise dates in England back to the 14th century, when the Merchant Adventurers of England about 1359 began trade. English commerce and empire are equally indebted to the efforts of the companies formed in the early part of the 17th century. The Eastland Company, the Muscovy Company, and the Turkey Company carried English trade into eastern Europe. The East India Company won the major part of the Asiatic trade for England, and gained possession of India and administered that country until the middle of the 19th century. The Virginia Company and the Massachusetts Bay Company prepared the way for English colonization in America, but never flourished. The history of the Hudson Bay Company is another interesting episode because of the combination of territorial and trading grants which it long held and because it still enjoys trading privileges. England still employs the same method of opening up trade, and the North Borneo Company, the British East Africa Company, and the famous South Africa Company were formed between 1880 and 1890. Germany with her new imperial policy fosters the formation of such associations, and in 1884 the German East Africa Company was started, with the object of extending trade and colonization. The London City companies also are historically important as outgrowths of the mediæval guilds and because for many years membership in them was a necessary preliminary to political privilege of any sort; their authority was curtailed in 1725 and by the reform bills of the 19th century, but members of the companies are still the only electors for civic offices.

In modern commerce companies may be most conveniently divided into the simple firm or partnership, which is a mere mutual agreement, and the stock company, which, by reason of its complex character and quasi-public nature, comes under State control and has displaced to a great degree the simpler method. In the stock company, instead of a private agreement, the members, under State authorization, make a company with a fixed capitalization divided into a certain number of shares, possession of which carries the right to vote, proportionally to holdings, on matters of business policy. State regulations require in all cases that one of the contracting parties be a resident of the State in which the company is incorporated, and that an office of the concern be located in the State. Other requirements vary in different States, especially in the matter of fees, which some of the western States have reduced to a minimum for the sake of attracting business to the State, and replenishing its treasury; and in the breadth and range of powers granted by the charter. The corporation laws of the State of New Jersey, together with its convenient situation near New York, have drawn a tremendous volume of this business to it. See CORPORATIONS; TRUSTS.

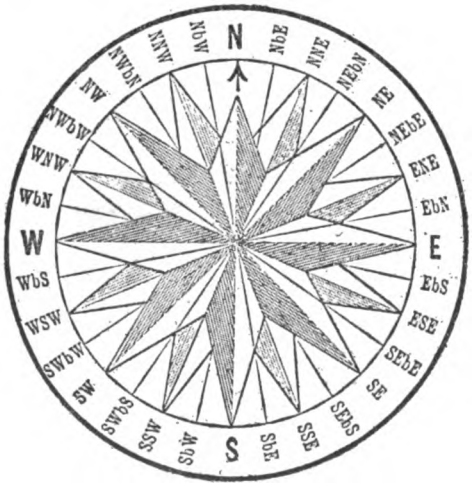
A particularly American class of stock company is the industrial, which is especially adapted to mine-exploiting or the development of agricultural business. In mode of government it differs from the usual share-holder controlled company, as it is largely managed by a promoter. The capitalization of American industrial com-

panies in 1903 is estimated at $150,000,000,000, of which a large fraction is paid in in cash.

In military nomenclature a company is regularly an integral part of a regiment or battalion and consists of 100 men. A looser and typically American use of the word applies it to any small body of soldiers or uniformed men, especially as independent of a State or national soldiery. These independent companies, numbering something like 25,000 in the United States, form a valuable supplement to army and State militia, as was evidenced by their service in the Spanish war.

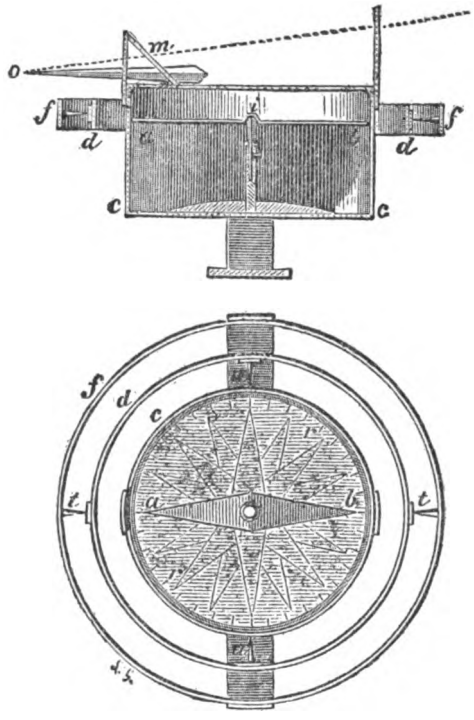
Compar'ison, Degrees of, in grammar, inflexions of adjectives denoting the degree in which a quality is possessed by a substance, either generally or in reference to other substances. The positive can scarcely be considered as a degree, as it denotes the quality generally without comparison. The comparative compares two things only, the superlative compares one thing with any number of others. In English the comparative is generally formed by the addition of *er*, the superlative by the addition of *est*, to the positive or monosyllabic adjectives and dissyllabic adjectives ending in *y*, or by the use of the words *more* and *most*. *less* and *least*, when the adjective is of more than one syllable and does not end in *y*. Adverbs are nearly always compared by the latter method. There are some adjectives, such as *good, better, best; little, less, least*, that do not form their degrees of comparison in the regular manner.

Compass, Mariner's, a form of compass specially adapted for use at sea. A thin circular sheet of mica is supported so as to turn with great freedom in a horizontal plane about its centre. This is called the compass-card. The bearing usually consists of a small plate of agate let into the card, and has a conical hole at the



Compass Card.

centre, and this rests on a fine needle-point of hard steel. This arrangement gives very little friction. To the under surface of the compass-card a magnet is attached, or often in the best instruments several parallel magnets. Many experiments have been made to find the best arrangement for the magnets, but there is probably still something to be learned on this question. The compass-card is marked with a star of 32 rays, which are called the rhumbs, or the points of the compass. A line joining two of these points diametrically opposite is or ought to be exactly parallel with the magnetic axis of the arrangement below; and at the extremities of these points are marked N. (north) and S. (south). E. (east) and W. (west) are marked at the extremities of another diametral line at right angles to the first. The other points have also names; and to repeat these from memory in order, beginning at north and going



Ship's Compass.

a b, Needle. *c c*, Box. *d d*, Inner gimbal. *f f*, Outer gimbal. *i*, Pivot upon which the card is placed. *m*, Reflector. *r r*, Card. *t t*, *u u*, Supporting pivots.

round the whole circle, is what sailors call «boxing the compass.»

The card is supported, as we have said, on a steel point, which is attached either to a hemispherical bowl of thick copper, or to a thick copper ring when the compass is to be used for night-sailing, in which case a lamp placed below the ring shines up through the mica card and makes the markings on it visible. This thick copper bowl or ring is called the compass-box. Its use is to damp the vibrations of the needle; for it is found that the presence of a large mass of copper properly placed damps the vibrations of a freely suspended magnet rapidly, while it does not at all prevent it from coming to rest in the proper position. The compass-box is suspended on gimbals, which are two concentric copper rings. The larger turns on a horizontal axis, whose extremities rest on the inside of the case that contains the compass. The smaller ring turns on a horizontal axis

at right angles to the former, and resting on the outer ring. The compass-box is attached to the inner ring, and its weight tends to keep both horizontal. Thus supported, the compass-box and card always remain horizontal however the ship rolls or pitches. The chief difficulty in making use of the compass arises from the magnetism of the ship itself. In iron ships particularly, the magnetism of the ship greatly interferes with its indications. The effect of the ship's magnetism is determined by swinging the ship, and determining a correction to be applied for every position. This, however, is liable to some uncertainty, for it is found that rough weather and other circumstances alter the magnetism of the ship, and therefore its effect on the compass. It is usual to place a compass at the mast-head of large ships, and from time to time to compare the deck compass with it.

The origin of this instrument cannot be traced with anything like certainty. There is reason to believe that the Chinese knew something about the polaric property of loadstone more than 2,000 years before the Christian era. In the year 1242 A.D. Bailak Kibdjaki gave an explicit description of a primitive kind of compass in common use on the Syrian coast; and it is said that on the return of Marco Polo from Cathay, in 1260, he brought a knowledge of this as well as several other Chinese inventions with him. The Italians ascribe the invention of the compass to Flavio Gioja, a native of Amalfi, giving the dates 1300–20, but it is obvious from the dates given above that he can be credited only with some important improvement of the instrument. The discovery of the variation of the needle has been generally attributed to Columbus, but is now supposed to have been known much earlier.

Bibliography.— Cornwell, 'Compass Disturbance in Iron Ships'; Bowditch, 'The American Practical Navigator'; Capt. F. J. Evans and Archibald Smith, 'The Admiralty Manual for the Deviations of the Compass.'

Compass Plant (*Silphium laciniatum*), a tall composite yellow-flowered plant growing on the prairies of the Mississippi Valley, and remarkable from the fact that its erect radical leaves stand so that their edges point almost exactly north and south, especially in midsummer. This is said to be due to the action of light, and to depend on the leaves having an equal number of stomata on either face. The plant is known in some localities as "resin-weed," because it contains such an amount of resinous matter. A European species of lettuce (*Lactuca scariola*) has received the same name.

Com'passes, a mathematical instrument used for describing circles, measuring lines, etc. They consist simply of two pointed legs movable on a point or pivot. For describing circles the lower end of one of the legs is removed and its place supplied by a holder for a pencil or pen. Hair compasses are compasses having a spring tending to keep the legs apart, and a finely threaded screw by which the spring can be compressed or relaxed with the utmost nicety, and the distance of the legs regulated to a hair's-breadth. Bow compasses are compasses having the two legs united by a bow passing through one of them, the distance between the legs being adjusted by means of a screw and nut. Proportional compasses are compasses used for reducing or enlarging drawings, having the legs crossing so as to present a pair on each side of a common pivot. By means of a slit in the legs, and the movable pivot, the relative distances between the points at the respective ends may be adjusted at pleasure in the required proportion. Beam compasses are used where greater lengths are needed than can be secured by the ordinary pivot compasses. Points are arranged on a sliding bar so they can be clamped at certain distances from each other. Triangular compasses, having three legs, are used when it is desired to transfer the vertices of a triangle. Club compasses, called also bullet compasses, are constructed with a ball instead of one of the points of the ordinary compasses; the ball being arranged so as to turn in a hole or socket.

Compensa'tion, that which is given or received as an equivalent for services rendered, losses sustained, sufferings endured, or in payment of a debt; amends, remuneration, payment, recompense. When one is sued for a debt, it is competent for him, partially or wholly, to bar the claim by alleging that he is the plaintiff's creditor for services rendered or money lent. If the sum claimed from the plaintiff is found to be the exact equivalent of that for which he sues, the two are held to compensate or balance each other; if, on the contrary, it be less, it diminishes by so much the prosecutor's claim. If, however, the defendant feels that he owes the plaintiff more than that individual is indebted to him, he is required at the outset to pay into court the smaller sum for which he admits himself to be responsible.

Compensatio injuriarum is a defense against actions for damages claimed for slander, false accusations, and like causes.

Compensation Balance, a balance-wheel for a watch or chronometer, so constructed as to make isochronal (equal time) beats, notwithstanding changes of temperature. This effect is usually attained by having the balance-wheel cut into two segments, the arcs being fixed at one end each. This allows space for the expansion and contraction with no variation in size of the wheel. See CHRONOMETER.

Compensation Pendulum, a pendulum constructed of two different metals, as brass and iron, which so work against each other, that the expansion of the one downward is counteracted by that of the other upward. By this arrangement the pendulum does not vary in length, and consequently in frequency of vibration, whatever the temperature may be. Arnold's compensation balance-wheel for chronometers and watches is constructed on a similar principle.

Competition, a term nearly equivalent to the phrase "struggle for existence." Lamarck was the first to point out definitely the fact of competition in the cases of man and the sloth, but it was not until a half-century later that Darwin and Wallace emphasized its far-reaching importance as a biological agent in evolution. Competition may be most strikingly illustrated by a case in which it is entirely absent. The Great Salt Lake of Utah is inhabited by the brine shrimp (*Artemia fertilis*), which abounds in enormous numbers in the dense briny waters; hundreds may be dipped up in a dish of water and thousands captured by a few sweeps of the tow-net. As the water is so

salt that no other animal can live in it except a maggot near shore, it has absolutely not an enemy, and there is no other form to compete with it. Its food is a floating green alga (*Polycystis packardii*). It is absolutely harmless and without means of defense, and lays but few eggs; yet its success in point of numbers is beyond all precedent. Another case is that of a fly (*Ephydra gracilis*) whose larva abounds at the margin of the same lake. These two cases illustrate how a species may abound in profusion, though not crowding out other forms, since there are no competitions.

A familiar example of the crowding out of native species by those introduced from foreign countries in the struggle for existence among plants is the ox-eye daisy, which was introduced from Europe, first appearing in Leicester, Mass., in 1740. Many years ago what were once throughout New England green fields of grass became white with its flowers; it drove out even the grasses introduced. On the other hand, in central Europe, throughout France, the Pyrenees, and the Alps, as recently observed, it grows sparsely, never in extensive patches. Other examples are the introduced European injurious insects, the gipsy moth, the scale insects, and many others, whose numbers in the Old World are kept within due limits by ichneumon parasites, but which in the United States and Canada, owing to the absence of their natural enemies, breed in unlimited numbers. Another case is that of the Colorado potato-beetle, which spread eastward from comparatively limited tracts in the Rocky Mountain region, and invaded the eastern States to the shores of the Atlantic. The English sparrow, introduced during a period from 1850 to 1870 has become, owing to the lack of competition, a grievous pest, driving out the native birds. The periwinkle (*Littorina littorea*) of the European coast, introduced on our shores, about 1855, has multiplied to such an extent that it lives between tide-marks in millions, to one of our native species of the same genus. Such cases as these throw light upon the subject and prove that there is a silent but unceasing struggle for existence going on over nearly all the earth's surface. Yet in the case of desert plants which grow sparsely, separated by barren spaces, there is, as Henslow has observed, no struggle for existence.

Nowhere is the agency of competition more marked than in human society. In the lower savage races, as in the black race of Africa or the natives of Australia, the scattered tribes have confined their contests to simple raids, and no single people or sub-race has gained marked pre-eminence over another, with the exception of the Hottentots and Bushmen, who were largely exterminated by negro tribes from the north. But as we ascend to the higher or white race, to the Semitic, the western Asiatic and European peoples, we have examples of the sudden rise to power and pre-eminence of vast hordes of barbarian peoples under Tamerlane, the Grand Mogul, Attila, and other conquerors, which have swept over vast territories and crushed the weaker, more peaceful, or even civilized but less resistant nations. The rapidity with which the Arabs overran and still dominate northern Africa in language, social customs and religion; the Mongolian movements eastward into China, and westward to the borders of Europe; the successive rise and irresistible waves of migratory hordes from eastern to northern Europe, throughout prehistoric and historic times; the colonizing and expansion of the powers of Greece, of Rome, of the Norsemen, Anglo-Saxon, the Spanish, French, and German peoples; the success of the white race in the struggle for pre-eminence; the disappearance of the lower, weaker races, less favored intellectually and morally, some of which had become fossilized, or semi-fossilized, and practically inept and unfit,— all these phenomena, which are historic facts, are of a piece with what we witness, though in a less distinct and marked way, in the plant and brute realms. The results are in the long run beneficent, though the injustice, moral degeneration, suffering, and evils which attend human progress are pitiful and deplorable. Consult: Darwin, 'Origin of Species'; Wallace, 'Darwinism'; Fredericq, 'La Lutte puer l'existence chez les Animaux Marins.'

Compiègne, kôn-pē-ān'yŭ, France, a town in the department of Oise, and on the left bank of the river Oise, 45 miles north-northeast of Paris. It has a tribunal of commerce, a communal college, a public library, a theatre, manufactures of muslin, hosiery, and cordage, besides a trade in wood and grain. The splendid château, surrounded by its extensive and beautiful park, bordering on the celebrated forest of Compiègne, was a favorite autumnal residence of Napoleon III. Charles VI. took this town from the Duke of Burgundy in 1415. In 1430 Joan of Arc was taken prisoner here by the English. Pop. (1902) 14,106.

Com'plement, that which fills up to a certain unit. Thus the complement of an angle is the angle which would, by addition, make the given angle a right angle; and the complement of a number is a number which would, by addition, make the given number equal to the next higher unit, or the next higher power of 10. Thus 2 and 98 are example arithmetical complements.

In medicine the complement or the complementary body is supposed to be a substance in the blood serum that is necessary for its antibacterial or bacteriolytic action. In order to bring about a lysogenic action (*Pfeiffer phenomenon*, q.v.), two bodies seem to be necessary in the blood serum. One known as the immune serum is developed during the process of immunization. It alone cannot however cause bacteriolysis. There must be present in the blood serum another body, the complement. Also called, alexine or cytase. See IMMUNITY.

Complemental Males, according to Darwin minute, very degenerate males of peculiar form which live attached like parasites to the body of hermaphroditic barnacles, as *Illa* and *Scalpellum*.

Complete Angler, The, a famous book by Izaak Walton, first published in 1653. It was designed primarily by its author to teach the art of angling, of which long experience with hook and line had made him master. It is written in dialogue form, and is filled with conversations touching the theme in question, which are carried on by an angler, a hunter, a falconer, a milkmaid, and others. The book is filled with descriptions of rural scenery and interspersed with many charming lyrics, old songs and ballads.

The 'Angler' is not alone devoted to sport, but is filled with precepts which recommend the practice of religion and the exercise of patience, humility, contentment, and other virtues. Whether considered as a treatise on the art of angling, or as a delightful pastoral filled with charming descriptions of rural scenery, 'The Complete Angler' ranks among English classics. In 1676, when Walton was preparing a fifth edition for the press, Charles Cotton, also a famous angler, and an adopted son of Walton, wrote a second part for the book, which is a valuable supplement. Walton, though an expert angler, knew but little of fly-fishing, and so welcomed Cotton's supplement, which has since that time been received as a part of his book.

Complex'ion, the term generally used to signify the special color or hue of a person's skin. The human skin, till the time of Malpighi, was supposed to consist only of two parts —the epidermis or outer skin, and the cutis or true skin; but that anatomist, about the middle of the 17th century, discovered between these a cellular texture, soft and gelatinous, to which the names of rete mucosum, rete Malpighi, or Malpighian tissue, have been given. He demonstrated the existence of this membrane at first in the tongue and in the inner parts of the hands and feet; but by his subsequent labors, and also by those of Ruysch and other anatomists, it was proved to exist, between the epidermis and cutis, in all parts of the human body. Malpighi, on the discovery of this membrane, offered a conjecture respecting the cause of the color of negroes. He supposed that this membrane contained a juice or fluid of a black color, from which their blackness arose. The actual existence of a black pigment has been since ascertained. The rete mucosum is of very different colors in different nations; and the difference of its color so completely agrees with the difference of their complexions, that there can be no doubt that it is the sole, or, at least, the principal seat of the color of the human complexion. Its thickness varies in different parts of the body; and the depth of its color, for the most part, is in proportion to its thickness. It is now, however, not regarded as altogether a distinct tissue, being considered rather as the innermost and newest layer of the epidermis or cuticle. The black color of the negroes is destroyed by whatever destroys the rete mucosum, as wounds, burns, etc.; the scar remaining white ever afterward. The greatest contrast in complexion is between the fair white peoples of northern Europe and the ebony colored negro of Africa.

There are several remarkable instances of the color both of whites and of negroes being either entirely or partially changed, from the operation of causes which cannot be detected or explained. An American girl, whose father was of English, her mother of American birth, and both persons of light complexion, began to change color about the age of puberty, and at the age of 16 presented the appearance, as regards color, of a dark mulatto. Latterly she presented the appearance of a white person whose skin had been covered with a thin coating of lamp-black, through which some appearance of the hue of the surface was apparent, with here and there spots, from a few lines to a fourth of an inch in diameter, which were as black as the skin of an African. A boy who was born in Virginia of black parents, continued of his native color till he was three years old: at that period a change of color began to take place, though the health of the boy continued good, and there was no assignable cause for the alteration, either in his food or mode of life. At first white specks made their appearance on his neck and breast, which soon increased in number and size; from the upper part of his neck down to his knees he was completely dappled; his hair was also changed, but not to the same degree, since, though some parts of it were white, in general it retained the black color and crispature of the negro.

The nature and color of the hair seem closely connected with the complexion. In proportion to the thinness of the skin and the fairness of the complexion the hair is soft, fine, and of a white color: this observation holds good not only in the great varieties of the human race, but also in albinos. Next to them in fairness of complexion is the Teutonic race, the *rutilæ comæ* (fair locks) of whom were a distinguishing characteristic even in the time of the Romans. The Celtic people are not so fair as the Teutonic, and their hair is darker and less inclined to curl; but it is perhaps more difficult than in the case of the Teutons to be sure of unmixed blood. But though the color of the hair is evidently connected with the complexion, yet its tendency to curl does not appear to be so. Many brown complexioned Celts have curled hair; the Mongolian and American races, of a much darker complexion, have hair of a darker color, but long and straight. Among that portion of the Malay race which inhabits some of the South Sea Islands, soft and curled hair is said to be met with. The color of the eye is also connected with the complexion. In the Africans, Prof. Sommering remarks that the white of the eye is not so resplendently white as in Europeans, but rather of a yellowish brown, something similar to what occurs in the jaundice. The iris in the negroes, in general, is of a very dark color; but the iris in the Congo negro is said to be frequently of a bluish tinge. The Teutonic tribes are not more distinguished by their fair complexion than by their blue eyes, —*cærulei oculi,* while the iris of the darker colored Finn is brown, and that of the still darker Laplander black. The color of the eyes also follows, in a great degree, in its changes, the variations produced by age in the complexion. Newly born children in Germany, it is stated, have generally blue eyes and light hair, both of which become gradually of a darker hue as the complexion of the individual grows darker; and similar changes are recorded of other peoples. The most singular class of people in point of complexion are the albinos, but albinoism is not confined to the human race. An intermediate complexion is produced where children are born from parents of different races. If the offspring of the darkest African and the fairest European intermarry successively with Europeans, in the fourth generation they become white; when the circumstances are reversed, the result is reversed also. Along with the successive changes of complexion is also produced a change in the nature and color of the hair; though, in some instances, the woolly hair remains when the complexion has become nearly

as fair as that of brown people in Europe. It does not, however, always happen that the offspring is the intermediate color between that of the respective races to which the father and mother belong; it sometimes resembles one parent only, while, perhaps, in the second or third generation, the color of the other parent makes its appearance. An instance has been given of a negress who had twins by an Englishman: one was perfectly black; its hair was short, woolly, and curled: the other was white, with hair resembling that of a European. In another case the child of a black man and an English woman was quite black; and still more remarkable: a black married a white woman, who bore him a daughter, resembling the mother in features, and as fair in all respects, except that the right buttock and thigh were as black as the father's.

The generally received opinion concerning the varieties of complexion which are found in the different races of man throughout the globe is, that they are caused entirely by the influence of climate. Respecting the primary color of man the supporters of this opinion are not agreed. The opinion that climate alone will account for the various complexions of mankind is very plausible, and supported by the well-known facts that in Europe the complexion grows darker as the climate becomes warmer; that the complexion of the French is darker than that of the Germans, while the natives of the south of France and Germany are darker than those of the north; that the Italians and Spaniards are darker than the French, and the natives of the south of Italy and Spain darker than those in the north. The complexion also of the people of Africa and the East Indies is brought forward in support of this opinion; and from these and similar facts the broad and general conclusion is drawn, that the complexion varies in darkness as the heat of the climate increases; and that, therefore, climate alone has produced this variety. But it can be shown that the exceptions to this general rule are very numerous; that people of dark complexions are found in the coldest climates, people of fair complexions in warm climates, people of the same complexion throughout a great diversity of climate. and races differing materially in complexion dwelling near together.

1. In the coldest climates of Europe, Asia, and America we find races of a very dark complexion. The Laplanders have short, black, coarse hair; their skins are swarthy, and the irides of their eyes are black. According to Crantz the Greenlanders have small, black eyes; their body is dark gray all over; their face brown or olive; and their hair coal-black.

The complexion of the Samoiedes and other tribes who inhabit the north of Asia is very similar to that of the Laplanders and Greenlanders, who are Eskimos by race. Humboldt's observations on the South American Indians illustrate and confirm the same fact. If climate rendered the complexion of such of these Indians as live under the torrid zone, in the warm and sheltered valleys, of a dark hue, it ought also to render or preserve fair the complexion of such as inhabit the mountainous part of that country; for certainly, in point of climate, there must be as much difference between the heat of the valleys and of the mountains in South America as there is between the temperature of southern and northern Europe; and yet this author expressly assures us that "the Indians of the torrid zone, who inhabit the most elevated plains of the Cordillera of the Andes, and those who, under the 45th degree of south latitude, live by fishing among the islands of the archipelago of Chonos, have as coppery a complexion as those who, under a burning climate, cultivate bananas in the narrowest and deepest valleys of the equinoctial region." He adds, indeed, that the Indians of the mountains are clothed, but he never could observe that those parts which were covered were less dark than those which were exposed to the air. The inhabitants also of Tierra del Fuego, one of the coldest climates in the world, have dark complexions and hair.

2. Fair complexioned races are found in hot climates. Ulloa informs us that the heat of Guayaquil is greater than at Carthagena; and by experiment he ascertained the heat of the latter place to be greater than the heat of the hottest day at Paris; and yet in Guayaquil, "notwithstanding the heat of the climate, its natives are not tawny"; indeed they are "so fresh-colored, and so finely featured, as justly to be styled the handsomest, both in the province of Quito and even in all Peru." According to a statement of Humboldt, in the forests of Guiana, especially near the sources of the Orinoco, "are several tribes of a whitish complexion of whom several robust individuals, exhibiting no symptom of the asthenical malady which characterizes albinos, have the appearance of true Mestizos. Yet these tribes have never mingled with Europeans, and are surrounded with other tribes of a dark brown hue." The inhabitants of Boroa, a tribe in the heart of Araucania, are white, and in their features and complexion very like Europeans. Even in Africa darkness of complexion does not increase with the heat of the climate in all instances; the existence of comparatively fair races in this quarter of the globe is noticed by Ebn Haukal, an Arabian traveler of the 10th century, and has been confirmed by subsequent travelers.

3. The same complexion is found over immense tracts of country, comprehending all possible varieties of climate. The most striking and decisive instance of this is on the continent of America, all the inhabitants of which, with the exception of the Eskimo, exhibit the copper-colored skin and the long and straight black hair. Australia is an instance of a similar nature, though on a less extensive scale: over the whole of the island, even in the comparatively cool climate of the southern parts, the complexion of its inhabitants is of a deep black, and their hair is curled like that of negroes.

4. Different complexions are found under the same physical latitude, and among the same people. Illustrations and proofs of this have already been given. The physical latitude in which the Norwegians, the Icelanders, the Finns, and the Laplanders live scarcely differs; and yet their complexion, and the color of their eyes and hair, are widely different. There is a great diversity of color and features among the Morlachs, who inhabit Dalmatia. The inhabitants of Kotar, and of the plains of Seigu and Knin, have fair blue eyes, broad face, and flat nose. Those of Duare and Vergoraz, on the contrary, have dark-colored hair; their face is long, their complexion tawny, and their stature tall. M.

Sauchez, who traveled among the Tartars in the southern provinces of Russia, describes a race or tribe as having countenances as white and fresh as any in Europe, with large black eyes. In the south of Africa we find the Kafirs, who are of a brown or iron-gray color, and the Hottentots of a yellow color. In the island of Madagascar, according to Mr. Sibree, the observer "finds almost every shade of color from a very light olive, not darker than is seen in the peoples of southern Europe, down through all gradations of brown to a tint which although not black is certainly very dark. In the quality of the hair, too, there is a good deal of difference; the lighter-colored people having usually long, black, and straight hair, while the darker tribes have, as a rule, shorter and more frizzly hair."

Besides a Malayan olive-colored race, people with the negro complexion and features are found in the Philippine Islands; and in Java, the Hindu, and Malay character may be clearly traced in the complexion and features of the two classes of inhabitants which are found in that island. In several of the Moluccas is a race of men who are blacker than the rest, with woolly hair, inhabiting the interior, hilly parts of the country. The shores of these islands are peopled by another nation, whose inhabitants are swarthy, with curled, long hair. In the interior hilly parts of Formosa the inhabitants are brown, frizzle-haired, and broad-faced; while the Chinese occupy the shores.

It is observed that there are two great varieties of people in the Pacific islands; the one more fair, the other blacker, with their hair just beginning to be woolly and crisp. The first race inhabits Tahiti and other of the Society Islands, the Marquesas, the Friendly Isles, Easter Island, and New Zealand; the second race peoples New Caledonia, Tanna, and the New Hebrides, especially Mallicolo. If we examine the relative situation and latitudes of these islands on a map, we shall be convinced not only that darker complexioned people are found where the climate is comparatively colder, but that the same complexion is found under very different latitudes. It is not meant to be denied that a burning climate will render the complexion very dark, and that a climate of less extreme heat will bronze the complexion of the fairest European; but there are some material points in which the dark complexion of the Caucasian, or naturally fair-skinned variety of mankind, caused by climate, differs from the dark complexion of all the other varieties of the human race.

1. The offspring of the Caucasian variety is born fair; the offspring of the other varieties is born of the respective complexion of their parents. Ulloa informs us that the children born in Guayaquil of Spanish parents are very fair. The same is the case in the West Indies. Long, in his history of Jamaica, expressly affirms "that the children born in England have not, in general, lovelier or more transparent skins than the offspring of white parents in Jamaica." But it may be urged that this is not the case with respect to the other nations of the Caucasian variety, who have been settled in warm climates from time immemorial, and that the question ought to be decided by the Moors, Arabians, etc. Their children, however, are also born fair complexioned, as fair as the children of Europeans who live under a cold climate. Russell informs us that the inhabitants of the country round Aleppo are naturally of a fair complexion, and that women of condition, with proper care, preserve their fair complexion to the last. The children of the Moors, according to Shaw, have the finest complexions of any nation whatsoever; and the testimony of Poiret is directly to the same effect. "The Moors are not naturally black, but are born fair, and when not exposed to the heat of the sun remain fair during their lives."

2. Individuals belonging to the Caucasian variety, that inhabit warm countries, preserve their native fairness of complexion if they are not exposed to the influence of the climate; while there is a uniform black color over all the parts of a negro's body. The hue which Europeans assume is the same, though the tinge may be lighter or darker, whether they settle in Africa, the East Indies, or South America. They do not become, like the natives of those countries, black, olive-colored, or copper-colored; their complexion merely resembles that of a tanned person in this country, only of a darker tinge. The negroes that are settled in the West Indies or America do not assume the copper color of the Indians, even though a milder climate may have some effect on the darkness of their complexions. The children of Europeans, of negroes, and of Indians are all born, in America, of the same reddish hue; but in a few days those of the negro begin to assume the black complexion of their parents, those of the Indian the copper complexion, while those of the European either continue fair, if kept from the influence of the sun, or become tanned; not black like the negro, or copper-colored like the Indian, if exposed to its influence. Europeans who settle in Canada, or in the northern parts of America, where the climate resembles that of their native country, do not assume the complexion of the Indians, but continue fair like their ancestors. The same observation may be made respecting the Russians who are settled among the Mongolian variety, in those parts of the Russian empire in Asia, the climate of which resembles the middle or northern parts of European Russia. Indeed the wide extent of country over which the Mongolian variety is spread, including the extreme cold of Lapland and the north of Asia, the mild temperature of the middle parts of that continent, and the warmth of the southern parts of China, is in itself a proof that dark complexion does not arise either from the influence of heat or cold.

Lastly, radical varieties of complexion are always accompanied with radical varieties of features. We do not find the olive color of the Mongolian variety with the features of the Malay; nor the brown color of the Malay with the features of the Mongolian; nor the black skin of the Ethiopian variety, or the red color of the American, united with any set of features but those which characterize their respective varieties. It, however, by no means follows that the hypotheses of different races having been originally formed must be adopted, because climate is not adequate to the production of the radical varieties of complexion which are found among mankind. Man, as well as animals, has a propensity to form natural varieties; and the variations may in process of time involve all the tissues so as to yield permanent differences in color and quality of hair, color of skin, size

and form of bones, especially those of the skull and limbs. See EPIDERMIS; HISTOLOGY; MALPIGHI; RUYSCH.

Com'pline, the last or seventh of the daily canonical hours in the Roman Catholic breviary; the complement of the Vespers or evening office. St. Benedict, in the 6th century, added Compline to the hours, thus making the number seven, answering to the praises of which the psalmist speaks of "seven times a day." Matins and lauds were classed as one hour.

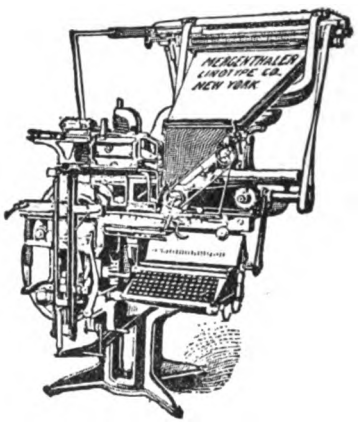
Complutensian (kŏm-ploo-tĕn'sĭ-ạn) **Pol'yglot,** a polyglot made by seven scholars under the auspices and at the expense of Cardinal Ximenes. It was begun in 1502, and finished in 1517, but was not actually published till 1522. It consists of six folio volumes. In the Old Testament, on the left hand page, are the Hebrew original, the Latin Vulgate, and the Greek Septuagint; and on the right hand page, the Vulgate, the Septuagint, with Latin translation above, and the Hebrew, with primitives belonging to that language on the outer margin. At the lower part of the page are two columns used for a Chaldee paraphrase, and a Latin translation. The Greek Testament, constituting part of the Complutensian Polyglot, was the first complete edition of that part of Scripture printed.

Composing-machines, a general title for all classes of machines that compose or set either type or matrices, arranging them in lines and columns for printing. There are three prominent types of these: (1) Those that set matrices in line and cast therefrom a solid line or slug, as the linotype, monoline, and typograph; (2) those that cast and set type at the same operation, as the monotype and graphotype; and (3) those that set and distribute ordinary founders' type, these being the only ones properly styled type-setting machines, as the Simplex (modernized Thorne), Empire (improved Burr), Dow, Frasier, Kastenbein, etc.

Historically, the type-setting machine comes first, William Church of Connecticut, devising a machine about 1822 that was the first practical effort in this direction. He employed a keyboard, and stored the type in channels. From 1822 to 1872 there were 35 United States patents granted on composing-machines, and a like number in Great Britain. The most noteworthy of these were the Alden and the Mitchell machines in the United States, and the Hattersley machines in England. These three machines all came into use during the period between 1850 and 1860, and, though not successful commercially, they served to lay the foundation for better machines that followed. The difficulty with all of them seems to have been that they required several persons to operate each machine, and that the consequent cost was very nearly the same as for composition by hand. From 1860 up to 1880 there were invented and constructed probably 100 different machines designed to supersede the compositor, nearly all of which failed of any commercial success. During the period between 1880 and 1890 the Thorne type-setting machine, originating in Connecticut, came into considerable use, being employed by many newspapers throughout the United States, and beginning to find a market abroad. At this latter date the Burr and McMillan machines had also found some sale in the United States, and the Frasier and Kastenbein in England and Germany.

About 1890 the linotype became a commercial machine and began to take the market, and since that time has far outsold all others combined, there being at this writing (1903) about 8,000 in use as against probably 1,000 of all other makes.

The linotype is the invention of Ottmar Mergenthaler, who spent nearly 20 years of his life in Baltimore perfecting the machine which has largely revolutionized methods of printing. It is based on the idea of substituting

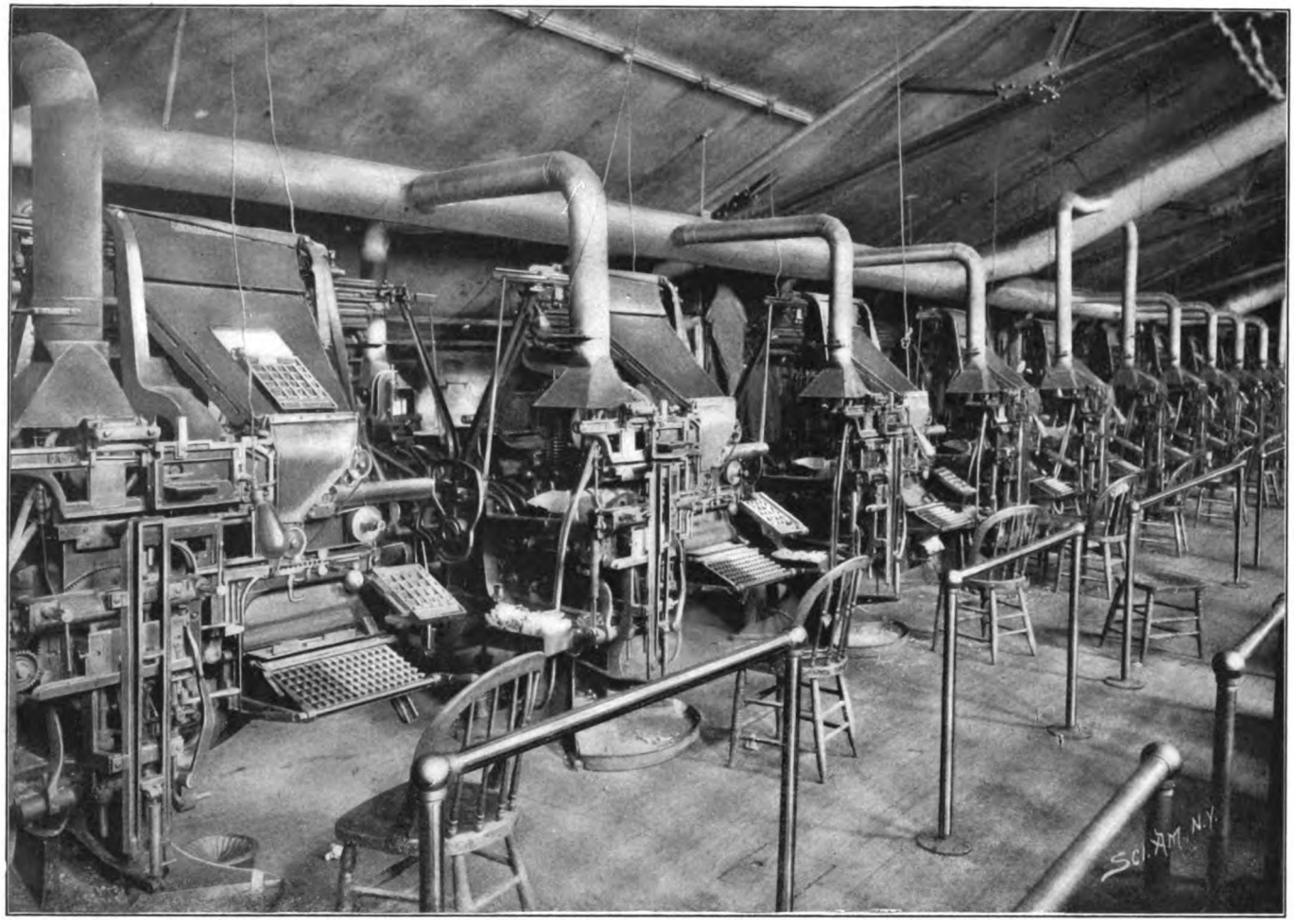


The Linotype

the solid line as a unit instead of the single type invented by Gutenberg. This solid line, or linotype slug, is formed by bringing together such matrices (or reverse types) as are required for a line, spreading them by wedges to the proper width, and then bringing them to the mouth of a mold, against which they are tightly clamped, while the molten metal is pumped into the mold. The parts are then released, and the linotype slug is pushed out ready for printing.

The matrices employed in the linotype machine are flat pieces of brass, about an inch in the longest dimension, and having the reverse of a type face stamped or sunk in one edge. By means of a series of notches in the heads of the matrices they are suspended on a rail at the top of the machine, and being pushed along are arranged to drop off into the tops of their respective channels. There are 90 of these channels, each representing a separate type character or letter, the channels together constituting a magazine in which they are contained when not in use.

To produce linotype slugs from the machine a special metal is first supplied to a pot, which is heated by a gas flame to a temperature approximating 550° F. When this is ready the operator sits down to the keyboard, which includes six horizontal rows of keys arranged in a sloping bank. As he manipulates the keys for a line, the matrices fall one by one into an elevator. At this point errors may be corrected by hand, or unusual characters, as accented letters, may be inserted in the same way. Between each word the operator strikes a key that calls for a space-band, or double-wedge device. When there are sufficient characters to



BATTERY OF LINOTYPE COMPOSING MACHINES.

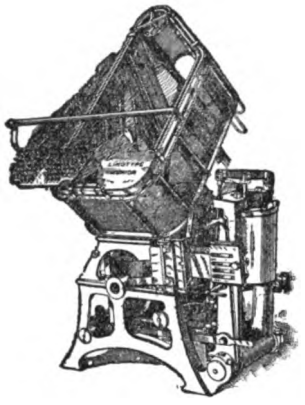
fill a line, he pulls the elevator lever, and the wedges of the space-bands are automatically closed up, spreading the matrices to the width of the proposed column, while the line of matrices is gripped in a vise and carried to the mold-wheel. This wheel has a slot that corresponds in size to the linotype slug that is to be cast. The matrices are clamped against one side of the wheel, while the mold-pot is tilted until the nozzle tightly connects with the other side. Then a pump gives a stroke, and the molten metal is forced in under pressure. It sets solid in a second, when the parts are separated, and the line of matrices is picked up by a long lever and carried upward to the distributing rail, while the linotype slug is pushed out between trimming-knives to a galley. The entire work after the operator touches the elevator lever is automatic. As soon as he has disposed of one line, he begins fingering the keys for another, without waiting for the machine.

Corrections or changes are made by resetting and recasting the lines affected. Four thousand ems an hour, the equivalent of about 7,000 type characters, is an average amount of work for a good operator at the keyboard, though there have been records made of a little more than three times this speed for an hour. The metal used for casting linotype slugs is a special composition, softer than type metal, because it requires to flow more easily. It is principally lead, with varying proportions of tin and antimony. After using it for a time it deteriorates, largely through the loss of antimony evaporated, and is returned to the smelter to be renewed.

About 1898 the capacity of the linotype was increased by placing two type characters on a single matrix, and this enabled the user to employ both italics and small capitals in composition, which had been impracticable before, owing to the limitation of 90 characters. This, together with other improvements, brought the machine into considerable use for book and magazine composition, for which it had been previously considered inadequate, though reducing the cost. In 1902 the Mergenthaler Linotype Company brought out a junior machine, selling at half the price, but confined in use to two sizes of typeface, and narrow widths of column. The linotype proper sets any size type from 5 to 12-point, any width up to five inches, and any one of 100 or more faces. The latest 1903 machine is built with two magazines, giving it a capacity of 360 characters. As many as six faces of type can be set from the same keyboard.

Although Ottmar Mergenthaler is the inventor of this machine, credit for its development should be given also to Whitelaw Reid, who furnished a large share of the original capital, and introduced it on the New York *Tribune;* and to Philip T. Dodge, who has successfully managed the business interests of the company, besides protecting the machine with strong patents and inventing many valuable devices that have improved the mechanism.

Of the same general character as the linotype machine is the Rogers typograph, brought out in the United States about 1888, and which has had some sale in Europe, but was stopped from introduction in the United States through interference with Mergenthaler's patents. The Linotype Company needed some devices used on the Rogers machine, however, and bought one of their patents, taking the inventor into the employ of the manufacturing company, where he assisted in the development of the linotype proper and perfected the junior linotype, which is very similar to the original typograph. In this machine the matrices travel on wires instead of in channels. It is smaller and simpler



The Linotype Junior

than the linotype, but slower of operation and less extended in range.

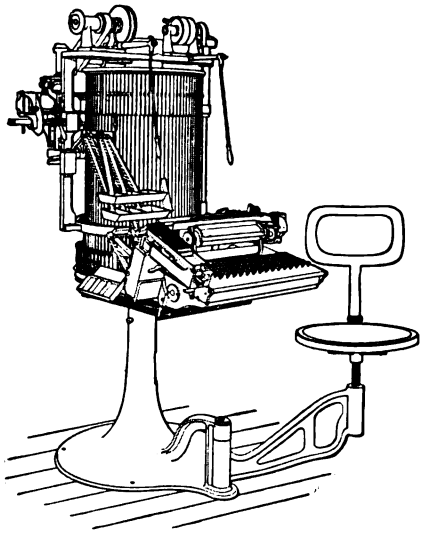
The Scudder monoline machine produces a slug like that of the linotype, and, like the typograph, has been barred out of the United States as an infringing machine. It was taken to Canada, and has been supplied to a considerable number of printing-offices there. It is much smaller than the linotype, and does a more restricted grade of work. Twelve characters are carried on a single matrix, and the position as to height in the line determines which of the 12 shall be used. Eight kinds of matrices thus serve to give a total of 96 characters, and because there are so few matrices the mechanism for distributing them after using becomes very simple. The matrices have hooks on top, and readily slide back to position.

The Lanston monotype is the leading machine of the class that both casts and sets type. It employs first a keyboard, the operation of whose keys results in punching holes in a paper tape. The combinations of holes represent the different type characters. This tape is carried to a type-casting machine and fed in; as it passes along it indicates to the caster which character to cast next, so that the characters are cast and pushed out into lines and columns in the proper order for printing. The keyboard machine or perforator is entirely distinct and separate from the casting mechanism, and is usually operated in a room apart. It includes 225 characters and a set of justifying-keys. The operator, having decided on the size and face of type and width of column, adjusts certain gauges and proceeds to manipulate the keys. As he approaches the end of a line, a pointer on a dial indicates to him what justifying-keys he should strike in order that the line, when cast in type, may be of proper length. Any errors he may make are of course repeated in the casting-machine, and must be corrected later by hand. The product of his machine is a paper tape about two and a half inches wide, with rows of holes, each row representing a type character.

This tape is taken to the type-casting machine and fed in backward, so that the caster may receive information, before casting a line, what thickness of spaces are required to justify that line accurately. The tape is fed in with a step-by-step motion and as each row of holes is presented to the proper part of the machine, a blast of air is driven through each of the holes of the row, and this serves to set in position the proper parts to produce whatever type character is called for. The casting-machine is automatic, but, being delicate and complicated, requires one attendant to two machines. The matrices are made separately, but are locked together in a frame that jumps from point to point, in order to bring the required letter to the face of the mold for casting. By changing the matrices and mold, any size or face of type within certain limitations can be produced from the one machine. A width of seven inches is also provided for, being the greatest on any composing-machine.

The Goodson graphotype machine operates on principles very similar to those of the monotype just described. Its mechanism is electrical, however, and both perforator and caster are much smaller machines. The number of characters on the keyboard is limited to 100, so that italics and small capitals cannot be produced with the full complement of other characters.

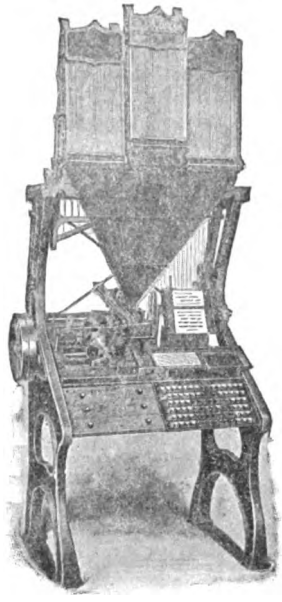
Of all the machines devised for setting founders' type, the Thorne is the best known. The types are contained in 90 channels, set radially in the periphery of an upright cylinder. As the operator fingers the keys, the types called



The Simplex

for are pushed out of the lower ends of the channels and carried around on a circular raceway to the point where they are brought into line. This line extends to a considerable length, without any reference to the length of line in which the matter set up is to appear finally. A second operator picks up from the composed type thus emerging enough to form a line of the desired length. This he puts in the galley and justifies, or spaces out to length, by hand. The leads, or spaces between lines, are also inserted by hand.

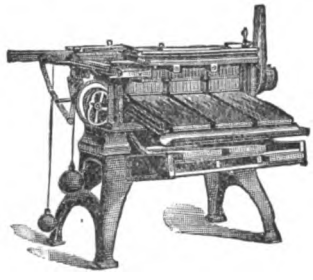
After type set on the Thorne machine has been printed from, or molded for electrotyping, it is redistributed by a boy, who puts the type, a line at any time, into a short cylinder su-



The Empire

perimposed over the type-cylinder previously mentioned, from which it passes to the lower cylinder ready for composition again. As distribution proceeds more rapidly than composition, the boy can attend to more than one machine.

About 1898 an improvement on the Thorne machine was placed on the market, under the name of the Simplex machine. In this the distributor boy was dispensed with, the type for distribution being loaded in quantity from time to time by the operator. The arrangement was such that the keyboard operator could also do the justifying (by hand), or two operators could be employed, as suited the convenience of



The Empire Distributor

the user. The Simplex and Thorne machines have enjoyed a larger sale than any other composing-machines except the linotype.

The Empire machine, originally known as the Burr, that being the name of the inventor, is a production of New York, and, like the Thorne

machine, requires three operators. The distributor is a separate machine, that, when loaded with pages of type, separates them one by one and pushes them into the channels of a magazine. This magazine is placed in the top of the setting-machine, which is supplied with a keyboard. The operator releases the lower type from the channels by manipulating the keys, and the lines are justified by a second operator by hand. The builders of this machine are now (1903) adding a justifying mechanism to do away with the labor of one operator.

The Kastenbein machine, which has had some sale in Europe, is very similar to the Empire, and does not require a separate description.

The McMillan machine, developed in Ilion, N. Y., was the first type-setting machine to be provided with automatic justification, thus dispensing with the labor of one operator. When a line of type was composed, it was taken up automatically by a carrier and transferred to a point where the spaces between the words were exchanged for a size larger spaces; if the line was not then filled to measure, it was carried on to a third and a fourth stage, until large enough spaces were supplied to spread it to the width of the column. This justifying mechanism was very ingenious, but complicated, and only a few of the machines were built and sold. The distributor was a separate machine, operating quite simply at a speed of about 10,000 ems an hour.

The Cox type-setting machine attracted considerable notice in the printing trade in Chicago and New York in 1897. It was purchased by the Unitype Company of New York, and its best features were incorporated in the Simplex or improved Thorne machine. The most unique feature of Cox's machine was the employment of crimped or corrugated spaces made of lead. The line was overset in length, and then squeezed down to measure by compressing the corrugations. This justification was satisfactory in most respects, but the crimped spaces created difficulty in stereotyping and electrotyping, and its use was abandoned.

The Calendoli type-setting machine, developed in France by a priest of that name, has attracted much attention because of the wonderful claims made for its speed. Though exploited for several years, it has not yet (1903) been perfected for the market. It employs short types grooved so as to slide on wires, and the keyboard has numerous combinations to enable the operator to strike whole words or syllables at a single motion of the hand.

Many other type-setting machines might be mentioned, that have been built and used somewhat, but practically all of them have been dropped by their owners, because the labor involved in operating them is much greater than with the linotype, which is a one-man machine, —that is, a machine delivering a full product with the labor of one operator. Many inventors have labored to produce a one-man type-setting machine handling single type, because such a machine is available for some purposes that a linotype machine is not. No such machine is yet on the market, though there was exhibited at the Pan-American Exposition in Buffalo, in 1901, a one-man type-setting machine that appears to be a success. It is the invention of Alexander Dow, and is the only machine handling founders' type that is adapted to handle the several sizes in one machine. The justification, or spacing out of the lines, is entirely automatic, requiring no thought by the operator. The machine measures the line, calculates the proper size and number of spaces, and, discarding the dummy spaces inserted during the original setting, substitutes the proper sizes and pushes the type into the galley. A distributor adapted to supply this machine has been constructed with a capacity for supplying three setting-machines, and a company is now (1903) preparing to market the two machines.

Among other composing-machines that have been built in the United States, and attracted the attention of the printing trade at one time or another, are the Alden, projected about 1860, which did good work, but failed to economize labor; the Paige, on whose development nearly $2,000,000 was spent, and which proved too costly to construct for the general market, the two machines built being now stored with Cornell and Columbia universities as mechanical curiosities; the St. John typobar, consisting of cold-pressed metal clamped on an iron base, to form a line; the Chadwick or Lagerman typotheter, a little machine for enabling a compositor to set with both hands; the Johnson, which justified the lines by sawing out a space of the required width; the composite type-bar machine, by which short hooked type were incorporated in a line by casting metal around their bases and between them; the Sears, in which type are impressed in a block of wood, and a slug cast from the matrix thus formed; the Risley and Lake, in which the type were impressed in a soft sheet like blotting paper, and a stereotype taken after a quantity had been thus impressed.

For further information on this subject consult 'Wonders of Modern Mechanism,' and the files of 'The Inland Printer.'

CHARLES H. COCHRANE.

Compositæ (Lat. "compound," "put together"), a family of dicotyledonous plants, the greatest order in the vegetable kingdom, usually herbaceous in temperate and colder climates and shrubby in dry and hot regions, and seldom, apparently only in tropical zones, growing as trees. The leaves are never accompanied by stipules; they most commonly are alternately arranged, and sometimes opposite or whorled. But the true mark of the order is the compound flower, from which it gets its name and which makes it one of the simplest orders to identify, the daisy or aster being the commonest type and the name aster family or sun-flower family being sometimes used. The true blossom is a head made up of many florets, flat as in the aster or approaching a conical shape as in the black-eyed-susan. This head is set in an involucre of leafy bracts, which to the lay observer resemble petals and give the compound flower the appearance of a single bloom. The calyx, joined to the ovaries, crowns them, save in a few cases, with the pappus, which is usually hairy, toothed, or bristly, and coming to maturity at the time of fruition frequently furnishes the seed with a sort of wing facilitating dispersion by the wind. The corolla, tubular, ligulate or labiate, divides into five lobes at the summit. The anthers are united in a tube by which the five stamens are also joined into one. The ovules at fruition dry up and become

achenes (q.v.). Among the florets, which naturally fall into two classes, the fertile ones of the disk and the sterile ones of the ray, grow bracts called paleæ or chaff, except where the receptacle is naked. The classification of the order *Compositæ* is difficult, if for no other reason because it contains about 11,000 genera and more than 1,000 species, that is about one-tenth of the higher vegetable forms. The simplest division is into *Liguliflora*, with all florets ligulate or strap-shaped, and *Tubuliflorœ*, with disk florets not ligulate. The latter class is by far the larger. The *Liguliflorœ* contains only the one tribe, *Cichoricæ*, of which the food-plants, lettuce, salsify, and chicory, are the best known members. In the other sub-order the *Tubuliflorœ* are 12 tribes; *Vernonieæ*, with 41 genera, iron-weed being a common member; *Eupatoricæ*, with 35 genera, including the medicinal plants, ayapana, bitterbush, boneset and hemp agrimony; *Astereæ*, including the typical asters, dahlias, etc.; *Helianthea*, with the artichokes and other tuberous plants; *Inuleæ*, of which elecampane may be mentioned as an example; *Helenieæ*, sneezeweed being an American member; *Anthemideæ*, including the different varieties of camomile, the chrysanthemum and the marguerite; *Senecioneæ*, with four sub-tribes, and the old-fashioned foliage plant called dusty miller; *Calendulaceæ*, including the marigolds; *Arctotideæ*, with only one genus, occurring in South Africa and Australia; *Mutiseæ*, another scantily diffused tribe; and *Cynareæ*, including the thistles.

The *Compositæ* may be regarded, especially from a consideration of their flowers, as the highest order in a scale of vegetable evolution. Their peculiarly efficacious methods of pollination, this process being simplified by the close set florets which permit of insect-fertilization or wind pollination, and by a peculiar action of the style which in the individual flower pushes itself in the way of wind or insect. Dissemination also is highly developed, there being three prominent types, the plumose pappus, as in dandelion and thistle, which is wind-sown; the hooked achenes, as in the burdock and tickseed, which fastens to passing animals, and the gummy seeds of other plants, which are dispersal adaptations. On the order in general consult Bentham, 'On the Classification, History, and Geographical Distribution of the Compositæ' (1873).

Composite Order, a term denoting the last of the five orders of architecture. As its name implies, it is composed of two orders, the Corinthian and the Ionic. Its capital is a vase with two tiers of acanthus leaves, like the Corinthian; but, instead of stalks, the shoots appear small, and adhere to the vase, bending round toward the middle of the face of the capital; the vase is terminated by a fillet, over which is an astragal crowned by an ovolo. The volutes roll themselves over the ovolo, to meet the tops or the upper row of leaves, whereon they seem to rest. The corners of the abacus are supported by an acanthus leaf bent upward; and the abacus itself resembles that of the Corinthian capital. In detail, the Composite is richer than the Corinthian, but it is less light and delicate in its proportions. Its architrave has only two fasciæ, and the cornice varies from the Corinthian in having double modillions. The column is 10 diameters high. The principal ancient examples of this order are the temple of Bacchus at Rome, the arch of Septimius Severus, that of Titus, and the baths of Diocletian.

Composition of Forces and Motions. See MECHANICS.

Com'post, any mixture of decomposed organic matter with earth, used as a fertilizing compound, or as a prepared soil in which to grow plants. Such mixtures are of small importance to the farmer, but to the trucker and florist they are indispensable. They are most frequently made by alternating layers of sods and stable manure in piles three or four feet thick and sprinkling them with lime, kainit, and some potash salt, such as the sulphate or muriate. After several weeks, during which they are kept moist by applications of water or, better, liquid manure, they are cut with a spade and turned over to form a new heap in which the various substances are mixed as much as possible. They may be turned several times to insure the decay of the various organic materials. By varying the proportions of manure and fertilizer to soil and organic matter composts may be obtained suitable for various purposes; rich ones for succulent crops and less rich for plants that must be kept stocky. In a general way the term compost is also used for any heap of decaying vegetable or animal matter which is to be used as a manure. Thus stable manure and litter become compost heaps; also the piles of leaves, etc., from which leaf mold is obtained for greenhouse use. Directions for making composts for particular kinds of plants may be found in all books on gardening, floriculture, etc., and many of the works dealing with manures and manuring also devote space to composting. See MANURES AND MANURING.

Compostella, kōm-pōs-tā'la, **Order of St. James of,** an order of Spanish knights formed in the 12th century to protect the Christian pilgrims who had flocked in vast numbers to Santiago de Compostella, in Spain, where the relics of St. James the Great were preserved. At first there were but 13 members of the order, but it grew rapidly in numbers, and they became not only strong defenders of the relics of their patron, but defenders of Christianity against the invasion of the Moors. In time this order attained great wealth, thereby exciting the jealousy of the crown, which succeeded in securing the grand-mastership in 1522, after which the order rapidly declined.

Compound Alcohol, rectified spirits to which has been added one or more flavoring ingredients. They are called also compounds. The chief compounds are gin, British rum, British brandy, and some grades of American whiskey, cordials, and liqueurs, such as curaçao, lovage, cherry brandy, noyeau, rum shrub, etc., are also denominated compounds. These are prepared by adding to clean rectified spirits various essences or oils, and sweetening with sugar or syrup. Sweetened compounds usually contain from 20 to 35 per cent of proof spirit.

Compound Ammonias, or Amines, a large and very important class of bodies derived from ammonia by replacement of the hydrogen with an organic radical. They are termed primary, secondary, or tertiary, according as one third, two thirds, or the whole of the hydrogen is replaced by an organic radical.

They are all basic in function, combining with acids to form crystalline salts. They have an alkaline reaction, and some are volatile and pungent. They are of great importance in the investigation of the constitution of various organic bodies.

Compound Animal. See COLONIAL ANIMALS.

Compound Steam-engine, a form of steam-engine originally patented by Hornblower in 1781, in which steam at a relatively greater pressure was allowed to expand in a small cylinder, and then, escaping into a larger cylinder, to expand itself against a larger piston. Compound engines are of two classes, which may be called compound and independent compound engines. The former are those in which the cylinders are near each other, and the pistons commence their respective strokes simultaneously, or nearly so, the steam expanding from one cylinder direct to the other through as small a passage as convenient. To this class belong most land engines, and the compound marine-engines with cranks at about 130°.

Compounding a Felony, the act of accepting from a felon, by the person aggrieved, a return of the goods, a consideration, or a reward, on the express condition that he will not prosecute the felon. The mere failure to prosecute a person committing a crime is not, even if the goods are returned, compounding a felony; but the essence of the action is the agreement not to prosecute, for a consideration of any kind,— and the return of the goods is a sufficient consideration. The person aiding the felon is an accessory to the crime and can be prosecuted, although the person committing the crime has never been tried. In English law, to advertise a reward for the return of stolen goods renders the advertiser liable to a fine of $250.

Compressed Air. Early inventors and experimenters found the air a most prolific medium for producing effects of various grades of utility. Hero of Alexandria a century before Christ wrote on this subject. He put into practical application an invention for opening and closing temple doors which was accomplished by the alternate rarefaction and condensation of air brought into contact with the heated and cooled surfaces of altar tops.

Elagabulus, a Roman emperor, in the beginning of the 3d century invented and used luxurious couches inflated by air. In the 16th century Galileo discovered the underlying principles of the power of air. Otto von Guericke of Madgeburg invented the air pump in 1654. In 1640 a system for compressing air was invented in Italy. It was called a trompe and was used for blowing forges. Air was compressed by means of falling water. About 1800 compressed air was first used for diving bells, and caisson work. Air pumps or compressors began to be developed about 1850. Since then they have undergone various changes in construction until to-day various enormous machines are built.

Air Compressors.— These machines consist of a metal cylinder; valves for inlet of free air, and for discharge of air being compressed; a piston for drawing in and discharging the air; a piston rod attached to the piston and connected to a crosshead connecting rod; crank shaft and means of driving. They are actuated by steam, water wheel, electricity, gas engine, etc.

An air compressor produces air under pressure from one pound to the square inch up to 3,000 pounds or more. The usual working pressure ranges from 50 to 100 pounds a square inch.

The air is forced from the cylinder into a storage tank called a receiver, where it accumulates pressure up to the desired point, and is regulated by checks, valves, and other devices for controlling and transmitting power. Air under pressure is called compressed air, and is simply air increased in density by pressure or by heat. When under pressure it gives forth power, moves the piston of an engine or drives objects before it. Air when being compressed becomes heated owing to the friction of the air upon itself. When compressed rapidly and under high pressures the temperature rises as high as 500° above zero. This necessitates the cooling of the cylinder of the air compressor by what is known as a water jacket, which is a means of circulating water in the walls of the cylinder. Hence we have for a working compressed air plant, an air compressor, air receiver, and piping for the air to travel in to the point where it is used.

The use of compressed air is of great importance. It is employed on locomotives, in ship-building, railroad shops, manufactories, waterworks, mines, quarries, tunneling and bridge-building, for glass-blowing, forging, foundry work, structural iron erection in residences, offices and various other industrial and domestic plants.

Some of the Important Uses of Compressed Air Showing Requirements, Volumes, and Pressures.— An air lift pump outfit consists of an air compressor, air receiver, air and water piping for the well and the devices in the well for properly applying compressed air. Pressure required, 80 pounds per square inch; volume, contingent.

Carrier system in stores.— Air compressor, receiver, tubing from cashier to various stations. Receiver approximately, 4′ by 8′. Pressure, minimum, six pounds; maximum, nine pounds.

Pneumatic hammer for chipping, caulking, flue beading.— Air compressor, air receiver, piping hose and hammer. Pressure, 80 pounds; volume, 10 to 14 cubic feet per minute.

Rivetting hammer.— Air compressor, air receiver, piping and tool. Pressure, 85 pounds; volume, 16 to 23 cubic feet per minute.

Drilling machines for iron and wood.— Air compressor, air receiver, piping and drill. Pressure. 80 pounds; 16 to 35 cubic feet per minute.

Foundry rammer.— Air compressor, air receiver, piping and rammer. Pressure, 60 to 90 pounds per square inch; volume, 11 to 25 cubic feet per minute.

Rock drill.— Air compressor, air receiver, piping and rock drill. Pressure, 75 pounds; volume, 35 cubic feet of air per minute, and upward.

Beer pumping.— Air compressor, receiver, piping. Pressure, 15 pounds; volume, contingent.

Sand blast.— Air compressor, receiver, piping, and sand blast machine or mixer. Pressure, 20 pounds; volume contingent.

Cleaning nozzles.— Air compressor, receiver, piping and nozzles. Pressure, 80 pounds; volume contingent.

Painting machine.— Air compressor, receiver, piping and paint spraying machine. Pressure, 80 pounds; volume, contingent.

Air hoists.— Cylinder or motor, for lifting 15,000 pounds. Air compressor, receiver, piping, and appliance. Pressure, 80 pounds; volume, 1 to 35 cubic feet per minute.

House-cleaning renovator.— Air compressor, receiver, piping and renovator. Pressure, 80 pounds; volume, 20 cubic feet per minute.

Lifting jacks or elevators.— Air compressor, receiver, piping and apparatus. Pressure, 80 pounds per square inch; volume, 1 to 35 cubic feet of air per minute.

The above give an idea of the range of usefulness of compressed air.

OTHER USES.

Air-drills.
Air-brakes.
Air-brushes.
Angle iron shears.
Annealing.
Agitating acids.
Aerating.
Automatic sprinkler.
Beds and mattresses.
Baggage handling.
Channeling machines.
Coal cutters.
Cranes.
Canal locks.
Caissons.
Crossing gates.
Drainage systems.
Derricks.
Elevators and elevator door openers.
Hoisting engines.
Finishing silk ribbon.
Granite surfacing.
Ice making.
Molding machines.
Mine locomotives.
Pumping water.
Pile driver.
Pipe bending apparatus.
Railway switches and signals.
Steering gear.
Sheep shearing.
Sewage raising.
Spraying for medical purposes.
Tapping.
Torpedo boats
Vulcanizing wood.
Welding.

Compressed Air for Operating Street Cars.— Experiments were made in New York (1899–1900), on the 28th and 29th Street lines for operating street cars by compressed air. Air under 3,000 pounds pressure to the square inch was stored in long flasks of steel placed under the seats and cars. It was passed out through a reducing valve and after being reheated went into a motor built along the lines of a steam engine. The operation was controlled by valves on the platform. These cars ran for over a year but were abandoned.

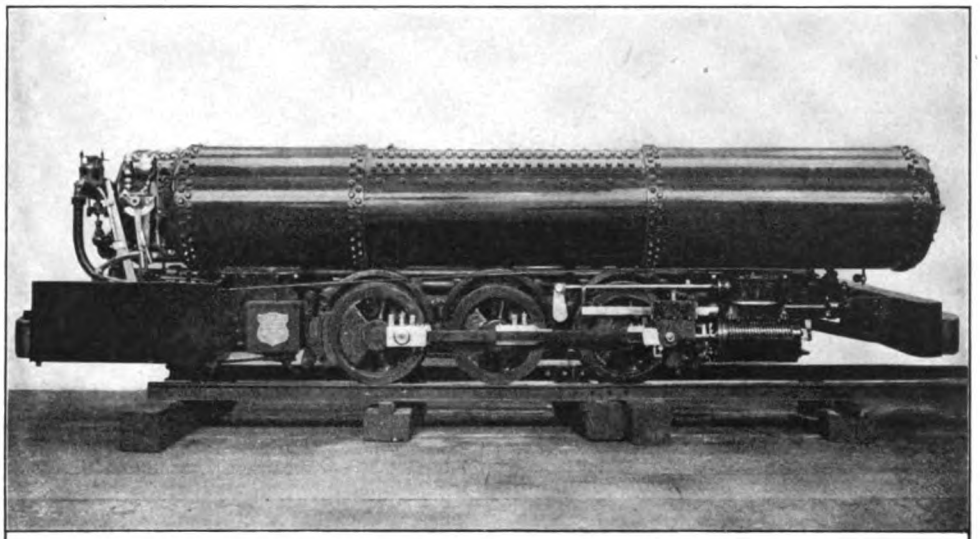
Liquid Air.—Air is compressed to 1,200 to 2,000 pounds to the square inch; passed into receptacles where it is purified by separating the moisture, oil, etc.; and passed thence into expansion chambers and through coils of pipe of considerable length. During this process it becomes intensely cold, reaching finally 312° below zero, at which point it becomes liquid. It is drawn off into insulated vessels, where it remains for days at a time, lessening in quantity until it evaporates entirely.

ANDREW E. KENNEY.

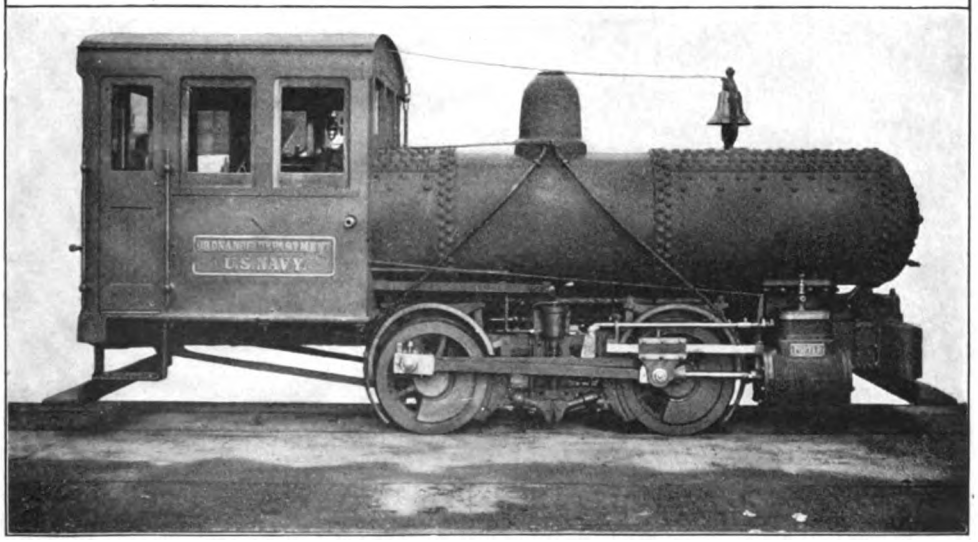
Compromise of 1820, in American political history, a national law enacted by Congress 6 March 1820. In 1819 the territory of Missouri, with a population of 60,000, demanded admission into the Union as a slave State. Arkansas was preparing to make similar demands. Such action would have given the South the balance of power in Congress, and the North made this a national issue. The North controlled the House of Representatives, while the South controlled the Senate. A deadlock was inevitable, and a party of compromise sprang up, which succeeded in producing a temporary arrangement acceptable to both parties. This was the compromise of 1820. It divided the Louisiana Purchase between freedom and slavery by a line drawn at 36° 30′ N. lat. See UNITED STATES — ABOLITION AND THE FREE SOIL MOVEMENT.

Compromise of 1833. This was Henry Clay's tariff compromise, to prevent Civil War on account of nullification by South Carolina. The tariff of 1828 was regarded by the South as very injurious and inequitable, raising its expenses and reducing its income, and laying burdens upon it without compensating advantages. The tariff was borne in the hope that Jackson, a southern man, would throw his influence against it, but when he signed the amended act of 1832, leaving the duties much as they were, South Carolina took the lead in revolt. On 19 Nov. 1832, a convention called by its legislature, declared the act of 1828 and its amendments null and void, forbade its enforcement in the State or appeal to the supreme court regarding it, and decreed secession in case the United States should attempt to use force. On 4 Dec. 1832, Jackson's annual message mildly criticised the tariff as overgrown and needing gradual retrenchment to a revenue basis, and apologized for the popular resistance, which he thought the laws adequate to suppress. The nullifiers and their opponents alike thought he had surrendered to the former as in the Cherokee case (see CHEROKEE NATION *v.* GEORGIA); but on the 10th, apparently from a sudden shift of emotional feeling, he issued a powerful proclamation against them, characterizing nullification as an absurdity "incompatible with the existence of the Union," and declaring that it would be resisted by the entire national force. There was great enthusiasm throughout the North, and general approval even in the South, but South Carolina returned a defiant counter-proclamation, and Calhoun resigned the vice-presidency, to be immediately returned to the Senate as the champion of nullification. To remove the grievance the House Committee of Ways and Means on the 27th reported the Verplanck Bill, reducing the tariff within two years to the standard of 1816, the primitive basis. But the President, angered by the new South Carolina threat, asked for a bill to enforce the law by military power, and extend Federal jurisdiction over revenue cases — called by the people the Force Bill, and by the South Carolinians the "Bloody Bill." All parties were perplexed and unable to act. South Carolina had relied on Southern support, which was not forthcoming; the House could not agree on the Verplanck Bill nor the Senate on the Force Bill. On 12 February, 20 days before final adjournment of the 22d Congress, Clay undertook a compromise. He introduced a bill into the Senate which reduced the duties to a general 20 per cent by a sliding scale to end in 1842, enlarged the free list, etc. Clay's assigned motive was, that without some such measure the protective system was likely to be abolished altogether, but not before there had been civil war, in which the South would not let South Carolina stand alone. A further motive was, that he dreaded to see Jackson made a virtual dictator with a large army in his hands, as none could tell what he might do with it. Calhoun, to men's great surprise, struck hands with Clay, though the pending Verplanck Bill was a far greater relief to the South. But Calhoun was far more anxious for a triumph of nullification, and the consequent mastery by the

COMPRESSED AIR LOCOMOTIVES.



COMPRESSED AIR MINE LOCOMOTIVE.



COMPRESSED AIR INDUSTRIAL LOCOMOTIVE FOR SURFACE USE.

South of her own destinies, than for mere lightening of material burdens, and the compromise bill would be notoriously a concession wrung from the North by the threat of nullification, while the Verplanck Bill, even if passed (which was dubious), would be only a bill like another. The compromise bill was referred to a select committee with Clay for chairman. The manufacturers' lobby insisted on amendments, of which the chief was very obnoxious to the South — that for computing *ad valorem* duties on the basis of valuation at the home ports. As they made this an ultimatum, Clay supported it in the Senate, while Calhoun denounced it as both oppressive to the South and unconstitutional. Finally Clayton of Delaware, a strong Protectionist, threatened for his party to lay the whole on the table unless the Calhounists and their leader voted for the amendment, which they did. Meantime the Force Bill had passed the Senate; and Clay urged it to pass the compromise tariff bill also, so that the bill for violence should have that for harmony to counteract it. The objection was raised that the bill was one to raise revenue, and could not originate in the Senate. This was met by the shrewd device of moving the House to strike out all but the enacting clause of the Verplanck Bill and substitute Clay's bill, and send it to the Senate for concurrence — which it did the next day, 119 to 85, and the Senate adopted it, 29 to 16. South Carolina, which had appointed 1 February for the nullification ordinance to go into effect, repealed it, and the country hailed it as a great deliverance. Clay himself later confessed, however, that he doubted whether he had done wisely. The nullifiers denied that they had abandoned a jot of their contention; hailed the result as a proof that it was the only means by which the South could obtain justice; and professed to have postponed the date of its operation only out of friendship to Virginia, which sent a commissioner to deprecate it. It is certain that the South won both the material and the moral fruits of the victory. Consult Schurz, 'Life of Henry Clay,' Vol. II., chap. xiv.; also other lives of Clay, and biographies of Jackson and Calhoun.

Compromise of 1850. The Missouri Compromise of 1820 (q.v.) had divided the Louisiana Purchase between free and slave territory at 36° 30′ (the general boundary between Arkansas and Missouri), except that Missouri was to be slave. The extreme pro-slavery members, about one fifth of the House and one fourth of the Senate, based their opposition on the ground that Congress had no power to legislate on slaveholding in the Territories, it being a fundamental right implied in the Constitution; but the majority admitted the jurisdiction by passing the bill. The joint resolution for admitting Texas in 1845 extended the same line to any new bodies formed out of that State; and was supported by the most ultra slavery men, as taking the merest sliver from them and securing solidly the enormous remainder. When the Mexican war seemed likely to add new territory, the Wilmot Proviso (q.v.) of 8 Aug. 1846, attempted to bar slaveholding from it, as did existing Mexican law; and the struggle to prevent this transformed political parties. After the annexation had taken place, 2 Feb. 1848, bills for organizing the Territories of New Mexico and California were introduced: at first in an omnibus bill with Oregon (the Clayton Compromise), to force all of them to permit slaveholding, then to extend the Missouri compromise line to the Pacific (including in slave territory nearly all the present New Mexico and Arizona, and the entire southern half of California); then the Democratic Senate receded from the Oregon "hold-up," and the House repeatedly attempted to organize the other bodies as territories with the proviso; while the Senate regularly killed the bills, and once attempted to attach its own as rider to an appropriation bill. This went on till the end of 1849, when the gold discoveries in California forced the hand of both the Southern slavery party and its Northern allies. The immense immigrant population there formed a constitution prohibiting slavery, and demanded admission of California as a State. Even the deniers of the right of Congress to legislate on slavery had always admitted that the people of a State had the right to live under any constitution they pleased; and the Democrats, to hold their vote in North and South, now took the position that the inhabitants of an inchoate State should be allowed to decide their own destinies. As this meant the immediate reinforcement and ultimate supremacy of the free States, the Southern Whigs and Democrats began to draw together, and formulated the doctrine that the people of a Territory had no right to exclude the industrial or social system of any part of the Union; that Congress should force them to rescind such exclusion if made; and that the exclusion, if permitted, was a wrong which justified secession. But California was not a Territory: it was a body of unorganized settlers who would come in as a State from the first, and certainly could be admitted by Congress on their own terms. The Southern leaders, therefore, resolved that they should not be admitted except by passing through the territorial stage, so as to come under the congressional prohibition. Zachary Taylor, a slaveholder, but a moderate and just-minded man, had been inaugurated as President in March 1849, and his first congress met in December. The Senate had a large Democratic majority; the House was so evenly divided that the few Free-Soilers held the balance, and it required 63 ballots and three weeks to elect a speaker, Howell Cobb of Georgia. On their meeting Taylor had sent a message recommending California's wish to become a State, to their favorable consideration; on 21 Jan. 1850, he sent a special message, declaring that the people would not sustain them in denying the Californians the right of self-government. The South, nevertheless, was passionately determined not to yield; and Henry Clay undertook one of the great compromises which were the pride of his life, the shortest-lived and most destructive compromise in American history. The difficulty was to find anything that either side wanted badly enough to take as a price for yielding. For the South, this was found in the Fugitive Slave Law (q.v.), which Alexander H. Stephens declared to be the very essence and heart of the whole compromise, and the breach of which by the Northern personal-liberty laws was accounted the crowning justification of secession; and in a money indemnity to Texas for abandoning her claim to the Rio Grande as a western boundary, which that State was ready to fight for, but the payment for

which would raise the market value of her bonds, largely held in the South. For the North, it was found in the admission of California as a free State, and the prohibition of the slave-trade in the District of Columbia — the latter a mere sop, as slavery was not abolished in the District. The sacrifices were, that the South gave up the right of insisting that no free State should be admitted into the Union except as paired with a slave State, and so in her own view gave the North the fruits of the Mexican war; the North gave up the proviso, and the right of stopping the interstate slave trade, though this was later stricken out. On 16 January a bill had been brought into the Senate to organize "the Territories of California, Deseret [Utah], and New Mexico"; on the 29th Clay unfolded his compromise, in eight resolutions: (1) admitting California with her free-State Constitution; (2) organizing the remainder of the newly acquired lands as territories, without restriction as to slavery, as it "did not exist [there] by law, and was not likely to be introduced," — merely staving off the question till they formed State governments; (3, 4) annulling Texas' claim to New Mexico, but paying her a blank indemnity; (5, 6) non-abolition of slavery in the District of Columbia without the consent of Maryland, but prohibition of the slave trade in it; (7) a more effectual fugitive slave law; (8) non-interference with the interstate slave trade. Clay said that the question with the South was one of interests, with the North one of sentiment, and the latter was easier to sacrifice than the former. The northern members and their constituents did not agree to this, nor did the South as to the equivalents; and after two months' debate the question was referred to a compromise committee of 13, of which Clay was chairman. On 8 May it reported a bill of four parts, known in history as the Omnibus Bill (*par excellence*, for there have been others), to be passed or rejected as a whole. The essential changes were, that New Mexico and Utah were forbidden to pass laws respecting slavery, that California should not be admitted unless this were granted, that the blank for the Texas indemnity should be filled with $10,000,000, and that no mention was made of the interstate slave trade. It will be observed that the gains in this revised "compromise" were pretty much all by the South. The bill of course embodied the specific legislation needed to make the resolutions effective. Part 1 consisted of the provisions for admitting California, New Mexico, and Utah, and indemnifying Texas; Parts 2 and 3 were the Fugitive Slave Law of history; Part 4 the provisions about the District of Columbia. This bill was stormily debated for nearly three months more, until 31 July, and amended until one item only was left, that admitting Utah, which passed the next day. Meantime Texas was arming and threatening war, and other States proposing to aid it; and Congress saw that the bills must be passed in some shape. The items were therefore voted on as separate bills, and all passed in Clay's form: Texas bill — Senate, 10 August, 30 to 20; House, 4 September, 108 to 97. California — Senate, 13 August, 34 to 18; House, 7 September, 150 to 56. New Mexico — Senate, 14 August, 27 to 10; House (together with the Texas bill), 4 September, 108 to 97. Fugitive Slave Bill — Senate, 23 August, 27 to 12; House, 12 September, 109 to 75; District of Columbia — Senate, 14 September, 33 to 19; House, 17 September, 124 to 47. The Fugitive Slave Law, the vital part of the compromise, was also its assured ruin, as it gradually turned the entire North into abolitionists; but the immediate cause of its collapse was the Kansas-Nebraska Bill (q.v.), which repealed not only the Missouri Compromise, but the present compromise which practically reaffirmed that. Consult: Von Holst, 'Constitutional History of the United States,' Vol. III.; Benton, 'Debates of Congress'; Stephens, 'War between the States,' Vol. II.; and lives of Clay.

Compromises of the Constitution. See CONSTITUTION, FORMATION OF THE.

Compsognathus, kŏmp-sŏg'nā-thŭs, a genus of carnivorous dinosaurs (see DINOSAURIA) of the Jurassic Period, of very small size, hardly larger than a domestic cat, and slenderly proportioned. A very perfectly preserved skeleton has been found in the lithographic limestone of Solenhofen in Bavaria.

Comp'ton, Alfred George, American teacher: b. London, Eng., 1 Feb. 1835. He graduated at the College of the City of New York in 1853, and since then has taught chiefly mathematics. At present (1903) he holds the chair of physics in the College of the City of New York. He has written: 'A Manual of Logarithmetic Computation' (1881); 'First Lessons in Wood-working'; 'First Lessons in Metal-working' (1890); with De Groodt, 'The Speed-lathe' (1898); and 'Some Common Errors of Speech' (1898).

Compton, Henry, English bishop: b. Compton, Wynyates, 1632; d. Fulham 7 July 1713. He was the youngest son of Spencer, second earl of Northampton, studied at Oxford, and after the Restoration became a cornet in a regiment of horse. Afterward he left the army for the Church, became bishop of Oxford in 1674, and bishop of London in 1675. Charles II. made him a member of his privy council, and intrusted to him the education of his nieces Mary and Anne. He was distinguished for his hostility to the Roman Catholic Church. After the accession of James II., Dr. Sharp, rector of St.-Giles'-in-the-Fields, having become highly obnoxious to the court, Compton was required by a royal order to suspend him. His refusal to obey was made the ground of his own suspension. He was restored to his see at the time of the Revolution, and, together with the bishop of Bristol, made up the majority of two in the house of lords for filling the vacant throne. He performed the ceremony of the coronation of William and Mary, and was afterward appointed one of the commissioners for revising the liturgy. During the reign of Anne he was put on the commission for the union of England and Scotland. The reconciliation of dissenters with the Church of England was one of his favorite projects.

Compton, Herbert Eastwick, English novelist and miscellaneous writer: b. 16 Nov. 1853. He was educated at Marlborough College, and has traveled extensively. He has published: 'The Dead Man's Gift' (1890); 'A Master Mariner' (1891); 'Military Adventures of Hindustan' (1892); 'A King's Hussar' (1893); 'A Free Lance in a Far Land' (1894); 'The Inimitable Mrs. Massingham' (1900);

'The Ashanti War'; 'A Fury in White Velvet' (1901); 'Facts and Phantasies of a Foliogrub' (1902).

Compulsory Arbitration. See NEW ZEALAND.

Compurga'tion, a mode of defense allowed by the Anglo-Saxon law in England, and common to most of the Teutonic tribes. The accused was permitted to call a certain number (usually 12) of men, called compurgators, who joined their oaths to his in testimony to his innocence. They were persons taken from the neighborhood, or otherwise known to the accused, and acted rather in the character of jurymen than that of witnesses, for they swore to their belief, not to what they knew; that is, on the accused making oath of his innocence they swore that they believed he was speaking the truth. Compurgation in the ecclesiastical courts was not abolished till the reign of Elizabeth. Consult Blackstone, 'Commentaries on the Laws of England'; Pollock and Maitland, 'History of English Law.'

Comstock, Anthony, American reformer: b. New Canaan, Conn., 7 March 1844. In 1863 he enlisted in the 17th Connecticut regiment, served under Gen. Gilmore, and was mustered out in July 1865. In March 1873 he became secretary and special agent of the New York Society for the Suppression of Vice, and has completely identified himself with its work. It is said that largely through his special efforts 2,500 criminals have been brought to justice, and over 80 tons of indecent literature and pictures have been seized and destroyed. He has written: 'Frauds Exposed; How the People are Deceived . . . and Youth Corrupted' (1880), an exposure of various schemes operated through the mails; 'Traps for the Young' (1883); 'Gambling Outrages; or, Improving the Breed of Horses at the Expense of the Public Morals' (1887), and minor tracts for the furtherance of his work.

Comstock, kŭm'stŏk, **Cyrus Ballou,** American soldier: b. West Wrentham, Mass., 3 Feb. 1831. He graduated at West Point 1855, was chief engineer of the Army of the Potomac 1862–3, and attained the brevet rank of major-general of volunteers 26 March 1865, having been successively promoted for gallant, faithful, and meritorious services. He was later president of the Mississippi River Commission, and a member of the permanent board of engineers for fortifications. He was retired in 1895 as brigadier-general in the regular army. He wrote: 'Notes on European Surveys' (1876); 'Survey of the Northwestern Lakes' (1877); 'Primary Triangulation, United States Lake Survey' (1882).

Comstock, George Cary, American astronomer: b. Madison, Wis., 12 Feb. 1855. He graduated at the University of Michigan 1877 and from the law department of the University of Wisconsin 1883. He practised law for a time, but later devoted himself entirely to astronomy, and is now (1903) professor of that subject and director of the Washburn Observatory in the University of Wisconsin. He is a member of the National Academy of Sciences. He has written: 'Text-book of Astronomy' (1901); 'Text-book of Field Astronomy for Engineers' (1902).

Comstock, John Henry, American entomologist: b. Janesville, Wis., 24 Feb. 1849. He graduated at Cornell University 1874; was United States entomologist at Washington, D. C., 1879–81, and since that date has been instructor and professor of entomology and general invertebrate zoology at Cornell. He has been a constant contributor to the literature of his subject, the following being the more important of his works in book form: 'Report on Cotton Insects' (1879); 'Introduction to Entomology' (1888); 'Manual for the Study of Insects'; 'Insect Life' (new ed. 1901); and 'Elements of Insect Anatomy' (3d ed. 1903), (with Kellogg).

Comstock, John Lee, American writer on physics; b. Lyme, Conn, 1789; d Hartford, Conn., 21 Nov. 1858. He received a common-school education, studied medicine, and during the War of 1812 was assistant surgeon at Fort Trumbull, Conn., and on the northern frontier. He settled in Hartford, Conn., practised medicine until 1830, when he became an author by profession, and attained remarkable success in the compilation of text-books for educational purposes. His 'Introduction to Mineralogy' (1832) was used at West Point; of the 'Elements of Chemistry' over 250,000 copies were sold; while the 'System of Natural Philosophy' (1831) had a sale of over 900,000 copies (94th ed. N. Y. 1847), and was translated into the chief European languages. Others were: 'History of the Greek Revolution' (1828); 'History of the Precious Metals' (1849); 'Natural History of Quadrupeds' (1829); 'Grammar of Chemistry' (1825); 'Introduction to Botany' (3d ed. 1835).

Comstock, Theodore Bryant, American geologist: b. Cuyahoga Falls, Ohio, 27 July 1849. He graduated at Pennsylvania State College 1868, and at Cornell 1870, where he was professor of economic geology 1875–9. He accompanied Hartt's expedition to Brazil 1870, and Jones' Wyoming expedition 1873. He was professor of mining engineering and physics in the University of Illinois 1885–9, and assistant State geologist of Arkansas 1887–8, and of Texas 1889–91. He founded the Arizona School of Mines, was its director 1891–5, and president of the University of Arizona 1893–5. He has been manager, engineer, and consulting expert to many mining companies and syndicates, both American and foreign. He has published: 'Outline of General Geology' (1878); 'Classification of Rocks' (1877); 'Notes on the Geology of the San Juan Country' (1882); 'The Geology and Vein Structure of Southwestern Colorado' (1886); the last two in the 'Transactions' of the American Institute of Mining Engineers; and numerous papers in the 'American Journal of Science'; 'American Naturalist'; and 'Engineering and Mining Journal.'

Comstock Lode, a remarkable vein carrying silver sulphides with some native silver and considerable native gold, near Virginia City, Nev. The wide vein is a faulted fissure following the contact of a basaltic dike with the andesite country rock, the latter of Tertiary age. The gangue is mainly quartz. The ores are of recent origin, and the waters ascending along the fissure are hot, making mining costly. Some wonderfully rich ore bodies, «bonanzas,» were found in certain of the mines along the

lode, and the history of its discovery, the great mining speculations based on it, and the final abandonment of nearly all the mines, reads like a romance. At present the deepest shaft on the lode is being reopened. The total yield of the lode from its discovery in 1859 up to July 1880 was over $306,000,000.

Comte, François Charles Louis, frăṅ-swā shärl loo-ē kôṅt, French writer on politics and jurisprudence: b. St. Enimie, department of Lozère, 1782; d. 1837. In 1814 he united with Dunoyer in starting a journal, called 'Le Censeur,' in which the adherents, both of Napoleon and the Bourbons, were roughly handled. On the second restoration of the Bourbons judicial proceedings were taken against the 'Censeur,' and the editors were fined and imprisoned. In 1819 Comte converted his journal into a daily newspaper, under the name of 'Le Censeur Européen,' and shortly after amalgamated it with the 'Courrier Français.' In 1821 a new prosecution condemned him to two months' imprisonment and a fine of 2,000 francs. He then went to Geneva, where he obtained a chair of public law, and taught with great success till the Helvetic Diet, in consequence of diplomatic complaints, found it necessary to refuse him an asylum. The work by which his name will be best known to posterity is his 'Traité de Législation Criminelle' (1827).

Comte, Isidore Auguste Marie François (ē-zä-dōr ôg-üst mä-rē frăn-swä), **Xavier,** French philosopher, founder of the "positive" system of philosophy: b. Montpellier 12 Jan. 1798; d. Paris 5 Sept. 1857. He was educated at the École Polytechnique, and embraced enthusiastically the socialist tenets of St. Simon, which became greatly in vogue in France after the Restoration. As one of his most distinguished pupils, he was employed, in 1820, to draw up a formula of the doctrines professed by the St. Simonian school, which he accordingly accomplished in his 'Système de Politique Positive.' This work did not, however, meet with the entire approbation of St. Simon, who asserted that Comte had made a very important omission by overlooking the religious or sentimental part of human nature. In 1826 he began lecturing on mathematics, and had for an audience such men as Humboldt, Blainville, Carnot, etc. In 1830 he began the publication of his 'Cours de Philosophie Positive,' completed in six volumes in 1842, and freely translated into English and condensed by Harriet Martineau (2 vols. 1853). The following is an abstract of the philosophical system propounded by Comte in that work. It consists of three leading positions. The first is, that the human mind in its progress, historically and individually, passes through three stages of development: (1) The theological, in which all the phenomena of nature are imputed to the active agency of the gods. (2) The metaphysical, in which the gods are supplanted by certain abstractions called "nature," "harmony," "number," etc. (3) The positive or scientific, in which it is discerned that man can know nothing of causes, and is only able to refer phenomena to their general laws of existence or succession. Arrived at this stage, science is born, and knowledge, no longer baffled by the inscrutable or misled by the imaginary, advances from one generalization to another, to a comprehensive perception of the universe as a whole. The second position is, that in this advance the mind proceeds in a regular hierarchical order, from the simple to the complex, or from the most elementary relations of numbers to the highest and deepest complications of society and life. The hierarchical order of the sciences is arranged by Comte as follows: 1. The most general and simple of all, dealing only with numbers and magnitudes — mathematics. 2. The application of the principles of mathematics to the phenomena of the celestial sphere, or astronomy. 3. The application of mathematics and astronomy to the phenomena of the terrestrial sphere or general physics, including heat, light, optics, electricity, etc. 4. The science of the phenomena of individually organized being, or vegetable and animal life, termed biology. 5. The science of the phenomena of corporate or social life, which he terms *sociology,* and which, as presupposing and containing all the former, he represents as the essence and perfection of all the sciences. The third position lays down the laws and principles which regulate social life, constituting order and liberty. The first element of order is the family; the second the community, composed, not of individuals, but of families, and co-operating, to a certain extent, in their employment; and the third, the government or state. Liberty is the effect of this harmonious organization, and progress the development of it, by the conquest (1) of material nature; (2) of the lower propensities by the higher intellectual faculties; and lastly, of the selfish passions by the noblest social affections. In 1832 he became one of the professors at the École Polytechnique. In 1843 he published a mathematical work, 'Traité Élémentaire de Géometrie Analytique,' and in 1848 'Discours sur l'Ensemble du Positivisme,' in which the doctrines laid down in his previous work are recapitulated. But some change had, in the interval, taken place in Comte's views. The death of a lady, whom he calls Clotilde, and for whom he had conceived the most ardent affection, impressed his mind deeply with the conviction that something more than a mere material array of facts was needed to satisfy the cravings of the human soul. The religious tendencies of the heart had been hitherto wholly overlooked by him, and he now perceived the necessity of presenting some object to supply this want. He invented a religion which consists in referring the whole harmony of existence to, and concentrating its essence in one great Being, whom he termed Humanity. As manifestations and representatives of this Being, he maintained that the proper objects of worship are those who have shown themselves the greatest benefactors to the human race — in fact, a hero-worship. This system is propounded by him in a book published in 1849, entitled 'Culte Systematique de l'Humanite Calendrier Positiviste, ou Système Général de Commemoration Publique,' in which he has drawn up a regular calendar of demigods, presiding over the months, weeks, and days of the year, and having each their appropriate festivals. The 13 months into which he divided the year, he called Moses, Homer, Aristotle, Archimedes, Cæsar, St. Paul, Charlemagne, Dante, Gutenberg, Shakespeare, Descartes, Frederick, and Bichat. He assumed the office of high priest of this new religion, performing marriage and

funeral rites on behalf of the disciples induced to adopt his system. These, however, were never very numerous, and by the time of his death had nearly all dropped off one after another. The last work published by him was entitled 'Système de Politique Positive, ou Traité de Sociologie, instituant la Religion de l'Humanité,' (1851–2). However extravagant many of Comte's theories may appear to be, they nevertheless display in their enunciation a powerful intellect with much universality and comprehensiveness of knowledge. Many new and original ideas are brought forward, and much matter afforded for thought and reflection. His works have been made known to English readers mainly by Mr. G. H. Lewes, 'Comte's Philosophy of the Sciences,' and Miss Martineau's translation above mentioned. See POSITIVISM.

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Comte, Pierre Charles, pē-ār shärl, French painter: b. Lyons 23 April 1823; d. 1895. He studied at Paris as a pupil of Robert Fleury, and exhibited his picture 'Lady Jane Grey,' in 1847, which won him considerable attention. His other works include: 'Henry III. Meeting the Duke of Guise'; 'Joan of Arc at the Coronation of Charles VII.'; 'A Scene at Fontainebleau' (at Washington, D. C.); 'Gipsies Before Louis XI.'; and 'The Last Visit of Charles V. to the Castle of Ghent.'

Comte de Paris, dė pä-rē. See PARIS, COMTE DE LOUIS PHILIPPE ALBERT D' ORLEANS.

Comus, kō'mŭs (Greek *kōmos*), in ancient Greece the name given to a kind of festal procession in honor of some of the gods (as Bacchus) and sometimes in honor of victors in the public games. The term had also the wider sense of revel and merry-making. This name was also given to a divinity supposed to preside over such festive occasions, but as his name does not occur in early ancient writers whose works have been preserved, he is evidently a creation of later times. He is first mentioned by Philostratus (about 200 A.D.).

Comus, a masque by John Milton, given before the Earl of Bridgewater at Ludlow Castle, Shropshire, England, 29 Sept. 1634. It was first printed in 1637. An altered version of it was played at Covent Garden Theatre, London, in 1773, and in 1901 it was played at Tufts College, Massachusetts, by the students of that institution.

Comyn, kŭm'ĭn, **John,** the elder, Scottish noble: d. about 1300. He was one of the commissioners sent to confer about the marriage of the Maid of Norway to Prince Edward of England. On the competition for the Scottish throne in 1291 Comyn put in a claim as a descendant of Donald Bane.

Comyn, John, Scottish noble: d. Dumfries 1306. He was called the "Red Comyn," was chosen one of the three guardians of Scotland, and defeated the English at Roslin in 1302. He submitted to Edward I. in 1304, and was killed by Bruce in the Convent of the Minorites at Dumfries in 1306, a well-known episode in the life of the great Scottish king.

Con, kŏn, an Italian preposition signifying with, and of frequent occurrence in musical phraseology; *con amore,* with feeling: *con brio,* brilliantly; *con gusto,* with taste, etc.

Conan'icut, an island of Rhode Island, situated in the lower part of Narragansett Bay. It is about nine miles long. The town of Jamestown is near the east shore, and there is a lighthouse at the north end.

Co'nant, Alban Jasper, American artist: b. Chelsea, Vt., 24 Sept. 1821. He settled in St. Louis in 1857, and during the Civil War visited Washington, and painted portraits of President Lincoln, Secretary Stanton, and Attorney-General Bates. He was a curator in the University of Missouri for eight years, and made valuable studies of the archæology and antiquities of the Mississippi Valley. In 1880 he was appointed Délégué Correspondant de l'Institution Ethnographique of Paris. He has published: 'Footprints of Vanished Races in the Mississippi Valley' (1879, 4to 1); 'The Archæology of the Missouri Valley'; 'My Acquaintance with Abraham Lincoln,' etc.

Conant, Charles Arthur, American economic writer: b. Winchester, Mass., 2 July 1861. He was for some years after 1880 a journalist in Boston, and in 1889 became the Washington correspondent of the 'New York Journal of Commerce.' He has published: 'A History of Modern Banks of Issue'; 'The United States in the Orient: the Nature of the Economic Problem' (1900); 'Alexander Hamilton'; 'Securities as Payment'; 'The Law of the Value of Money.'

Conant, Hannah O'Brien Chaplin, American author: b. Danvers, Mass., 1809; d. Brooklyn, N. Y., 18 Feb. 1865. In 1830 she married Thomas Jefferson Conant (q.v.). She was a woman of versatile talent, having an excellent knowledge of Oriental tongues, which enabled her to share in the biblical studies of her husband. She frequently contributed to the literary and religious periodicals of the day, and in 1838 became editor of the 'Mothers' Monthly Journal' at Utica, N. Y. She published: 'Lea: or the Baptism in the Jordan, by G. F. A. Strauss,' (1844); 'First Epistle of John Practically Explained, by A. Neander' (1852); 'The New England Theocracy, by H. F. Uhden' (1859), all translations from the German; 'The Earnest Man: Sketch of the Character and Labors of Dr. A. Judson' (1855); 'The English Bible: Popular History of the Translation of the Holy Scriptures into the English Tongue' (1856; English ed. 1859; new ed 1881).

Conant, Thomas, Canadian descriptive writer: b. Oshawa, Ont., 15 April 1842. He was educated in the public schools and at Eddystone Seminary in Geneva, N. Y., and has achieved distinction with brilliant sketches of scenery and articles on Canadian and other subjects. In 1896 he visited Australia, India, and the Orient.

Conant, Thomas Jefferson, American biblical scholar: b. Brandon, Vt., 13 Dec. 1802; d. Brooklyn, N. Y., 30 April 1891. He was graduated from Middlebury College in 1823,

and between 1825 and 1857 taught the classics and biblical literature in Columbia College, Waterville (now Colby) College, Maine, Madison, now Colgate, University, Hamilton, N. Y., and Rochester Theological Seminary. Taking up the studies that soon gave him a wide reputation, he was appointed by the American Bible Union one of a committee to prepare a revision of the English version of the New Testament. He was also a member of the American committee on the English revision of the Old Testament, and his versions were highly esteemed and constantly used by the English revisers. His numerous publications include translations of the 11th and 17th editions of Gesenius' 'Hebrew Grammar'; 'Job; Revised Version, and Notes' (1856); 'Matthew, Revised Version' (1860); 'Baptizein, Its Meaning and Use' (1860); 'Genesis, Revised Version' (1868; 1873); 'The New Testament; Common Version Revised' (1871); 'Psalms, Revised' (1871); 'Proverbs, Revised' (1872); 'Greek Text of the Apocalypse, as edited by Erasmus' (1873); 'Prophecies of Isaiah, Chapters 1–12' (1874); and 'Historical Books of the Old Testament, Joshua to II. Kings' (1884).

Cona'tion (from Lat. *conari*, to attempt), a term in its original sense used simply to express the idea or to designate the act of attempting or undertaking something. In present usage it is appropriated by psychologists to the expression of desire and volition as manifested in or constituting voluntary agency, although as a factor in consciousness and effort its precise implications appear not to have been finally determined. In the exertion of the muscles, and in direct conscious attention, the agency of conation in an individual finds its two representative aspects. Attention, desire, and endeavor, with their accompanying states of thought and feeling, are held by some psychologists to be the completing aspects of conation; while others maintain that its function is limited to the sensations of straining, with consequent states of consciousness, pleasurable or otherwise, attendant upon contraction of the muscles. Whether conation is to be regarded as simple or complex in its psychological aspects, remains therefore a question for further research and experiment. Consult: James, 'Principles of Psychology'; 'Experimental Psychology'; Scripture, 'The New Psychology'; Titchener, 'Outline of Psychology'; Hyslop, 'Syllabus of Psychology'; Stout, 'Analytic Psychology.'

Conaty, Thomas James, American Roman Catholic clergyman: b. Ireland 1 Aug. 1847. He was graduated at Montreal Theological School and ordained priest in 1872. From 1880 to 1897 he was pastor of the Church of the Sacred Heart and from 1893 to 1897 president of the Catholic Summer School. In 1896 he was made rector of the Catholic University of America, in Washington, D. C., and on 24 Nov. 1901 was consecrated titular bishop of Samos. In 1903 he was appointed Bishop of Los Angeles, California. He has published 'New Testament Studies' (1898), and lectured much on education.

Concan, kŏn'kăn, British India, a maritime subdivision in the presidency of Bombay. It consists of a long belt of seacoast, stretching from north to south for about 220 miles, with an average breadth of 35 miles, and bounded on the east by the Western Ghauts. It is divided into North and South Concan, and though the surface is much broken, contains many spots well adapted for cultivation. It contains the town of Bombay itself. Pop. over 3,000,000.

Concarneau, kôn-kär-nō, France, a seaport in the department of Finisterre, on an island in the bay of La Forêt, 12 miles southeast of Quimper. It has an extensive establishment for the rearing of fish, important sardine fisheries, and a harbor somewhat difficult of access, but with good anchorage for vessels of 500 tons. From 15,000 to 20,000 barrels of sardines are exported each year. Pop. 5,800.

Concave Lens, a lens ground so that it is thinnest in the centre, thick toward the edges. See LENS.

Concentra'tion, in chemistry, the act of increasing the strength of solutions. This is effected in different ways: by evaporating off the solvent, as is done in the separation of salt from sea-water; by distilling off the more volatile liquid, as in the rectification of spirit of wine; by the use of low temperatures, as in the purification of benzol; by difference of fusibility, as in Pattinson's process for desilverizing lead.

Concentration Camp, a camp into which non-combatants are gathered in time of war. During the Cuban rebellion of 1895–8 many peaceable and defenseless people were forced to abandon their homes in the agricultural regions and were imprisoned upon the barren waste outside the residence portions of the cities, and within the lines of entrenchment. It is estimated that at least 400,000 persons, mostly old men, women, and children were thus subjected to concentration under Weyler's administration. They were known as reconcentrados. The British also carried on a scheme of concentration of non-combatants during the Boer war, but those who were kept in the concentration camps were not subject to physical hardships such as disgraced the camps in Cuba. In the "appeal" issued by the Boer generals 25 Sept. 1902, thanks were tendered to those sympathizers who had rendered pecuniary and other assistance to Boer wives and children in the concentration camps. The British government expended about $1,000,000 per month on the burgher camps and stated that they were still maintained after the close of the war, "only in the cause of humanity." Provision was made at great expense in these camps for the education of the Boer children. The term concentration district may be applied to the rendezvous where troops are gathered during the process of mobilizing an army.

Concen'tric. Similar figures having a common centre are called concentric.

Concepción, kōn-thāp-thē-ōn' or kŏn-sĕp'-shŏn, Bolivia, a province of the department of Tarija, near the Argentine frontier and the San Juan and Vermejo rivers.

Concepción, Chile, a province lying between the provinces of Ñuble and Bio-bio. Area 3,532 square miles. It is divided into the departments of Coelemu, Puchacay, Rere, Concepción, Talcahuano, and Lautaro. The importance of its capital, its commercial activity, and its numerous ports make this the most interesting province in the south of Chile. Two of the

largest bays in the republic are on its coast, those of Talcahuano, which is defended by fortifications, and Arauco, which includes the ports of Lota and Coronel, notable for their coal mines. The city of Concepción is the capital. Talcahuano (15,500 inhabitants) is a military port, with a dry-dock for repairing warships and mercantile vessels, and at the same time an active commercial port. Products of the whole southern region are brought to it for exportation, and it supplies cities of the interior with a large part of their merchandise. The port of Tomé (5,000 inhabitants), situated near rich agricultural districts, exports a large quantity of wine and has a woolen mill, etc. Penco, a small port 10 miles by rail from the city of Concepción, is a favorite seaside resort and has a sugar refinery and coal mines in the neighborhood. The population of the province is 225,000.

Concepción, Chile, the capital of the province of the same name. It is situated on the banks of the Bio-bio River, and has a street-railway, theatre, electric lights, breweries, furniture, and carriage factories, saw-mills, flour-mills, distilleries, etc. It is in importance the third city of Chile. Pop. 55,000.

Concepción, Paraguay, also called Villa Concepción, the second city of the republic in commercial importance, though not in the number of its inhabitants. It is situated on the left bank of the Paraguay River, 213 kilometers from Asunción. It is a port of entry and delivery, where the steamers navigating the Upper Paraguay regularly touch. The principal buildings are the city hall, custom-house, parish church, market, and some fine private residences. It has a line of street-cars, telephone service, two banks, and several commercial houses that trade directly with Argentine and European cities. Yerba-maté and cattle are the principal items of the city's commerce. Pop. 13,654.

Concepción, Philippines, a former district of the island of Panay, now part of the province of Iloilo, situated on the northeast part of the island; area 683 square miles. The former capital, Concepcion, is a pueblo situated on the east coast of the island, 47 miles northeast of Iloilo; pop. 5,736. Pop of the district (1900) 19,342.

Concepción, Philippines, a town (pueblo) in Tarlac province in the island of Luzon, 12 miles south of the town of Tarlac. Pop. 13,499.

Concepción, a lake in the central portion of the department of Santa Cruz, Bolivia.

Conception, Immaculate, of the Blessed Virgin Mary, a dogma of the Roman Catholic Church, defined as such by Pope Pius IX. The purport of this definition is very commonly misapprehended, being understood to relate to the virginal motherhood of Mary: but the doctrine of the Roman Catholic Church, as expressed in the definition proclaimed by Pius IX. in his Letter Apostolic of 8 Dec. 1854 is that Mary «at the first instant of her conception was, by a singular privilege and grace of Almighty God, in virtue of the merits of Jesus Christ the Saviour of mankind, preserved immaculate from all stain of original sin.» This doctrine, though thus formally declared an article of Catholic belief only in the middle of the 19th century, had for many centuries been believed either explicitly or implicitly by saints and fathers of the Church. When at last the sense of all the bishops and all the churches of the Catholic communion with regard to this belief was elicited by a letter of Pius IX. addressed to them, the reply from the great majority of them was strongly in favor of a definition: yet a good many held it unwise to make the definition for the reason that neither in Scripture nor in Christian tradition could, as they thought, sufficiently clear intimations of it be found, or they doubted the wisdom of promulgating a definition at that time. Some of the bishops feared that a definition would alienate many minds outside of the Church that were favorably disposed toward the Catholic religion.

Conception of Our Lady, Sisters of the, an order of nuns, founded in Portugal in 1484 by Beatrix de Sylva, in honor of the Immaculate Conception. It was confirmed in 1489 by Pope Innocent VIII., and the Cistercian rule was adopted. In 1489 Cardinal Ximenes put the nuns under the direction of the Franciscans, and imposed on them the rule of Saint Clara. The order subsequently spread into Italy and France.

Conception. See EMBRYOLOGY.

Conceptualism, kŏn-sĕp'tū-ạl-ĭzm, in metaphysics, a doctrine in a sense intermediate between realism and nominalism. Conceptualism assigns to universals an existence which may be called logical or psychological, that is, independent of single objects, but dependent upon the mind of the thinking subject, in which they exist as notions or conceptions. See NOMINALISM; REALISM.

Concep'tualist, one of a metaphysical sect —if indeed it has coherence enough to be called a sect — which arose in the Middle Ages during the disputes between the Nominalists and the Realists; or one who holds the views of conceptualism. The conceptualist school sought to occupy an intermediate position, but it approximated much more nearly to the Nominalists than to the Realists. The conceptualists held that general ideas, such as genus, species, etc., were not merely names, but mental conceptions. The eminent metaphysician, John Locke (q.v.), held views essentially conceptualist.

Concert Pitch, the pitch of a certain note in the musical scale adhered to by the general body of musicians. The middle C (seated on the ledger-line which unites the G and F clefs) is produced by a string making, according to theorists, 512 vibrations per second. In England, however, the pitch has risen to 538, while in Germany it is 528, and in France 522. The gradual rise of the pitch from the theoretical 512 vibrations is attributed to the necessities of piano-tuning on the one hand, and the desire to attain a more intense and brilliant tone on the other. See PITCH.

Concertina, kŏn-sẽr-tē'na, a musical instrument invented by Sir Charles Wheatstone. It is generally polygonal in shape, is held between the hands so that the fingers drop naturally down on studs which raise the valves and allow the air (supplied by the bellows between the finger-boards) to act upon a series of metal tongues of the same construction as those of the accordion or harmonium. The usual range

of the instrument is from the lowest G on the violin to the C three and a half octaves higher, including the chromatic tones. The German concertina is a much less perfect instrument, as only tunes on a limited number of keys can be performed on it.

Concerto, kŏn-chār'- or kŏn-sĕr'to, a kind of composition first introduced by the Italian musicians of the 17th century, for the purpose of showing the capabilities of the violin, or of a particular performer on that instrument. The principal composers and artists in this department are Corelli, Viotti, Rodes, Baillot, Kreutzer, Alard, Beriot, and Vieuxtemps. Subsequently concerti were written for other instruments, such as the flute, the piano, etc. Among the most successful composers for the piano are Bach, Mozart, Hummel, Chopin, Schumann, Ries, Czerny, and Thalberg. Concerti usually consist of three movements, an *allegro,* an *andante,* or *adagio,* and a lively *rondo.* Except in the *tutti* the orchestra should be as subservient to the instrument for which the piece is written as it should to a vocalist.

Concerto grosso is an expression applied to the great or grand chorus of the concert, or to those places of the concert in which the *ripienos* and every auxiliary instrument are brought into action, for the sake of contrast and to increase the effect.

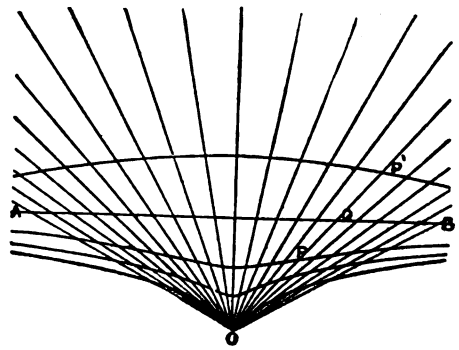
Concerto spirituale was a concert at Paris, performed in the religious seasons, when the theatres were closed. The pieces performed, however, were not always of a spiritual kind. It was introduced in 1725 by Anne Danican, called Philidor.

Conch, kŏnk, a name of certain large marine gastropods, especially of the king conch (*Strombus gigas*), abundant in the southern United States and parts of the West Indies. In Florida the shells are made into horns used for calling the farm hands, as is still done in the East Indies with shells of the genus *Triton.* This is one of the shells used for making cameos, and great quantities are collected in the Bahamas and shipped to Liverpool for this purpose to some extent, but more for conversion into buttons and similar small articles, in allusion to which industry the native whites of the Bahamas are called "Conchs." The name is also applied to two large sea-snails, the *Fulgur carica* and *Sycotypus canaliculata,* common on most parts of the Atlantic coast.

Concha, José Gutierrez de la, hō-sā' dā la kŏn'chä (MARQUES DE LA HABANA), Spanish general: b. Cordoba, Argentine, 4 June 1809; d. Madrid, Spain, 5 Nov. 1895. He went to Spain in childhood, entered the army, took part in the struggles in South America, and against Don Carlos, was appointed lieutenant-general in 1839, and officiated as captain-general of the Basque provinces 1843–6. He was captain-general of Cuba 1849–52, when he was replaced by Cañedo. Joining his brother in opposing the government, he was banished from Spain in 1854, and fled to France, where he was detained at Bordeaux. After the July revolution of 1854, he was re-appointed captain-general of Cuba, and, with the exception of a short suspension of his functions by Narvaez's administration in 1856, when Lersundi was appointed as his successor, he continued to hold office until December 1858, when he tendered his resignation. Returning to Spain he was at various times minister to France, president of the senate, and minister of war, and captain-general of Cuba again 1874–5.

Concha, Manuel (mä'noo-ĕl) **de la** (MARQUES DE DUERO), Spanish general and statesman: b. Cordoba, Argentina, 25 April 1808; d. Muro 28 June 1874. He was a brother of José de la Concha (q.v.), fought in early life against Napoleon and the revolted Spanish colonists in South America, and afterward against Don Carlos. In 1847, during the complications with Portugal, he was put in command of 6,000 men, and took possession of Oporto. Having issued at the end of 1853, in concert with O'Donnell and Bravo-Murillo, the famous protest against the policy pursued by the government, he was banished from Spain after the revolution of July 1854, and repaired to Paris; but was soon recalled to Madrid by the outbreak which terminated in the exile of Maria Christina, the downfall of Narvaez, and the restoration of Espartero. Concha was now made inspector-general of cavalry and marshal; but on 12 Oct. 1856, when Narvaez came again into power, he was compelled to relinquish these posts. He was killed in the battle of Muro while serving in the republican army against the Carlists.

Conchoid, kŏng'koid, a curve, shell-like in flexure (whence the name), invented by Nicomedes in the 2d century B.C., and used by him for finding two mean proportionals. If a straight line always passes through a fixed point O, and a point Q, fixed into the revolving line, always moves along the line A B, then any point P in the revolving line always at the same distance from O will trace out a conchoid. And, since the length Q P can in any position of the revolving line be measured either toward or from O, it is evident that, corresponding to any given length assigned to Q P, two conchoids can be described, one above and the other below the line A B. These are known as superior and inferior conchoids. Moreover, with a given point O, and a given straight line A B, any number of pairs of different conchoids can be described by varying the length QP. Moreover, the shapes



Conchoid.

of all such curves will vary according to the length of Q P. Thus, if Q P is less than the perpendicular from O on A B, the shape is as given in the adjoining figure, and this isolated point O is also a point on the curve.

Conchology, kŏng kŏl'ō jē, the science of shells. Two well-marked stages in its develop-

ment are traceable. At first shells were studied without any reference to the animals of which they constituted the hard framework or skeleton. Subsequently the study took a wider scope, and for the first time became worthy of being called a science, when the animals and their shells were viewed as parts of one common whole. When shells were looked upon as little more than ornamental objects, those who studied conchology were not generally of a high order of intellect; but since the rise of geology and the discovery that, of all fossils, shells are able to furnish the most definite information regarding the several strata, and consequently regarding the history of by-gone times, scientific minds of the very first class have given keen attention to shells. Some of these belonging to land animals, others to those inhabiting fresh water, and the great majority to those which are marine.

When shells, and they alone, were studied, conchology was a not unsuitable name, except that the termination -ology suggested that the investigation was more scientific than in most cases it really was. When the animals came to be carefully examined, M. de Blainville proposed for this deeper study the name malacozoology — that is, the study of the softer animals, mollusks; this has been since abbreviated into malacology. At the present time malacology is a highly developed branch of zoological science which treats of everything relating to the great phylum *Mollusca* (q.v.). Conchology is frequently used in the same sense, but cannot altogether escape the opprobrium which attaches to it as a mere collector's pastime. Consult Tryon and Pilsbry, 'Manual of Conchology.'

Conchos, kŏn'chōs, or **Conchas,** Mexico, a river in the state of Chihuahua; rises high up in the Sierra Madre, flows southeast, northeast, and then north through a beautiful country, comprising rich table-land, and empties into the Rio Grande near Presidio del Norte, after a course of about 350 miles. It is the largest tributary of the Rio Grande, and very little inferior in size to that river itself. Its principal branches are the Florido, Buenavista, San Pedro, Chihuahua, and Balleza, which, with their lesser tributaries, water more than one third of the state.

Conchyolin, kŏn-kī'ō-lĭn, an organic base allied to chitin (q.v.), which enters into the composition of the shells of mollusks. The conchyolin forms a thick cuticular layer of organic matter containing carbonate and a slight proportion of phosphate of lime. In dead shells the conchyolin soon disappears, leaving the shell much more brittle than when it was alive.

Conciergerie, La, lä kôṅ-sē-ėr-zhė-rē, a noted prison in Paris, which was a part of the Palais de Justice. Many royal prisoners were there confined, and during the Reign of Terror it was the scene of fearful butcheries, 328 prisoners being put to death in one week. Marie Antoinette went from her cell in this prison to her execution.

Concil'ium in Trullo, or **Concilium Quinisextum** (Council in Trullus, Fifty-Sixth Council), a council or synod of the Church convened in a hall (called the Trullus) of the imperial palace at Constantinople in the year 692. It was an assembly of eastern and western bishops called for the purpose of enacting canons of Church discipline: this the council did, both adding to the existing canons 102 new ones and confirming ancient canons that had fallen into desuetude. Its work was to supplement the decrees of the 5th and 6th councils of the Church: hence it is known as the Quinisext Council.

Conclave, both the apartment in which is conducted the election of a Pope and the college of cardinals assembled there. The procedure in electing popes is substantially the same to-day as it was in 1274 when it was prescribed by the Council of Lyons. When a Pope dies, a secretary of the college of cardinals summons all the cardinals to an election to be held on the 10th day after the demise. In whatever city the Pope dies, there the conclave must be held. The conclave apartment must be immediately prepared in such a place and manner as will insure safety of person and non-interference from outsiders. If the conclave is held in Rome, the great halls of one of the papal palaces is divided by wooden partitions into small rooms or cells, two or at most three cells for each cardinal and his personal attendants. The apartments all open on one corridor, and to that there is but one means of access from without, and that is strictly guarded. After the 10 days have elapsed, the cardinals all assemble in the Vatican church and assist at the Mass of the Holy Ghost, after which they form a procession and proceed to the conclave, each one taking the apartments assigned to him. The first day the conclave is open to the public, and numerous persons, high and low, avail themselves of the permission to enter. In the evening all outsiders leave, and the cardinals must remain until a Pope is chosen. A two thirds majority vote is requisite. Daily provision of food is brought in from outside, which is closely scrutinized lest any written communication should reach the cardinals: if no election is had after five days the food supply is restricted to bread, wine, and water, or rather used to be, for the rigor of the law is now much relaxed. A cardinal coming from a distance is admitted after closure. The election is made by scrutiny, that is, by ballot, or by compromise, that is, by a committee chosen by a majority of the conclave, or by acclamation. Sometimes a conclave has sat many weeks, or even months, before reaching an election: the conclave which elected Pius VII. (1799) sat during six months. The conclave in which Leo XIII. was elected Pope consisted of 62 cardinals, and it began its session the evening of 18 Feb. 1878. The scrutiny of the morning of the 20th showed that Cardinal Pecci was chosen. The election was then ended and he was made Pope by acclamation. The conclave at which Pius X. (q.v.) was elected began its session 31 July 1903, and the first ballot was cast the morning of 1 Aug. The scrutiny of the morning of 4 Aug., the seventh ballot, showed that Cardinal Sarto, patriarch of Venice, was elected. He chose the name of Pius X. This conclave was remarkable as being the only one of which a cardinal from the United States was a member.

Concone, Giuseppe, joo-sĕp'pĕ kōn-kō'nā, Italian teacher of vocal music: b. Turin 1810; d. there June 1861. From 1838–48 he was a teacher at Paris, and then became organist of the royal chapel at Turin. He wrote a large

number of vocal exercises which are still used in the teaching of music.

Concord, kŏng'kẽrd, Mass., a town in Middlesex County, on the Concord River and on the Boston & M. R.R., 20 miles northwest of Boston; settled in 1635. It is situated in a beautiful rural district, and has several manufacturing establishments. Here is located the Massachusetts Reformatory. The town has an excellent public library, a national bank, and an assessed property valuation of over $4,000,000. At the beginning of the Revolution the Americans had a large stock of arms and military stores at Concord. Gen. Gage, the British commander in Boston, hearing of this, sent a body of soldiers to destroy these stores, and on their way (19 April 1775) they fought the battle of Lexington, the first of the war. When they reached Concord, the same day, they destroyed what stores they could find, but were soon driven off by the Americans. Concord is celebrated as the home of many authors — of Ralph Waldo Emerson, Nathaniel Hawthorne, Henry David Thoreau, Amos Bronson Alcott, Louisa May Alcott, the poet William Ellery Channing, and others.

Concord, N. H., a city, capital of the State and county-seat of Merrimack County, on the Merrimack River, and on the Boston & M. R.R., 75 miles northwest of Boston. The city has an abundance of water-power, and manufactories of carriages, shoes, twine, electrical apparatus, silverware, leather goods, machine-shop products, etc. Near Concord are extensive quarries of a fine-grained white granite. There are three national banks with a combined capital of $500,000 and a surplus of $300,000, and several private banking houses. The assessed property valuation exceeds $20,000,000. The city is well laid out, has finely shaded streets, is well lighted, and its waterworks are excellently constructed. The noteworthy buildings include the State-house, a fine building of Concord granite, the city hall and courthouse, the State prison, State insane asylum, and the United States government buildings. The public schools are admirably organized and conducted, and represent a property valued at more than $325,000. This city is the seat of the well-known St. Paul's School (Episcopal) for boys. Concord was settled by whites in 1725, on the site of the Indian village of Pennacook. It was called by this name until 1733, then incorporated as the town of Rumford, and became a city in 1853. It is noted as the place near where Hannah Dustin (q.v.) made her escape from Indian captors. Pop. (1900) 19,632.

Concord, N. C., a city and county-seat of Cabarrus County, on the Southern R.R. Here are large industrial interests, and among the principal manufactures are those of cotton goods, foundry and machine-shop products, etc. There are also roller mills, a cannon manufactory, and brick works. Concord is an old place to which in recent years new industries have brought rapid growth. Pop. (1890) 4,339; (1903) about 9,000.

Concord, kŏng'kôrd, an expression used in music denoting the combination of two or more sounds pleasing to the ear, and requiring no further combination before or after it to make it so. Concords are the eighth (or octave), the fifth, third, and sixth. Their ratios are 2:1, 3:2, 5:4, 5:3. The two first are called perfect, because as concords they are not liable to any alteration by sharps or flats. The two last are called imperfect, as being alterable. The fourth is considered as a discord by some authorities; as a component part of an inversion of the perfect chord it may be classed among the concords. See COUNTERPOINT.

Concord, Book of (*Liber Cŏncordia*), the name given to a collection of confessions of faith which are generally accepted by the Lutheran Church. The Formula of Concord (1580) was the result of a series of conferences and discussions upon the following subjects: The Rule of Faith and the Creed; Original Sin; Free Will; Justification; Good Works; The Law and the Gospel; The Third Use of the Law; The Lord's Supper; The Person of Christ; The Descent of Christ into Hell; The Customs of the Church; Predestination and Election; Heresies and Sectaries. The whole received the sanction of a large number of the Germans. Other subjects treated in the Book of Concord are: The Three Ecumenical Creeds — Apostles, Nicene, and Athanasian; The Six Particular Confessions of the Lutheran Church — Augsburg, Apology of the Augsburg, Schmalkald Articles, Catechisms of Luther (larger and smaller).

Concor'dance, a book in which the more important words of a volume or collection of writings are arranged alphabetically, part of a passage being extracted with each and the place of its use specifically given. The first known concordance of the Bible in any language was that of St. Anthony of Padua, who was born in 1195, and died in 1231. His work was called 'Concordantiæ Morales,' and was of the Latin Vulgate. It formed the basis of a more elaborate concordance, also of the Vulgate, that of Hugo de Santo Caro, better known as Cardinal Hugo. This was published in 1244 A.D. The first Hebrew concordance was that of Rabbi Mordecai Nathan, begun in 1438 and finished in 1448. The first Greek concordance to the New Testament was that of of Xystus Betuleius, whose real name was Birck; it came forth in 1546 A.D. The first English concordance to the New Testament was that of Thomas Gybson, before 1540 A.D.; the first to the whole English version of the Bible that of Marbeck, 1550 A.D. These, of course, preceded the appearance in 1611 A.D. of the authorized version of the Bible. The elaborate and well-known work of Cruden appeared first in 1737.

The first known concordance to Shakespeare was that of Ayscough, in 1790. Mrs. Mary Cowden Clarke's elaborate and most useful work was first published in London in 1845, and in 1894 appeared a still more excellent one, that of John Bartlett, published in New York. A concordance to Milton was published in Madras in 1856 and 1857, and one to Tennyson in London in 1870.

Concordat, kŏn-kôr'dăt (*concordatum,* or, plur., *concordata*), a compact or convention entered into by the Holy See and a secular government to determine their respective powers and rights in the regulation of ecclesiastical affairs within the jurisdiction of the state which is a party to the compact. The earliest example of such compacts is the convention between Calix-

tus II. and the Emperor Henry V., concluded at Worms in 1122: it marked the end of the great dispute about investitures. In 1448 was concluded the so-called concordat with the German nation, or with the Emperor Frederic III., under which the patronage of ecclesiastical dignities in the empire was divided between the imperial crown and the holy see. Memorable is the concordat of 1515 between Leo X. and Francis I.; the king agreed to annul the pragmatic sanction of Charles VII., which restricted the right of appeal to Rome; and in return the Pope conceded to the king the right of nomination to all Church benefices within the realm, with a reservation of the *annates* to the holy see, and with the proviso that the nominees should be acceptable to the Pope. Another celebrated corcordat is that concluded 15 July 1801 between Pius VII. and Napoleon as first consul: it recognizes the legal existence of the Catholic Church in France which had been annulled by the revolution. The ecclesiastical topography of France was altered, the number of episcopal sees being reduced from more than 100 to 80. The confiscation of ecclesiastical property by the republican government was to pass for *fait accompli* and *res judicata* and the Pope and his successors were not to move to disturb purchasers or grantees of such properties. The government was to have the right of nomination of bishops, but the Pope that of canonical institution. Provision was to be made by the state for the support of bishops and clergy in lieu of their property, which had been appropriated by the Revolutionary Government. Ever since the concordat was concluded there has been in France an agitation for its abrogation, and this agitation was never more insistent than in 1903.

Concor'dia, or **Concord,** personified and worshipped as a goddess in Rome, where she had several temples, the most important of which was that in the capital, erected by Camillus. An annual feast was celebrated in her honor 16 January. She was represented with wreaths of flowers on her head, and in one hand a cornucopia, in the other an olive branch or a *patera.*

Concor'dia, Kans., a city and county-seat of Cloud County, situated on the Republican River and on the Atchison, T. & St. F.; the Missouri Pac.; and the Union Pac. R.R.'s, 110 miles northwest of Topeka. It has good water power and shows considerable manufacturing activity. There are iron-works and flour-mills and factories for making plows, wagons and cigars. Nazareth Academy is located here, and there is a United States land office. Pop. (1900) 3,400.

Concordia, kōn-kôr-dē'ä, Argentine Republic, a town of the state of Entre Rios, on the Uruguay, 302 miles north of Buenos Ayres by river. It has a custom-house and a river trade exceeded only by that of Buenos Ayres and Rosario, exporting salted meat and Paraguay tea. It has railway connection with Paraná, Uruguay, and South Brazil. Pop. about 13,000.

Concor'dia College, an educational institution in Fort Wayne, Ind., organized in 1839 under the auspices of the Lutheran Church; reported at the end of 1899: Professors and instructors, 8; students, 169; volumes in the library, 4,310; grounds and buildings valued at $100,000; income, $12,400; number of graduates, 754; president, Joseph Schmidt, A.M.

Concrete (Lat. "to grow together"), an artificial stone, a composition of hydraulic cement, sand and broken stone, used for foundations, especially submarine, and now more and more in place of building stone even when exposed to the air. In place of hydraulic cement pure lime was originally used and the name concrete applied only to this compound, "beton" being the proper term for the composition based on hydraulic cement until it became the only method. The mixture of sand and cement is termed the matrix, and the broken stone or other addition is styled aggregate and is composed of slag, coke, broken bricks, gravel or pebbles. The ideal aggregate is broken, sharply angular and irregular stone, as this material mixes better with the matrix than rounded pebbles, minute particles of gravel, or the more spongy brick, shell or coke, although broken stone or gravel may be used advantageously in connection with pebbles, even in such small proportion as 3 to 5. Broken limestone is considered especially efficacious as an aggregate, possibly because of an affinity between the molecules of carbonate of lime in it and the matrix. The proportions of the various parts approximate 1 part of cement, 1 to 3 parts of sand, and 4 to 6 parts of aggregate, but no fixed norm is to be followed the true rule being that the cement paste is to be thoroughly incorporated with sand coating each particle and that the matrix thus formed shall fill all interstices in the aggregate. In the process of mixture there are two extreme methods of watering, one very wet and the other scarcely more than moist. The spraying is followed by a mixture by shovel or by mixing machines. These machines are of two types: continuous, a trough or cylinder with a revolving screw shaft which works until the mixture is complete; and intermittent, a box being rotated slowly. The concrete is most commonly made into blocks, one layer of comparatively small depth being made at a time. By the newer method it is applied to its place on the building or foundation in the soft state and allowed to harden there. For submarine construction the concrete is usually sent under water in bags, which break because of pressure, or in closed chutes. While concrete is a comparatively modern invention, it was employed in ancient times, and in some of the most renowned works of history. The factitious stones employed by the Babylonians and the early Egyptians, as well as among the Greeks and Romans, and at the present day in Barbary and among the nations of Malabar, were all a species of beton. Pliny mentions that the columns which adorn the peristyle of the Egyptian labyrinth were of this material, and the great length of time it has existed (over 3,600 years) shows the durability of this mode of construction. In Rome the pyramid of Ninus is formed of a single block, as was also the square stone that formed the tomb of Porsena, which was 30 feet wide by 5 feet high. The Romans made free use of this material in constructing their walls, aqueducts, piers, and roads, many portions of which exist at the present day. The mole which shelters the harbor of Algiers is so much exposed to the effect of winds that breaches were continually being made in it by the force of the sea, and to such an extent that in former times the Moors were compelled to employ a large number of workmen constantly repairing it, at an annual

expenditure of over $60,000. When the French commenced the reconstruction of the mole in 1833, after the failure of partial repairs, the first operation was to raise an outer embankment of large stones, under whose cover the foundation might be properly restored, it being intended to form this embankment of *pierre perdue*, that is, of stones thrown in at random, and allowed to arrange themselves to the necessary slope for equilibrium by the action of the sea. But during the first ensuing winter the embankment was completely destroyed by the action of the waves, one block of 141 cubic feet having been carried completely across the mouth of the harbor. This rendered it necessary to rebuild the entire embankment of blocks so large that no action of the sea could move them; this was of course possible, since the action is proportioned to the surface struck, while the resistance of the block increases as its mass, and there must necessarily be a point where the latter predominates; this was found on trial to be about 353 feet. The expense of quarrying and transporting such enormous blocks of stone, led to the employment of artificial stone or beton. Two kinds of blocks were manufactured: the first in the water, in the place they were intended to occupy, and the second on shore, to be afterward thrown into the sea. In the process of reconstruction, these blocks were used as follows: Those of the first kind, made in lined caissons, formed an outer sea line; on these blocks molds were placed filled with beton, and after these second blocks had set, they were launched into the sea, forming a line in front of the first; the intervening space was then filled up with blocks of natural stone. Behind this embankment thus formed, the ground was dredged to a depth of over six feet, and the whole of this space filled up with a continuous mass of beton. The entire work was performed in five years, at a cost of less than $420,000, notwithstanding that the mole, at the time of the occupation of Algiers by the French army in 1830, was in a state of complete dilapidation, in spite of the extensive repairs which had been annually executed upon it by the Moors during a period of two centuries. Marine works of the above character present numerous advantages over constructions in which natural stone is employed, of which the following are some of the most prominent: (1) immediate stability, while ordinary pierre perdue is never secure; (2) incomparably greater facility in transportation, which is always expensive and troublesome when blocks of stone are to be quarried exceeding 100 cubic feet; (3) a considerable reduction in the sectional area of the pier, and consequent economy of cost; and (4) that the system can be applied in every locality, now that our advanced knowledge of the subject of hydraulic mortars enables us to manufacture beton in any place where it may be needed. On the use of concrete in modern building consult I. O. Baker, 'Treatise on Masonry Construction' (1900).

Concrete Construction. The use of concrete for purposes of construction, while not entirely a new idea, has within the last few years received an enormous impetus, and its use for all kinds of engineering construction has been thoroughly tested by American engineers. As a substitute for stone, steel, hollow tile, etc., its service has been demonstrated by a constantly increasing use. Concrete may be defined as an artificial stone. It can be used for all structural purposes as a substitute for stone and in addition it has a wide variety of applications where the use of stone is impracticable.

Composition.— Concrete is composed of broken stone or gravel, sand and cement with the addition of water sufficient, after allowing for evaporating and absorption, to unite chemically with the cement. A typical concrete is made as follows: To one barrel of a standard Portland cement is added three barrels of clean sharp sand. The two are intimately mixed — either manually or by a mechanical mixer — and then enough water is added to bring the mixture to a certain consistency, the proper amount of water being readily judged by one experienced in this work. Five barrels of broken stone are then added, the whole thoroughly intermixed and the concrete thus formed is ready to be conveyed to the forms or the excavations prepared for it. Concrete made in the above proportions would be known as a 1:3:5 mixture. The permissible proportions, however, vary widely from 1:2:4 to 1:5:10 according to the nature of the ingredients and the service for which it is intended. In general, the concrete with the smaller proportion of cement will not sustain the same strains as the concretes wherein the proportions are about as indicated in our typical mixture.

The composition of a properly proportioned concrete may be thus considered; sand fills up the interstices between the pieces of rock, and the cement, in turn, fills up the interstices between the particles of sand and between the sand and the rock. As 90 per cent of a standard cement will pass through a sieve of 10,000 meshes to the square inch, it is evident that the cement will effectually fill up all the voids. But the cement also performs an even more important function. It enters into chemical combination with the water used in mixing and acts as a binder, tenaciously holding the whole mass together. As soon as the cement is mixed with water this chemical change commences, or the concrete begins to "set" as it is generally expressed. Therefore the concrete must be put in place immediately after mixing. At the end of about three or four days, the concrete is solid enough for the supporting forms to be removed and after possibly thirty days it is ready for the loads for which it is designed. The hardening continues for months and the concrete becomes stronger as time elapses.

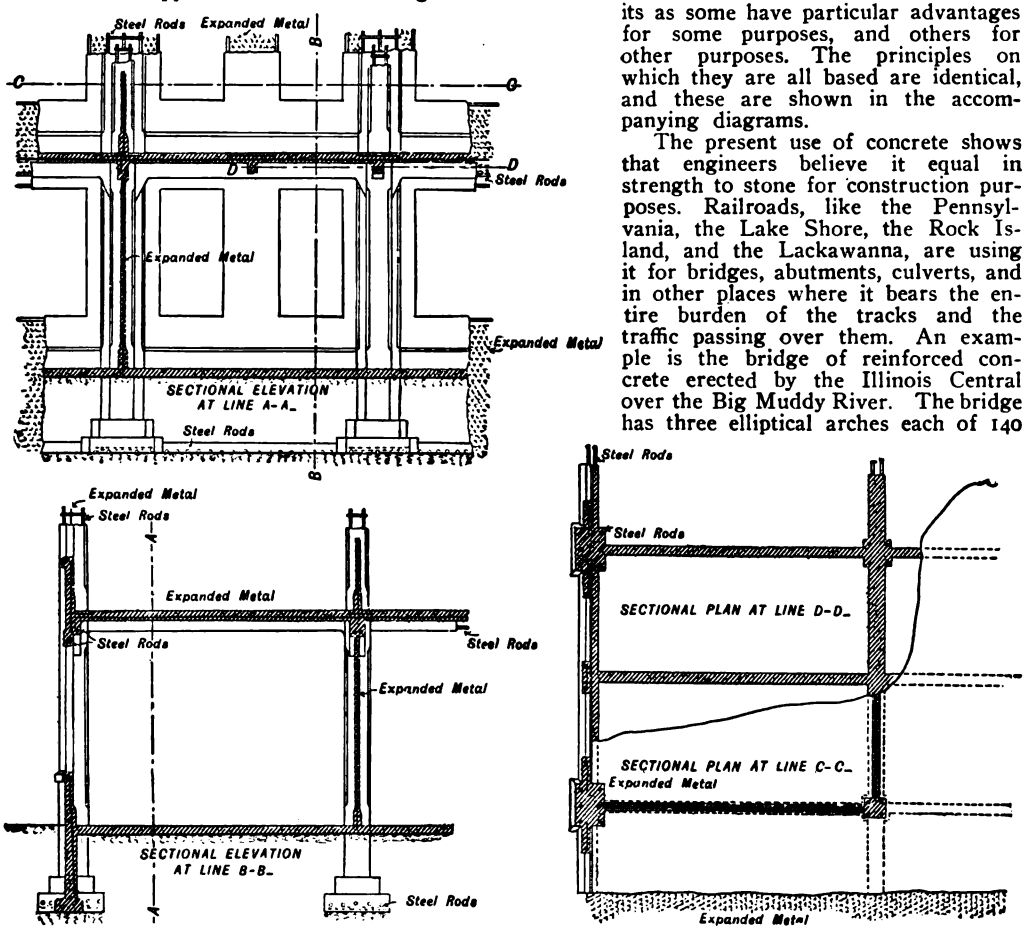
Merits and Advantages.— Concrete as a material for construction has been known for centuries. Some of the most enduring monuments of antiquity are constructed either wholly or in part of this material. The dome of the Pantheon, erected at the beginning of the Christian era, is built of concrete, as are some of the other historic structures of that period. Concrete has ever since been used to a greater or less extent. With the discovery and application of the methods of making Portland cement, which we may ascribe to the period 1820–50, concrete assumed its place as one of the principal materials of engineering and we may say that each year has shown an increase in the amount of concrete construction with a constant widening of the field of its application. Concrete reinforced with steel, has been successfully used in office buildings, apartment houses, theatres, schools, court-houses, public libraries, factories,

mills, warehouses, foundries, grain elevators, stables, cisterns, bins, stand-pipes, bridges, culverts, abutments, sea-walls, breakwaters, jetties, piers, reservoirs, tanks, dams, aqueducts, sewers, subways, dust-chambers, and chimneys, besides a great number of minor uses in buildings constructed primarily of other material.

The fact that concrete can be molded into any form desired is a most valuable quality and one which is largely availed of in practice. Aside from such uses as being simply deposited for foundations, abutments, etc., it is molded into shapes as intricate as may be desired, one of the recent applications which is being extensively developed at the present time being the use of concrete for making hollow blocks for building purposes. The facility with which it can be molded for producing decorative effects, is, of course, well known. Another highly important advantage resulting from the plasticity of the newly-mixed concrete is that other materials, such as iron, may be imbedded in it.

The strength and durability of all concrete depend, of course, upon the quality of the ingredients and the care exercised in mixing and handling. When the work is done under experienced supervision, however, the characteristics of the resulting concrete can be accurately predicted. Concrete will withstand enormous compression strains. When heavy strains other than those of compression are to be provided for, the concrete is so strengthened with steel that the metal takes the tensile and shearing strains, and the concrete the compression strains. This construction, known as armored or reinforced concrete, is rendered entirely feasible by the facts that concrete has considerable adhesion for iron and steel, and the co-efficients of expansion (by heat) of the two materials are practically identical. There are a number of "systems" of reinforcing concrete with steel. We need not here discuss their relative merits as some have particular advantages for some purposes, and others for other purposes. The principles on which they are all based are identical, and these are shown in the accompanying diagrams.

The present use of concrete shows that engineers believe it equal in strength to stone for construction purposes. Railroads, like the Pennsylvania, the Lake Shore, the Rock Island, and the Lackawanna, are using it for bridges, abutments, culverts, and in other places where it bears the entire burden of the tracks and the traffic passing over them. An example is the bridge of reinforced concrete erected by the Illinois Central over the Big Muddy River. The bridge has three elliptical arches each of 140 feet clear span. It was erected at less cost than a bridge of structural steel, it is more enduring and is decidedly more pleasing to the eye. A typical bridge of concrete alone, built on the straight masonry principle, is that of the Pennsylvania Railroad over the Susquehanna River, near Harrisburg, Pa. This structure is faced with a thin veneer of natural stone, which is not, however, an essential part of the structure. The United States government is using concrete in enormous quantities for all sorts of purposes. In the reconstruction of the fortifications around New York harbor during the last few years, concrete has been used to the practical exclusion



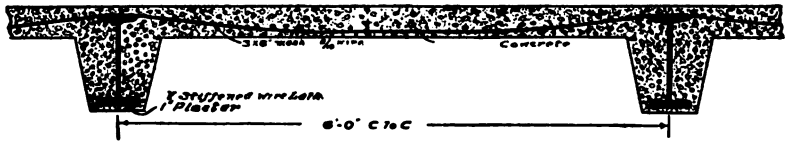
Reinforced Concrete Building Sections Showing Column, Pilaster, Floor Beam, Girder, Footing, Curtain Wall and Partition Construction.

of all other materials. In other words, the 13-inch guns which guard the City of Steel-frame Skyscrapers are mounted on concrete foundations and are protected from hostile projectiles by the same material. The Ingalls Building, Cincinnati, Ohio, 16 stories high, is made entirely of reinforced concrete. The plans for this building were approved by the city authorities only after a great number of tests had been made which proved beyond the possibility of doubt that the building would be absolutely safe. Concrete enthusiasts predict that this building will be standing long after the steel skeleton structures in the neighborhood have disintegrated. The deterioration of steel when protected by nothing more than terra-cotta slabs, noted in a number of cases, tends to lend strength to this view. In fact, superior durability is one of the best-substantiated claims for concrete buildings. It has long been recognized that concrete becomes stronger with age, and the same is not true of any other material. Engineers are divided in their estimates as to how long a steel-framed structure will endure.

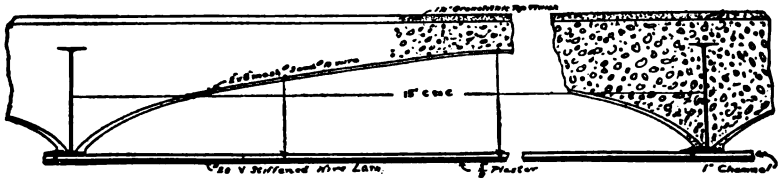
In reinforced concrete construction the steel is completely imbedded in the concrete which absolutely protects it from fire as indeed it does from rust and all other corrosive action. It has been demonstrated in several instances that cast-iron piping which has been covered with a coat of liquid neat cement and buried underground for from 10 to 15 years, showed no signs of rust or other external deterioration. A lining of «rich» concrete has been found to be the only material which will withstand the corrosive action of the acids in the large storage tanks or vats at pulp mills.

As regards the all-essential quality of ability to resist fire, concrete is absolutely and unqualifiedly superior to all other building materials. This has been shown many times in tests conducted by the building and fire departments of various large cities in this country and abroad. The usual way of conducting such tests is to build a small structure of concrete and to maintain therein a fire of a temperature of about 1,700° F. for a number of hours. A stream of water is then turned on the fire and concrete and results are carefully noted. In general, a few hair-like cracks in the concrete is the only effect noticeable, the strength of the material being unimpaired. In the great Baltimore conflagration every known type of construction was subjected to the flames. After the fire, engineers came from all over the country to observe what type of construction had best withstood the fire. The opinion of these experts was strikingly unanimous and decisive to the effect that concrete has stood up better than the steel frames with terra-cotta protection and, of course, better than brick and stone. Prof. Norton of the Massachusetts Institute of Technology re-

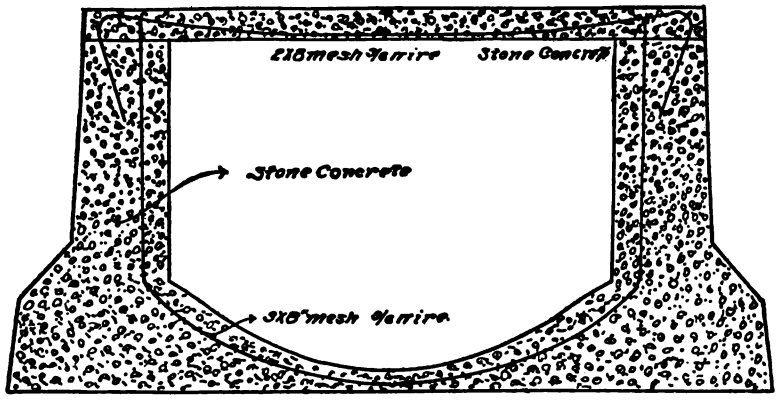
EXAMPLES OF REINFORCEMENT WITH ELECTRICALLY WELDED WIRE FABRIC.



Floor construction with I-beams.



Floor construction, with ceiling clipped to I-beams.

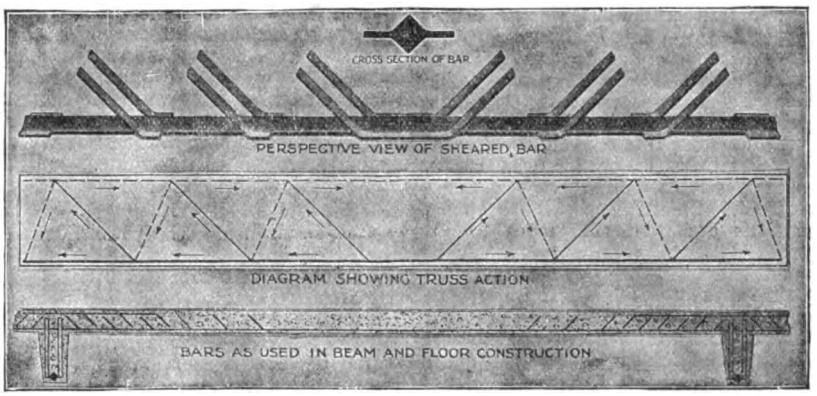


Method of reinforcing water-mains, sewers, etc.

flected the general expert opinion in his report to the 'Boston Transcript': «Stone, whether granite, marble, sandstone or limestone fared badly. Where floor arches and steel coverings were of concrete they stood the test much better than terra cotta. This was due probably to the fact that concrete and steel expand at the same rate while terra cotta expands 2½ times as fast as steel and so the partitions or floor arches buckle or break. In general, the unfitness of terra cotta for beam and post covering and floor construction in comparison with concrete was demonstrated.»

Cost.— It might be expected that a material with so many desirable qualities would be more expensive than the materials which it is displacing. The contrary is the case. Concrete is cheaper than stone, or steel frame and terra cotta. It can be manipulated by unskilled labor to a greater extent than any other material. There are many localities in the country where no stone suitable for building purposes exists, but where there is much stone admirably adapted for being crushed and used for concrete. In short, the raw materials for concrete can be laid down at almost any point in this country cheaper than any other material and the cost of putting it in place is less. It will therefore be seen that the strength and durability of concrete, the ease with which it may be reinforced with steel to form a combination of universal applicability, its fire-resisting and time-defying qualities and its low first cost, stamp it as the great construction material of the future.

R. H. JOHNSTON,
Of Engineering Company of America, New York.



The trussed steel bar for concrete reinforcement.

Concretionary Structure. Among the strata of rocks formed by deposition of sediment it is a common thing to find lumps of material differing more or less in chemical composition from the strata in which they lie, and, though separated from each other by short intervals, still arranged in layers conforming to the general stratification. The balls of argillaceous iron ore found in the shales of the coal formation are examples of these concretions. They have no regular form, but are generally flattened spheroidal masses, and are commonly called «kidney-shaped.» In the clay beds of the Tertiary group, in various parts of the country, are found curious collections of clay concretions, harder and more compact than the rest of the clay, and presenting forms in imitation of nuts, fruits, and different organic substances. The resemblance is so striking that common observers are satisfied that they see actual relics and petrifactions instead of mere aggregations of inorganic matter. Through each one of these clay concretions a hole may be traced, which was at some time filled with a rootlet, the carbonaceous residue of which, if not the form of the root itself, may be observed. This appears to have been a nucleus around which the material collected, following the law of attraction by which neighboring particles of the same composition seek out and join with each other when in a medium that admits of their movement. In argillaceous deposits, even among the older stratified rocks, the same tendency appears to have obtained after the deposition of their materials. The calcareous portions separated from the shaly or sandy strata, and arranged themselves in these concretionary layers. But if the quantity of calcareous matter was sufficient to form a stratum of itself, this force appears not to have been exerted to produce the spheroidal masses; except occasionally the rock is said to have a concretionary structure when it displays a tendency to form here and there along its course bunches or knots, as if these parts had curled and rolled over, presenting very much such an appearance as is observed in very gnarled and knotty wood. In the shales of the Lower Secondary in New York State, particularly in those of the Hamilton and Portage groups, numerous dark-colored calcareous concretions are found of extraordinary size and forms. They abound along the shore of Lake Erie, washed out of the banks by the action of the waves. Very often they are formed about some nucleus of entirely different substance from their own as a fossil shell or a nodule of iron pyrites; and the fossil shell not infrequently has first served as a nucleus for an incrustation of pyrites, by which it was completely buried before both were concealed within the large concretionary mass. After the forming and hardening of the concretions, they appear to have cracked by shrinkage, the cracks sometimes radiating from the centre or taking other irregular directions. The cracks afterward became filled with light-colored clay or calcareous matter, and now appear like mineral veins. As the shape of these bodies often

approaches that of the large sea turtles, and the seams resemble the divisional lines of the plates of the shell, they are very naturally supposed by most people who meet with them to be the petrified remains of this animal; and looking at those specimens deposited in the State collection at Albany, one may well suppose that this common belief will not soon be corrected. At Erie and other places in this part of Pennsylvania, concretions in a light-blue limestone are found, which consist of a number of cones closely arranged side by side, and forming a thin layer not more than two inches thick, of which the flat base of the cones constitutes one side, and their points reach nearly through to the other. Little is known of the laws that have caused these matters thus to assume at different localities similar, and, as they appear, fantastic forms. Extraordinary clay concretions from the banks of the Park River in Hartford, Conn., are to be found in many museums.

Concretions, Morbid, in animal economy, hard substances that occasionally make their appearance in different parts of the body, as well in the solids as in those cavities destined to contain fluids; in the former case they are denominated concretions or ossifications; in the latter, calculi. The concretions are named from the parts of the body in which they occur. Pineal concretions, from their being found in that part of the brain called the pineal gland, consist of carbonate and phosphate of calcium with organic matter; salivary concretions, as being discovered occasionally in the salivary glands, also consist mainly of earthy phosphates; pancreatic concretions are hard substances found in the pancreas; pulmonary concretions, which have been sometimes coughed up by consumptive persons, contain mucus and albumen in addition to the salts; hepatic concretions, of which the liver is sometimes full, are composed chiefly of cholesterin, mucus, and coloring matter; urinary concretions are found in the bladder, and their constituents are very variable, uric acid, urates, fibrin, oxalates, phosphates, and several other bodies being found. Gouty concretions consist of urate of sodium and small quantities of other salts with organic matter. Concretions have been discovered in the intestines and stomach of man, but more frequently in the bodies of other animals. Those found in the intestines of a horse were examined by Fourcroy, and found to consist of magnesia, phosphoric acid, ammonia, water, and animal matter. See CALCULUS.

Concu'binage, the cohabitation of a man with a concubine. Among the Greeks concubinage was allowed even to married men: the number of their concubines, also, was unlimited. Among the Romans concubinage was neither unlawful nor disgraceful. It was moreover, formally permitted to unmarried men by the Lex Julia, and by the Lex Papia Poppæa, but with the provision that it should be limited to a single concubine, and that only women of mean descent, as freed women, actresses, and the like, should be chosen for the purpose. The children begotten in concubinage were not considered as legitimate, but were called natural, and the right of inheritance of the concubine and her children was very much limited. With the introduction of Christianity concubinage ceased; and, indeed, Constantine the Great made laws intended to put a stop to it. Concubinage also signifies a marriage with a woman of inferior condition, to whom the husband does not convey his rank. By French law the presence of a concubine in the house entitles the wife to a divorce. The term is used in a more general sense to mean the cohabiting of a man and woman who are not legally married.

Concurrent Jurisdiction, the jurisdiction of different courts authorized to take cognizance of the same case. In criminal cases the court which first takes up a case has what is called the right of prevention, that is, the right of deciding upon that case exclusive of the other courts, which but for that right would have been equally entitled to take cognizance of it. In civil cases it lies with the suitor to bring his cause before any court he pleases, which is competent to take it up. Concurrent, also called cumulative, jurisdiction is opposed to privative jurisdiction.

Concussion of the Brain, a term applied to certain injuries of the brain resulting from blows and falls, though unattended with fracture of the skull. Stupor or insensibility, sickness, impeded respiration, and irregular pulse are the first symptoms, and though these may subside there is always for a time more or less risk of serious inflammation of the brain setting in. The patient should be put to bed at once with the head low, and kept warm; but stimulants should, except in special cases, be withheld. All excitement should be avoided, and for some time after apparent recovery great care is necessary.

Condé, kôn-dā, the name of a French family, the younger branch of the Bourbons, who took their name from the town of Condé, department of Nord. One Godfrey de Condé, about 1200, was in possession of a part of the barony of Condé. His great-granddaughter, Jeanne de Condé, married in 1335, Jacques de Bourbon, Comte de la Marche, and the barony of Condé went to their second son, Louis de Bourbon, Comte de Vendôme, whose great-grandson, Louis de Bourbon, Prince of Condé, in virtue of his blood-relationship to the royal family, assumed the title of Prince, and is regarded as the founder of the new house of this name.

Condé, Henri (ŏn-rē) **II. de Bourbon,** PRINCE DE: b. 1588; d. 1646. At the request of Henry IV. he became a Catholic. In 1616 he was sent to the Bastile, where he remained for three years. After the death of Louis XIII. the prince was liberated, and was made minister of state to the regent.

Condé, Louis (loo-ē) **I. de Bourbon,** boor bôn, PRINCE DE, French general: b. Vendôme 7 May 1530; d. 15 May 1569. He married the grandniece of the Constable de Montmorenci. He served his early campaigns in Piedmont, but first distinguished himself at the defense of Metz, besieged by Charles V. in 1552. Affronted at court, and hated by the Guises, he joined his brother, the king of Navarre, at Nérac, and became a Protestant. In 1560 he was arrested and sentenced to death, but was discharged after the death of Francis I. He soon after appeared as head of the Protestants, and was defeated and captured at the battle of Dreux. In 1567 he fought the battle of St. Denis without decisive result. Two years later the Protestants were defeated, and Condé was slain at Jarnac.

Condé, Louis II. de Bourbon, PRINCE OF, French general: b. Paris 8 Sept. 1621; d. near Fontainebleau 11 Dec. 1686. He was the son of Henri II., Prince de Condé (q.v.) and during the life of his father bore the title of Duc d'Enghien. He immortalized this name at the battle of Rocroi, in which, at the age of 22, he defeated the Spaniards (1643). Wherever he appeared he was victorious. He besieged Dunkirk in sight of the Spanish army, and gained this place for France in 1646. During the troubles of the Fronde he at first took the side of the court against the parliament and the nobles, and after a siege of a few months brought back the young Louis XIV. to Paris (1649); but believing himself ill requited by Mazarin for his services he put himself at the head of the faction of the *Petits Maîtres.* Being captured, however, he was imprisoned by Mazarin (1650), and was not released till after the lapse of a year. He at once put himself at the head of a new Fronde, and entered upon negotiations with Spain. In spite of several checks he then marched upon Paris, where he was met and opposed in the suburb St. Antoine (1652). The battle which ensued was indecisive; and Condé, finding himself abandoned by many of his friends, retired to the Netherlands, and joined the Spaniards, who appointed him generalissimo of the Spanish armies. In 1658 he was defeated before Dunkirk, by Turenne, and was only restored to royal favor by the Peace of the Pyrenees in 1659. In 1668 he was charged with the reduction of Franche Comté (then belonging to Spain), which he accomplished in three weeks; and in 1674, at the head of an army sent by Louis XIV. against the United Provinces, defeated the Prince of Orange (afterward William III. of England) at Senef. He was unable, however, to take advantage of this victory, as he was obliged to withdraw into Alsace to defend it against Montecuculi, to whom it was thrown open by the death of Turenne in 1675. He succeeded in driving Montecuculi across the Rhine. This was his last triumph. Four years later he retired to Chantilly, near Paris, where he devoted himself to the sciences.

Condé, Louis Joseph (loo-ē zhō zĕf) **de Bourbon,** PRINCE OF: b. Chantilly 9 Aug. 1736; d. Paris 13 May 1818. In the Seven Years' war he distinguished himself by his courage and skill, and afterward formed in 1792, at Worms, a little corps of emigrant nobility, which joined the Austrian army under Wurmser. In 1795 he entered with his corps into the English service. In 1797 he entered the Russian service, but in 1800, after the separation of Russia from the coalition, reentered the English service. The campaign of 1800 ended the military career of the prince. He returned to Paris in 1814; where, being appointed president of a bureau of the chamber of peers, he remained some time, but at last retired to Chantilly. He published: 'Essai sur la Vie du Grand Condé, par L. J. de Bourbon, son 4me Descendant' (1806).

Condé, or **Condé-sur-l'Escaut,** France, a town in the department of Nord, seven miles northeast of Valenciennes, at the junction of the Hayne and Schelde rivers. It is well built, and has a superb arsenal. The fortifications were constructed by Vauban. It has manufactories of starch and chicory, oil and salt refineries, nail and ropes, etc. Pop. 3,000.

Condé - sur - Noireau, kôṅ-dā-sür-nwä-rō, France, town in the department of Calvados, at the junction of the Noireau and Drouance rivers. It is supposed to be of Roman origin, and has two ancient churches, Saint Sauveur and Saint Mark. Dumont d'Urville, the navigator, was born there 23 May 1790. Cutlery and leather are manufactured, and the local trade is chiefly in the products raised on the surrounding farms. Pop. 6,483.

Condell, kŭn'dĕl, **Henry,** English actor: d. Fulham, England, December 1627. With John Heming (q.v.) he edited the famous first edition of Shakespeare's plays, 1623. He belonged, as did Shakespeare, to the lord chamberlain's company of players and is named in Shakespeare's will.

Condensa'tion, the reduction of anything to another and denser form, as of a vapor or gas to a liquid, or a liquid to a solid; the passage of gases or vapors from the aëriform to the liquid state. It is sometimes called also the liquefaction of vapors. It may be due to one of three causes: cooling, compression, or chemical affinity. Before the first or second of these causes can operate, the vapor must be saturated. Various salts also condense vapors by means of chemical affinity. When vapors are condensed their latent heat becomes free. The condensation of liquids is the reduction of a liquid to smaller bulk, with a proportionate increase in the specific gravity.

Condensed Milk, milk reduced greatly in bulk and rendered proportionately denser. Gail Borden in 1849 invented a process for the condensation of milk, which has since been carried out extensively in the United States and Europe.

Conden'ser, one who or the thing which condenses. Some of the methods in general use are:

Steam-engine.— An apparatus for reducing to a liquid form the steam in front of the piston, so as to obtain a partial vacuum at that point, and thus utilize the natural pressure of the atmosphere. Watt invented the injection condenser and the separate condenser. The surface condenser has a series of flat chambers or tubes, usually the latter, in which the steam is cooled by a body of water surrounding the tubes. Distilled water for ships' use is obtained by the condensation of steam in a surface condenser.

Distilling.— The still-condenser is an apparatus generally made of the worm-tube form; the coil containing the alcoholic vapor traversing a tub which receives a constant accession of cold water, condensing the vapor in the coil. The liquid escapes at a cock valve below.

Metal.— An apartment in which metallic or deleterious gaseous fumes are condensed to prevent their escape into, and contamination of, the atmosphere. The device consists of a prolonged duct for the fumes, with showers of water to condense the arsenical, sulphurous, and other fugitive volatile matters. It also serves an economical purpose in saving fugitive fumes of lead, zinc, mercury, sulphur, antimony, etc.

Electricity.— (1) An instrument for concentrating electricity by the effect of induction. It usually consists of a confolded sheet of tin-foil, whose layers are separated by a thin sheet having a non-conducting surface. (2) With induction apparatus, a device for absorption or sup-

pression of the extra current induced by the rapid breaks in the main current. (3) An instrument in which an electric spark passes between the poles in a closed glass cylinder, so as to be employed in burning metals in an atmosphere of any given tenuity or specific chemical character, to obtain the spectra of metals or gases free from accidental characteristics of the general atmosphere for the time being.

Condensing and Non-condensing Engines. Steam-engines are classified according to the method in which they use steam. In the non-condensing engine, the steam, after having performed its work in the cylinder, is exhausted into the atmosphere at a pressure equal to that of the atmosphere (14.7 pounds on each square inch of surface at the level of the sea), thereby giving a back pressure equal to that amount which the steam actuating the piston has to work against, or overcome constantly. It is entirely possible, however, to so arrange a method of using the steam that, after having performed its work in the cylinder instead of being exhausted into the atmosphere at a pressure of 14.7 pounds, it shall be exhausted into a reservoir within which a vacuum is constantly maintained, and thus conserve the energy lost in overcoming the back pressure in the cylinder. The most convenient method of securing a vacuum is by condensing the steam which fills a given volume or reservoir back to the form of water, and engines operating on this principle of exhausting into a vacuum are classified as condensing engines. The physical principle on which a partial vacuum is caused by the condensation of steam is, that one cubic inch of water forms 1,700 cubic inches of steam at a pressure of one atmosphere. Therefore, if that volume of steam is condensed back to water, the reduction of volume is in the same proportion less only the volume occupied by the tenuous vapor given off even by cool water in a vacuum. To maintain a vacuum thus obtained, it is only necessary to provide suitable apparatus to draw off the water as it is being created by the condensation of the steam. The earliest steam-engines were all of the condensing type. Steam at pressures slightly above that of the atmosphere was admitted to the cylinder for the working stroke, and the absence of pressure on the working side of the piston due to the vacuum caused by the condensation of the steam was the principal dependence for the power of the stroke. They were called low-pressure engines, while those of the non-condensing type which necessarily required a higher boiler pressure to overcome the back pressure in the cylinder were designated as high-pressure engines, so that at one time the terms high-pressure and low-pressure were synonymous with the terms non-condensing and condensing, respectively. This relation, however, does not apply at the present time, since the majority of modern condensing engines are operated by steam at high-pressure. The advantages of the condensing engine may be stated as follows: The same power can be secured by a smaller cylinder of the condensing type than of the non-condensing type, with all the attendant advantages of diminished bulk, while the condensation of the steam to a temperature of about 130° F. (usual practice) affords a quantity of pre-heated water which can be used to replace the amount turned out of the boiler in the form of steam, thus saving fuel, and extending the wear of the boiler. Its disadvantages are partly inherent, and partly accidental. The inherent disadvantages are due to four conditions: (1) The lowering of the temperature and pressure of the steam lowers the temperature of the metal of the cylinder and increases the amount of condensation to be expected within the cylinder, so that the actual economy is much less than the theoretical economy; (2) the maintaining of the vacuum imposes an amount of work upon the engine, directly or indirectly, which a non-condensing engine is not required to perform; (3) the serious annoyance caused by the introduction of lubricating material into the cylinder where it fouls and stops up the passage, thence into the condenser, and finally into the boiler, where, by forming a coating on the heating surfaces, causes overheating by preventing the intimate contact of the water with the metal; (4) the condition that it can only be used where a sufficient quantity of water for condensation can be obtained at a small expense, thus limiting the application of the principle to stationary engines on land, although for that very reason it is pre-eminently applicable to all types of marine engines. Locomotives cannot be operated as condensing engines. The accidental disadvantages depend upon the methods employed to apply the principle — (1) if the pumps attached to the condensing apparatus are driven by the engine itself, a high rotative speed is impracticable, since the engine cannot be run at a speed faster than that required for the proper working of the pumps; and (2) if the engine operates its own condensing apparatus at low speeds, the weight and bulk of such appliances become inconvenient.

Bibliography.— Hutton, 'The Mechanical Engineering of Power Plants' (1903); Hutton, 'Heat and Heat-Engines' (1900); Perry, 'The Steam Engine' (1902).

W. Morey, Jr.,
Consulting Civil Engineer.

Condillac, Etienne Bonnot de Mably de, ā-tē-ēn bŏn nō de mä-blē de, French philosopher: b. Grenoble 30 Sept. 1715; d. Beaugency 3 Aug. 1780. He founded an international reputation on 'The Essay on the Origin of Human Knowledge (or Sense Perceptions)' (1746); duly succeeded by the celebrated 'Treatise on the Sensations' (1754), the central standpoint of these and other works being what is, philosophically speaking, sensationalism; a belief, that is, that what we know we know only through the senses, and hence our ideas of deity, love, the soul, etc., are largely modified forms of the objects that impress us in our daily material experience. These standpoints were practically those of French philosophy till the advent of Cousin. Among his other works are: 'Traite des Sensations' (1755); 'Cours d'Etudes' (1755); 'Le Commerce et le Gouvernement Considérés Relativement l'un à l'autre' (1776); 'La Logique' (1781); 'Langue des Calculs' (1798).

Condition, in law a statement of terms, a provision or stipulation, as in a contract, by which the parties thereto consent to be bound; or an undertaking to do something, pay money or other consideration, etc., as a proviso in an agreement by which the other parties thereto bind themselves to perform some act in return. Conditions must be made at the same time as the original conveyance or contract, but may be by a separate instrument, which is then con-

sidered as constituting one transaction with the original. Unlawful conditions are void. Conditions in restraint of marriage generally are held void; but this is not true of conditions restraining from marriage to a particular person, or restraining a widow from a second marriage. A condition in general restraint of alienation is void, but a condition restraining alienation for a limited time is good. Where land is devised, there need be no limitation over to make the condition good, but where the subject of the devise is personalty without a limitation over, the condition, if subsequent, is held to be *in terrorem* merely, and void. But if there be a limitation over, a non-compliance with the condition devests the bequest. A limitation over must be to persons who could not take advantage of a breach. Performance should be complete and effectual. An inconsiderable casual failure to perform is not non-performance. Any one who has an interest in the estate may perform the condition, but a stranger gets no benefit by performing it. Conditions precedent, if annexed to land, are to be strictly performed, even when affecting marriage. Conditions precedent can generally be entirely performed, and usually at any rate equity will not interfere to avoid the consequences of non-performance.

The word «condition» also means the situation of every person in some one of the different orders of persons which compose the general order of society and allot to each person therein a distinct separate rank. For instance, at common law, a person under 21 is an infant, with certain disabilities and privileges. Every person is presumed to know the condition of the person with whom he deals.

Conditional Immortality, a tenet held by a theological school which denies the inherent immortality of the soul, and the consequent doctrines both of eternal misery and of Universalism as contrary to the teachings both of nature and of revelation. Its advocates maintain that the Bible sets immortality before men as something to be sought after (Rom. ii. 7), as a divine gift offered on certain conditions (Rom. vi. 23; John iii. 15, 16), and as a matter of hope and promise in the present life (Titus i. 2); that this immortality is not a present possession (Mark x. 30), and is to be realized by the assumption of a spiritual body at the resurrection of regenerate men from the dead (Luke xx. 35, 36), an event synchronous with the second coming of Christ (1 Cor. xv. 51, 52). Divine testimony, no less than experience, they say, declares unequivocally that man has the same natural life as all other animals (Eccles. iii. 19), and only those who by faith and obedience are united to Christ have the promise of immortality. The Calvinistic doctrine of eternal misery is untenable, the punishment of sin being death or everlasting destruction, to be inflicted subsequent to a judgment after the Lord returns (2 Thess. i. 9, 10). The dogma of Universalism, the only alternative to endless torment if the soul must live forever, is also, they maintain, unfounded, since the punishment of sin (death) is said to be everlasting, like the life which is the reward of the righteous (Matt. xxv. 46). The Conditional Immortality Mission began in Great Britain in 1878. It has an organ 'The Bible Standard,' published monthly by the secretary. Churches have been established in the United States.

Conditioned, Philosophy of the, or **Philosophy of the Unconditioned,** the name given by Sir William Hamilton to certain philosophical views first promulgated by him in an article contributed to the 'Edinburgh Review,' in October 1829, forming a critique on Victor Cousin's philosophy, especially of his doctrine of an absolute cause. The Unconditioned is regarded by Sir William Hamilton as a genus including two species: the Infinite, or the unconditionally unlimited, and the Absolute, or the unconditionally limited; and the thesis which he maintains and expounds in the essay referred to, and which forms one of the leading doctrines of his philosophical system, is that the Unconditioned, as thus explained, is entirely unthinkable. In his own words, «the mind can conceive, and consequently can know only the limited, and the conditionally limited. . . . Conditional limitation is the fundamental law of the possibility of thought.» This he illustrates by stating that we can neither conceive an absolute whole, that is, a whole so great that we cannot conceive it also as a part of a still greater whole; nor an absolute part, that is, a part so small that we cannot conceive it as a relative whole, divisible into still smaller parts. And this he declares to hold good as to space, time, and degree. «The Conditioned,» he goes on to say, «is the mean between two extremes — two unconditionates, exclusive of each other, neither of which can be conceived as possible, but of which, on the principles of contradiction and excluded middle, one must be admitted as necessary.» The Unconditioned, on the other hand, being merely negations of the Conditioned in its opposite extremes, bound together by the aid of language and their common character of incomprehensibility, is not even a notion, either simple or positive. It presents no object to the thought, and can afford no real knowledge. From this, however, we are only to learn that our faculties are weak, and that hence we have no right to constitute our capacity of thought into the measure of existence. Although then we are unable to conceive anything above the relative and finite, it is quite competent to us to believe in the existence of something unconditioned beyond the sphere of all that is conceivable by us. This doctrine was adopted by Mansel, dean of St. Paul's, and applied by him to determine the limits of religious thought. It was combated by John Stuart Mill. Consult: Mansel, 'Limits of Religious Thought'; Mill, 'Examination'; Sir William Hamilton, 'Discussions.'

Condom, kôn-dôn, France, a town in the department of Gers, on the Baïse River, which is here crossed by two stone bridges, 25 miles northwest of Auch. It contains an ancient church, a Gothic edifice, and in the outskirts are a number of handsome villas. The manufactures are porcelain, woolen yarn, leather, and brandy. It was formerly the capital of Pays-de-Condomois. Bossuet was appointed Bishop of Condom in 1669, but remained here only one year. Pop. 4,500.

Condona'tion, in law, a forgiveness of injury, such as to restore the person who has committed an offense to the same position which he or she held before it was committed. In

an action on the ground of adultery it is a legal plea in defense.

Condor, the popular name of the great vulture of the Andes, formed by a mispronunciation of the Indian name *kunter,* which, according to Humboldt, is derived from another word in the language of the Incas, signifying "to smell well." This species (*Vultur gryphus,* Linn., or *Sarcoramphus gryphus*) belongs to the family (*Cathartidæ*) of diurnal rapacious birds, and which is distinguished by the following characters: The bill is elongated and straight at base; the upper mandible is covered to the middle by the cere; the nostrils are medial, approximate, oval, pervious, and naked; the tongue is canaliculate, with serrated edges; the head is elongated, depressed, and rugous; the tarsus rather slender; the lateral toes equal; the middle toe is much the longest, the inner free, and the hind one shortest; the first primary is rather short, the third and fourth are longest.

The natural history of the condor was in a fair way to rival the ancient fables of griffins, basilisks, and dragons, or even of exceeding the roc of Sinbad the Sailor, in extravagant exaggeration, until Humboldt placed it upon the basis of truth. His careful measurements established the fact that the wonderfully gigantic condor is not generally larger than the lämmergeyer, or bearded vulture, of the Alps, which it closely resembles in various points of character. These birds prefer to dwell above all animal life, and at the extreme limit of even Alpine vegetation, inhaling an air too highly rarefied to be endured, unless by creatures expressly adapted thereto. From such immense elevations they soar upward until their great bulk diminishes to a scarcely perceptible speck, or is lost to sight. The condor is a carrion bird, and is quickly lured to the plains by the sight or scent of a carcass. To such a feast considerable numbers repair, and commence their banquet by first plucking out the eyes, and then tearing away the tongue of the animal; next to these the bowels are eagerly sought for, and devoured with that gluttony which distinguishes the whole vulture tribe. The appetite of these birds seems to be limited only by the quantity of food that can be gorged into their stomachs; and when thus overloaded they appear sluggish, oppressed, and unable to raise themselves into the air. The Indians profit by this condition to revenge themselves for the robberies which they commit upon their flocks, and, watching while they eat until flight has become exceedingly difficult, attack and secure them by nooses, or knock them down with poles before they can get out of the way. If the condor, thus loaded, succeeds in rising a short distance from the ground, he makes a violent effort, kicking his feet toward his throat, and relieves himself by vomiting, when he soon ascends out of reach. Many, however, are surprised, and are captured or killed before they are able to ascend. But the condor does not exclusively feed upon dead or putrefying flesh; he attacks and destroys deer, vicuñas, and other middling-sized or small quadrupeds; and when pinched by hunger a pair of these birds will attack a bullock, and by repeated wounds with their beaks and claws harass him until, from fatigue, he thrusts out his tongue, which they immediately seize and tear from his head; they also pluck out the eyes of the poor beast, which, if not speedily rescued, soon falls a prey to their voracity. It is said to be very common to see the cattle of the Indians on the Andes suffering from the severe wounds inflicted by these rapacious birds. It does not appear that they have ever attacked man. When Humboldt, accompanied by Bonpland, was collecting plants near the limits of perpetual snow, they were daily in company with several condors, which would suffer themselves to be quite closely approached without exhibiting signs of alarm, and never showed any disposition to act offensively. The nesting-time of the condor varies with the latitude, and the place selected for the nest is usually some inaccessible ledge of rock. It lays two white eggs from three and a half to four inches long, which are hatched in about seven weeks. The development of the young birds is very slow, since they are not able to fly until they are a year old, and they have to remain with the parent birds for a year or two longer. They are occasionally seen even on the shores of the southern ocean, in the cold and temperate regions of Chile, where the Andes so closely approach the shores of the Pacific. Their sojourn, however, in such situations is but for a short time, as they seem to require a much cooler and more highly rarefied air, and prefer lofty solitudes from 10,000 to 15,000 feet above the level of the sea. When they descend to the plains they alight on the ground rather than upon trees or other projections, as the straightness of their toes renders the first-mentioned situation most eligible. Humboldt saw the condor only in New Granada, Quito, and Peru, but was informed that it follows the chain of the Andes from the equator to the seventh degree of north latitude into the province of Antioquia. There is now no doubt that it ranges from nine or ten degrees north of the equator to the Straits of Magellan. The king vulture (*S. papa*) is another bird of the same genus.

The head of the male condor is furnished with a sort of cartilaginous crest, of an oblong figure, wrinkled, and quite slender, resting upon the forehead and hinder part of the beak for about a fourth of its length; at the base of the bill it is free. The female is destitute of this crest. The skin of the head in the male forms folds behind the eye, which descend toward the neck, and terminate in a flabby, dilatable, or erectile membrane. The structure of the crest is altogether peculiar, bearing very little resemblance to the cock's comb or the wattles of a turkey. The auricular orifice is of considerable size, but concealed by folds of the temporal membrane. The eye, which is peculiarly elongated, and farther distant from the beak than the eagle's, is of a purple hue and very brilliant. The neck is uniformly marked by parallel longitudinal wrinkles, though the membrane is not so flabby as that covering the throat, which appear to be caused by the frequent habit of drawing the neck downward to conceal or warm it within the collar or hood. The collar in both sexes is a fine silken down, forming a white band between the naked part of the neck and beginning of the true feathers, and is rather more than two inches broad, not entirely surrounding the neck, but leaving a very narrow naked space in front. The rest of the surface, the back, wings, and tail, are of a slightly grayish-black, though sometimes they are brilliantly black; the feathers are triangular, and placed over each other tile-wise. Humboldt

never saw male condors with white backs, though descriptions of such have been given by Molina and others. The primaries are black; the secondaries in both sexes are exteriorly edged with white. The wing-coverts, however, offer the best distinction of the sexes, being grayish-black in the female, while in the male their tips, and even half of the shafts, are white, so that his wings are ornamented with beautiful white spots. The tail is blackish, wedge-shaped, rather short, and contains 12 feathers. The feet are very robust, and of an ashen blue color marked with white wrinkles. The claws are blackish, very long, and but slightly hooked. The four toes are united by an obvious but delicate membrane; the fourth is the smallest, and has the most crooked claw. The largest male condor described by Humboldt was three feet three inches long from the tip of the beak to the tip of the tail; height, when perched, with the neck moderately extended, two feet eight inches; from the tip of one extended wing to the tip of the other, eight feet nine inches. Humboldt states that he never saw a condor which measured more than nine feet across the wings; but a specimen described by Dr. Shaw measured 14 feet. Notwithstanding, therefore, what is said by Humboldt of the general correspondence in size of the Alpine lämmergeyer and the condor of the Andes, we cannot avoid believing that a full-grown individual of the latter species would be much more than a match in every respect for any European species. The condor is peculiarly tenacious of life, and has been observed, after having been hung for a considerable time by the neck in a noose, to rise and walk away quickly when taken down for dead, and to receive several pistol bullets in its body without appearing greatly injured. Its plumage defends its body to a considerable degree from the effects of shot. It is easily killed when shot, or struck sufficiently hard, about the head.

A very similar species is the California condor or vulture, which may be easily distinguished from the true condor, which it nearly equals in size, by the lack of the white neck-ruff and of the caruncle of the male. The California vulture formerly ranged northward on the Pacific coast into British Columbia, but its habitat is said to be shrinking and now reaches only to Monterey on the north. The species may be approaching extinction. Like the condor, in addition to feeding on carrion, it attacks and kills young or sick animals, particularly lambs and calves. The rough nest of sticks, in which two dirty-white eggs are laid, is built on the ground, rock ledges, or stumps.

Condorcanqui, José Gabriel, hō-sā gä'-brē-ĕl kŏn-dōr-kän-kē' ("Tupac Amaru"), Peruvian revolutionist: b. Tinta 1742; d. Cuzco, 18 May 1781. He is called "The Last of the Incas," and in 1771 took the name of Tupac Amaru. In 1780 he incited the Peruvian Indians to rebellion against Spain, professing a design of restoring the dynasty of Manco Capac. This rebellion was the most important in South American colonial history. For three years the contest raged with doubtful success; at length, however, the natives fell away from him, and he was taken and executed. The cruelty of the Spaniards in this insurrection ultimately led to the independence of Peru.

Condorcet, Marie Jean Antoine Nicolas de Caritat, mä-rē zhŏn än-twän nīk-ō-lä de kä-rē-tä kôn-dōr-sā, Marquis de, French philosopher and mathematician: b. Ribemont, Picardy, 17 Sept. 1743; d. Clamat 28 March 1794. At the age of 21 he presented to the Academy of Sciences an 'Essai sur le Calcul Intégral.' His 'Memoire sur le Problème des Trois Points' appeared in 1767. Both works were afterward united under the title of 'Essais d'Analyse.' The merit of this work gained for him in 1769 the distinction of a seat in the Academy of Science. With astonishing facility and versatility Condorcet treated the most difficult problems in mathematics; but his genius inclined him rather to lay down beautiful formulas than to pursue them to useful applications. In 1777 his 'Theory of Comets' gained the prize offered by the Academy of Berlin. The aversion of the minister Maurepas to Condorcet delayed his entrance into the French Academy till 1782. During the troubles of the French Revolution his sympathies were strongly engaged on the side of the people. On the intelligence of the flight of King Louis XVI. he represented in a speech which was highly admired, the royal dignity as an anti-social institution. In the national convention, in which the legislative assembly was merged 20 Sept. 1792, he voted for the most part with the Girondists. On the trial of Louis he was in favor of the severest sentence not capital; at the same time he proposed to abolish capital punishments, except in case of crimes against the state. The fall of the Girondist party 31 May 1793 prevented the constitution which Condorcet had drawn up from being accepted. The constitution then adopted he attacked and was accused 3 October of being an accomplice of Brissot. To save his life he concealed himself, and was declared out of the protection of the law. While in hiding Condorcet wrote his curious 'Esquisse d'un Tableau historique des Progrès de l'Esprit humain,' full of enthusiasm for liberty. At Clamat he was arrested as a suspicious person by a member of the revolutionary tribunal of Clamat, and thrown into prison to undergo a more strict examination. On the following morning he was found dead on the floor of his room, apparently having swallowed poison. A collection of his numerous writings, complete with the exception of his mathematical works, appeared in Paris in 1804. Consult Arago, 'Biographie de Condorcet' (1849).

Condottieri, kŏn-dŏt-tē-ā'rē, a class of mercenary adventurers in the 14th and 15th centuries, who commanded military bands, amounting to armies, on their own account, and sold their services for temporary engagements to princes and states. The bands under command of the Condottieri were well armed and equipped. Their leaders had in many instances considerable military skill; but, as they took no interest in national contests, except to receive pecuniary advantages, the wars between them became a sort of bloodless contest, in which the only object of each party was to take as many prisoners as possible for the sake of the ransom. This singular system of warfare was put to an end by the more serious military operations of the French, who invaded Italy under Charles VIII. Though many Condottieri acquired much honor as well as emolument, one only attained to high rank and independent

power; this was Francesco Sforza, originally a peasant, who in 1451 made himself Duke of Milan, and transmitted that sovereignty to his descendants.

Conduction of Heat. See HEAT.

Conduit, kŏn'dĭt, in architecture, a long narrow passage between two walls or underground, for secret communication between various apartments, of which many are to be found in old buildings; also a canal of pipes for the conveyance of water, a sort of subterraneous or concealed aqueduct. The construction of conduits requires science and care. The ancient Romans excelled in them, and formed the lower parts, whereon the water ran, with cement of such an excellent quality that it has become as hard as the stone itself which it was employed to join. There are conduits of Roman aqueducts still remaining, of from five to six feet in height, and three feet in width. Conduits in modern times are generally pipes of wood, lead, iron, or pottery, for conveying the water from the main spring or reservoirs to the different houses and places where it is required.

Condurango, kŏn-dŭ-răng'gō, or **Cundurango,** the bark of the Marsdenia Condurango, a medium-sized twining plant of Ecuador and adjacent states. It is somewhat bitter; at one time it was much vaunted as a specific in the treatment of cancer.

Condylarthra, kŏn-dĭ-lär'thrą, a primitive order of ungulates of the early part of the Tertiary Period, collateral ancestors of the later hoofed animals, and connecting them with the primitive clawed animals, especially with the *Creodonta.* They were mostly of small size, five-toed, omnivorous, with bunodont teeth like those of the pigs, long tail, small brain and other primitive features. *Phenacodus,* of the Lower Eocene, of the size of a wolf, is the largest and best known. Remains of *Condylarthra* are found chiefly in North America, but also in Europe and in South America. They became extinct in the Middle Eocene.

Condyle, kŏn'dĭl, in anatomy, a protuberance on the end of a bone serving to form an articulation with another bone, and more especially applied to the prominence of the occipital bone for articulation with the spine.

Cone, Helen Gray, American poet: b. New York City 8 March 1859. Since 1899 she has been professor of English in the New York City Normal College. She is the author of 'Oberon and Puck: verses Grave and Gay' (1885); 'Baby Sweethearts' (1890); 'The Ride to the Lady and Other Poems' (1891).

Cone, Orello, American educator and author: b. 16 Nov. 1835. He was professor of biblical languages and literature in St. Lawrence University, N. Y., 1865–80; president of Buchtel College, Ohio, 1880–96; and has been Richardson professor of biblical theology in St. Lawrence University from 1900. He has published: 'Gospel-Criticism and Historical Christianity' (1891); 'The Gospel and Its Earliest Interpretations' (1893); 'Paul, the Man, the Missionary, and the Teacher' (1898); edited 'Epistles to the Hebrews, Colossians, Ephesians, Philemon, etc.' (1901); 'Rich and Poor in the New Testament' (1902).

Cone, Spencer Houghton, American clergyman: b. Princeton, N. J., 30 April 1785; d. 28 Aug. 1855. After a varied career as school teacher, actor, journalist, and government clerk, he was converted November 1813, and baptized into the fellowship of the Baptist Church, and soon began to preach with great success. He was chaplain of the House of Representatives, 1815–16; pastor at Alexandria, Va., for 7 years; of the Oliver Street Church, New York, for 18 years, and of the First Baptist Church in the same place until his death. He was president of the American and Foreign Bible Society, 1837–50, and of the American Bible Union from its formation until he died. For many years he was one of the most popular and influential clergymen of his denomination in the United States. There is a 'Memoir' of him by his son, Spencer Wallace Cone (1819–88).

Cone. 1. In geometry, the solid figure traced out when a right-angled triangle is made to revolve round one of the sides that contain the right angle; this is more strictly a right circular cone. A more comprehensive definition may be given as follows: Let a straight line be held fixed at one point, and let any other point of the line be made to describe any closed curve which does not cut itself; the solid figure traced out is a cone. The moving line is known as a generating line or generator of the cone. When the axis of the cone, that is, the line joining the fixed point to the centre of the closed curve, is perpendicular to the plane of the base, the cone is right; and when in addition the curve which the second point describes is a circle, the cone is a right circular cone. Cones whose axis is inclined to the base at any angle other than a right angle are known as oblique cones. If a cone be cut in two by a plane parallel to the base, the lower portion is called a frustum or a truncated cone. The geometry of the cone is important on account of the curves called conic sections, which are obtained by cutting a right circular cone by planes in various directions. The cubic content of a right circular cone is one third of that of a cylinder on the same base and of the same altitude. The cubical content of the cone is therefore found by multiplying the area of the base by the altitude, and taking one third of the product. The area of the slant or curved surface is obviously equal to that of a sector of a circle of radius equal to the slant height, and arc equal to the circumference of the base. It is therefore obtained by multiplying the slant height by the circumference of the base, and taking one half of the product.

2. In botany, a dry compound fruit, consisting of many open scales, each with two seeds at the base, as in the conifers; a strobilus.

Cone-Nose. A true bug (*Conorhinus sanguisuga*) of the family Reduviidæ, related to the bedbugs and having similar habits in the South; it is nearly an inch long, and black, blotched with red. In 1898 much excitement was occasioned in the North by newspaper accounts of attacks by "kissing-bugs," which were two related species, *Reduvius personatus* and *Melanolestes picipes,* the former frequently found in dirty houses feeding upon cockroaches, bedbugs, etc., and breeding in dusty corners. The bite is painful, but not poisonous.

Conepate, kō'nĕ-pāt, the name given in Mexico to the large white-backed skunk of that region. See SKUNK.

Cone-shells, or **Conidæ,** a family of ctenobranchiate *Gastropoda,* so called on account of their form. All the cones have a similar external outline; the aperture is long and narrow, the head of the living animal is more or less lengthened, the proboscis elongated, the foot is splay and abruptly cut off in front, the tentacles are rather widely separate and the eyes are placed on these organs. All of the species are carnivorous, and the bite of some of those found in the South Seas is reputed poisonous. Several hundred species have been described, about one fifth of them from tropical American waters. Owing to their beauty and variety the cones are much sought by collectors, who pay extravagant prices for the rarer forms. The textile cone-shells (*Conus textilis*), brought from Mauritius, a handsome species four or five inches in length, are marked with narrow, angular lines of dark brown, variegated with dashes of yellow and irregular white spots. It haunts the fissures and holes in rocks and the warmer pools in coral reefs. They all take a moderate range of depth, varying from 1 to 40 fathoms.

Cones, Pyromet'ric, or **Seger Cones,** instruments for measuring heat, consisting of three-sided pyramids about two and a half inches high and one half inch base. They are composed of fusible substances, and are graded so that they melt, each at its own temperature. The cones were invented by Dr. Herman Seger, of Berlin, for use in pottery kilns, and have since been largely adopted. An earlier method of heat measurement was the fusible alloys invented by Prinsep. Alloys of silver, gold, and platinum were so calibrated that they would, as to melting-point, cover the whole range between the two extremes of fusion of the metals. Many objections to these were found in practice, notably the expense and liability to loss. The Seger cones perform the same service and are very inexpensive. The cones range in numbers from 1 to 36 and back from .— 1 to .— 22. In practice two or three cones, approximating the required temperature, are set upright in the kiln upon a morsel of soft clay. The softer of them will, as the temperature reaches the proper point, bend over and melt, to be followed in regular order by the successive higher numbers. They can be easily seen through the hole left in the kiln wall for the inspection of trials.

Cones'si-bark, the bark of *Holarrhena antidysenterica,* a plant of India, used as a tonic, a febrifuge, and an astringent in diarrhœa. The plant is a shrub with opposite leaves and terminal cymes of flowers.

Conestoga, kŏn-ĕs-tō'gą, or **Conestogas,** a tribe of Indians belonging to the Iroquois linguistic stock, and formerly living on the lower course of the Susquehanna and at the head of Chesapeake Bay. At the time of the settlement of Virginia (1607) the Conestoga were at war with the Mohawks, whom they had almost exterminated. Later they became a source of serious trouble to the white settlers. With the Dutch and Swedes they were more friendly than with the English. By 1675 the tribe was holding land on the eastern bank of the Potomac River in Maryland. Giving way before the Iroquois they retreated southward, committing depredations upon the white settlements. Some of the refugees of the tribe escaped to North Carolina; others after submission to the Iroquois returned to the Susquehanna. In 1701 the Conestoga made a treaty with William Penn.

Coney, the name formerly given in England to the rabbit. In the western United States, the name is applied to a distant relative, the pika (q.v.), although this creature has little resemblance to the rabbit. The term as found in Scripture is a translation of the Hebrew *shaphen,* the local name for the Syrian species of hyrax, or daman. See HYRAX.

Coney Island, New York city, a small island in the borough of Brooklyn, about 10 miles southeast of the borough of Manhattan. It is about five miles in length and from half to three quarters of a mile in width; separated from the mainland by Coney Island creek. It is connected with the borough of Manhattan and Brooklyn by steam and electric railroads and steamboat lines. It is a noted day summer resort, and has numerous bathing houses, hotels, concert and other amusement halls, carousels, pavilions, electric lights, and a fine cycle path connecting it with Prospect Park, Brooklyn. Coney Island is divided into four sections: Sea Gate, the home station of the Atlantic Yacht Club; West Brighton; Brighton Beach, and Manhattan. There is a lighthouse at Sea Gate and many summer cottages, besides the Atlantic Yacht Club House. Sea Beach is the site of several charitable sanitariums, and is a popular pleasure resort. Brighton and Manhattan have extensive hotels, and are the preferred resorts for the wealthier class. Coney Island was one of the first landing places of the Dutch, and for over 200 years was considered a worthless waste. In 1840 steamboats began making excursions there, and for 25 years it was a popular resort. In 1875 steam railroads were built and since then the island has been the most popular resort in the immediate neighborhood of New York. In 1899 a scheme was proposed by the city authorities to purchase and reclaim a large portion of Coney Island and convert it into a public park. In 1903 the city opened a small public park on the island.

Confarreatio, kŏn-fär-ē-ā'tē-ō, the most solemn of the three ceremonies of marriage used among the ancient Romans. The other forms of marriage were *coemptio* and *usus.* These last are the only ones mentioned by Cicero, which shows that confarreation had fallen into disuse before his time. The ceremony was performed by the *pontifex maximus,* or *flamen dialis.* A formula was pronounced in the presence of 10 witnesses, and the man and woman partook of a cake of salted wheaten bread; part of which only they ate, the rest being thrown upon the sacrifice, which was a sheep. The cake was called *far,* or *panis farreus,* hence the term "confarreatio." By this form the woman was said to come into the possession of her husband by the sacred laws, and became a partner of all his substance and sacred rites, those of the penates as well as the lares. If the husband died intestate and without children, the wife inherited the whole property like a daughter; if there were children, she received with them an equal share. The offspring of this form of marriage were called *patrimi* or *matrimi;* and from them were chosen priests and priestesses, especially the *flamen dialis* and vestal virgins. In the reign of Tiberius, he wished for a priest of this pure

lineage, but the ceremony had fallen into disuse, so that three patricians thus qualified could not be found. Confarreatio could only be dissolved by a form of divorce equally solemn, called *disfarreatio.* The custom of bride cake is a relic of confarreatio; until within 200 years it was made of wheat or barley, without fruit.

Confec'tionery (Lat. "to put together," "compound," "prepare"), a general term for any preparation with sugar as a base, used as a sweetmeat and containing nuts, fruits, or other flavoring. In the United States confectionery is commonly called "candy," a name which suggests etymologically conserved fruits or seeds; in England "boiled sweets" is the usual term, derived from the commonest method of preparation. Historically the earliest use of confectionery was to disguise the taste of unpleasant medicines, a method dating back to the primitive smearing with honey the rim of a cup holding a bitter draught, a practice common with Greek and Roman doctors. The medicinal use was long the commonest, fruit conserves being the first exception. In Italy, even in the Middle Ages, *confetti* were used in the mock battles of the carnival maskers. The true development of the manufacture of confectionery begins in the 19th century, and in England, whence the trade spread after the great exhibition of English dealers at the Exposition of 1851, to Germany and France. The latter country took the lead in the manufacture of elaborate bonbons and confitures and was especially superior in its chocolate candies. But the greatest growth of the business and especially the greatest increase in the variety of confections has been in the United States. In the manufacture of cheap confections poisonous mineral dyes are used, especially for the more brilliant colors; and other dangerous adulterants, such as kaolin and terra alba, are employed.

Confectionery Trade in America. The early history of the confectionery business of this country is somewhat obscure, as little was published in relation to it until within the last 50 years. The term "confectionery" embraces a vast number of edibles or compounds that have sugar as a base or principal ingredient.

The art of manufacturing confections and sweet preparations was at first largely confined to apothecaries and physicians, who used sugar and honey to disguise their medicines; but in later years the making of confectionery became a separate and distinct branch of business, although the druggist is still dependent upon the manufacturing confectioner for an important line of his goods, known as medicated candies. Few modern industries have experienced more frequent or more radical changes during the last century than the confectionery business. Previous to the year 1851 the manufacture of "boiled sweets" was largely an English specialty, and its extension to other countries had its origin in the unique display of these goods made by the London confectioners at the first international exposition in that city in that year. The interest then attracted to the business gave it a new impulse and caused it to extend to Germany, as well as to France, which in the manufacture of chocolate bonbons and comfits excelled all other countries.

In the United States we find that as early as the year 1816 there were published the names of 20 confectioners in the city of Philadelphia who were manufacturing and selling candies. Among the pioneers in the business appear the names of Sebastian Henrion, who was succeeded by Henrion & Chauveau in the year 1844, and Sebastian Chauveau, who was the first to manufacture gum-drops, jujube paste, and marshmallows in this country. Another was Paul Lajas, who in 1831 changed his business from the manufacture of confectionery to that of sugar refining; George Miller in 1833, William N. Herring in 1834, S. S. Rennels in 1838, and J. J. Richardson. In the city of New York among the old-time confectioners were Ridley & Company, established in 1806, R. L. Stuart in 1828, James Thompson, John Stryker, and Delmonico Brothers. In Boston, in 1816, the names of Arnold Copenhagen, Lawrence Nichols, and William Fenno occur; and in Baltimore, Joseph Bouvey, Augustus M. Price, and John L. Bridges were pioneers in the business before 1831.

Previous to the year 1845 the manufacture of confectionery was in a somewhat crude state. As a rule each confectioner made his own goods, his stock in trade being limited to the ordinary stick candies, sugar-plums, and molasses candy, while all fancy goods were imported from France and other foreign countries. The introduction of machinery in the manufacture of confectionery has added much to the development and increase of the business. The foreign manufacturers were using some machines in their factories, but very little was done in the United States in this way until about the year 1845, when Sebastian Chauveau, of Philadelphia, imported the first revolving steam-pan used in the country; and in the year 1846 the first machine for making lozenges was invented and built in the city of Boston by Oliver R. Chase, who with his brother formed the firm of Chase & Company, and began the manufacture of lozenges as a special branch of business. In the year 1866 the first machine for making printed work or conversation lozenges was built and used by Daniel G. Chase, also of Boston.

Many improvements are constantly being made and new and improved machinery has been invented that is adapted to the manufacture of the various kinds of goods, and to meet the constantly growing demands of the business, so that the manufacture of special machinery for confectioners' use has become a separate and important industry. Nothing can convey a more complete idea of the wonderful growth and increase of the industry in the United States in the last half-century than the official census returns, as published at Washington from 1850 to 1890, with the following comparisons:

THE CONFECTIONERY INDUSTRY 1850 TO 1900.

Year	No. of Establishments	Hands Employed	Capital Invested	Total Wages Paid	Value of Material Used	Value of Product
1850..	383	1,733	$1,035,551	$458,904	$1,691,824	$3,040,671
1860..	541	2,340	1,568,478	668,423	2,991,186	5,361,100
1870..	941	5,825	4,995,293	2,091,826	8,703,560	15,922,643
1880..	1,450	9,801	8,486,874	3,242,852	17,125,775	25,637,033
1890..	2,921	21,724	23,326,799	7,783,007	31,116,629	55,997,101
1900..	4,297	33,583	35,155,361	10,867,687	45,534,153	81,290,543

Imposing as these figures are, they are somewhat misleading as to the real growth and

magnitude of the business. They take no account of the large amount in the aggregate that is produced by the small manufacturers in all sections of the country. They give only the result of production in the large manufactories, that are chiefly centered in the great cities. The great increase as noted between the years 1880 and 1890 shows a gain of more than 100 per cent in value of production in the 10 years, and in the succeeding 10 years, which closed the 19th century, though the former figures were not doubled the annual output of the large factories of the country reached the remarkable total of $81,290,543. In addition to the great increase of home production, the growth of the import trade has been an important factor. Previous to the year 1837 all confectionery that was imported was classed with sugars, but in that year the total importation as reported was 8,386 pounds, valued at $912. In the 10 years following that date the total of imports, as reported for the whole time, was only 12,000 pounds, at a value of $1,400. From 1847 to 1857, 258,374 pounds were imported, valued at $34,447; from 1857 to 1867, 260,860 pounds valued at $39,169; and from 1867 to 1877, 865,812 pounds, valued at $145,797. From 1877 to 1887 the total value of imports was $151,632; and in the eight years following, up to the present time, there has been a gain of more than 150 per cent, the total value being $387,152. The analysis of the returns shows that from the year 1837 up to 1849 the value of foreign confectionery imported in no year equaled that of 1837. But in subsequent years there was a gradual increase in the amount and value up to 1855, when the figures reached 74,371 pounds and $8,949 in value. From that date there was an irregular falling off in the importations until 1865, when there were 35,388 pounds, valued at $4,094. Following that period there was an irregular increase up to 1876, when the returns showed 87,955 pounds, valued at $18,500; and this increase continued in successive years until 1892, when confectionery to the value of $97,741 was received from foreign countries. This was the largest amount in any one year, the figures rapidly falling in the three following years, the amount in 1895 having dropped to $30,745. While the rapid increase and growth of our home market has made large demands upon the facilities of our manufacturers for their productions, the enterprise and push of the men who have been and are now engaged in the business has led them to reach out into other fields and larger markets.

The foundation of the American export trade in confectionery was laid in 1865, when goods to the value of $26,429 were exported. This was a good start, and with the exception of the following year, when none was shipped or the amount was overlooked, this branch of our foreign trade showed a fairly steady increase between that date and 1880, when the total export was valued at $81,757, the quantity in pounds not being given. Since then the United States has sent large amounts of confectionery to foreign countries every year, the amount increasing more than 10-fold in the years from 1881 to the close of the century.

Hence it appears that while our home market has been constantly broadening and extending, and the consumption of the products of our factories has largely increased, the markets of the world are being opened to us. Our foreign trade is steadily enlarging, American confections meeting with much favor in all markets where they have been introduced.

Of the important factors that have largely contributed to the wonderful development and growth of this industry, more especially in the last 35 or 40 years, may be mentioned the rapid growth and increase of our population during this period, the opening up of new territory, and the development of new industries that have resulted in bringing general prosperity to all classes of our citizens. The low price of sugars and other materials used in the manufacture of confectionery, together with the introduction of new and improved machinery in our factories, has made it possible to produce goods of superior quality at a comparatively low price, thus bringing them within the reach of the poor as well as the rich. There has been constant rivalry among our leading manufacturers to improve the quality of their productions.

The late Edward A. Heintz, of Philadelphia, who in the year 1874 established the 'Confectioners' Journal,' the pioneer trade paper in the interests of our business, and who through its columns constantly advocated progress and suggested improvements, thereby giving to the members of the trade a new impulse and inspiration, rendered incalculable service in popularizing the confectionery business among the people. The two great international expositions of Philadelphia and Chicago, where the fine display made by our manufacturers attracted the attention of the world, gave new importance to the industry and added much to the extension of the business. The organization of the National Confectioners' Association of the United States in the year 1884 was an important and prominent factor in this development. It was organized by and included in its membership all the leading manufacturers of the country, having for its declared purpose, as stated in its constitution, "to advance the standard of confectionery in all practicable ways, and absolutely to prevent hurtful adulterations; to promote the common business interests of its members, and to establish and maintain more intimate relations between them; to take united action upon all matters affecting the welfare of the trade at large."

The results of the work of this association are clearly manifest on every hand in the securing of necessary legislation in the different States whereby the manufacture or sale of any candy containing any harmful ingredients or poisonous colors is prohibited by law; by the effectual stamping out of adulterations in the manufacture of our goods, and by establishing in the minds of consumers a feeling of confidence in the purity of our productions.

The results of this combination of factors are shown in the investment of many millions of capital in this industry; in the building of large factories and warehouses for the transaction of its business; in the employment of many thousands of working-people in the manufacture of confectionery; in the enormous value of the annual product of all these establishments; and in the birth and successful growth of a competition in the United States against the markets of the world. Of the men who have been actively engaged in this development and growth of an important industry we may not speak in detail. Those who have honored their calling, men of

sterling integrity and uprightness of character, men of courage, energy, and foresight, constantly pushing forward toward larger and better achievements than their predecessors, would make a long list of names. Their work is evidenced in the record that has been made of the growth and development of an industry which, though small in its beginnings, has become a business of such large proportions as to be entitled to rank with other important manufacturing and mercantile industries of our country.

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Confederacy, Daughters of the. See UNITED DAUGHTERS OF THE CONFEDERACY.

Confederate Veterans' Association, a federation of all organizations of survivors of the Civil War on the Southern side. This association was organized at New Orleans 10 June 1889. Its avowed purpose is strictly social, literary, historical, and benevolent. Its constitution says that it "will endeavor to unite in a general federation all associations of Confederate veterans, soldiers, and sailors now in existence or hereafter to be formed; to gather authentic data for an impartial history of the War between the States; to preserve relics or mementoes of the same; to cherish the ties of friendship that should exist among men who have shared common dangers, common sufferings, and privations; to care for the disabled and extend a helping hand to the needy; to protect the widows and the orphans, and to make and preserve a record of the resources of every member, and, as far as possible, of those of our comrades who have preceded us in eternity." State organizations are authorized, and are called Divisions.

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Confederate States of America, the name adopted by the southern States which seceded from the Union and formed a government at Montgomery, Ala., 9 Feb. 1861, comprising South Carolina, Georgia, Florida, Alabama, Mississippi, and Louisiana, with Jefferson Davis of Mississippi President, and Alexander H. Stephens of Georgia Vice-President. Texas, Arkansas, Tennessee, North Carolina, and Virginia afterward joined, and Missouri and Kentucky became disputed territory, the Federal Congress and the Confederate each receiving and welcoming delegations claiming to represent those States.

The act of secession was passed by each State in full confidence that the legal right peaceably to secede was assured by the Constitution. And if the interpretation of any ambiguous provisions or expressions in any contract is to be governed by the joint intent of the parties at the time of making it, this right to secede must be conceded by all impartial historians.

Goldwin Smith, the English historian, has written: "Few who have looked into the history can doubt that the Union originally was, and was generally taken by the parties to it to be, a compact, dissoluble, perhaps most of them would have said, at pleasure; certainly on breach of the articles of union."

Henry Cabot Lodge of Massachusetts has written: "It is safe to say that there was not a man in the country, from Washington and Hamilton on the one side, to George Clinton and George Mason on the other, who regarded the new system as anything but an experiment entered upon by the States, and from which each and every State had the right peaceably to withdraw, a right which was very likely to be exercised."

In 1803, at the purchase from France of the Louisiana territory, and again in 1812, at the declaration of war with Great Britain, influential and leading public men in New England not only asserted the right of secession, but urged its exercise, in the celebrated Hartford Convention (q.v.) in 1814–15.

Nowhere, however, until 1860, was the issue actually made. Had it been made in the earlier days, it would doubtless have been accomplished peacefully. But in all human affairs, political, social, moral, or commercial, there are silently but forever at work forces which make for the survival of the fittest, and the passing away of the unfit; and these forces, when at last a crisis has been reached, declare themselves, and operate with a volcanic power, against which the barriers of no constitution can prevail.

Within the lifetime of a generation the moral sense of a majority of the civilized world had grown to condemn the institution of slavery: and the invention of steam-power, railroads, and telegraphs had begun to knit communities into nations, to their great commercial advantage. The prejudices against slavery gave rise to issues between the sections of the country, which became inflamed by events — such as the raid of John Brown — until certain States were wrought up to the point of seceding.

But now — born, not legitimately of the Constitution, nor of consent between the States, (which could never have generated anything more cohesive than a rope of sand), but of inexorable laws of nature — there stood a giant in the path. Perhaps, indeed, it was of origin unsanctioned by legal form. But it was born of proximity and geographical dependency, and it was nourished by the prosperous tide of commerce already beginning to transform the entire world. It already felt itself the natural heir to the vast and rich territory within its grasp. There it stood in the way of peaceable secession — a young nation, which denied the right of secession and stigmatized it as rebellion.

In vain did President Davis plead his constitutional rights, in a message to his Congress: "We protest solemnly, in the face of mankind, that we desire peace at any sacrifice, save that of honor. In independence, we seek no conquest, no aggrandizement, no concessions of any kind, from the States with which we have lately been confederated. All we ask is to be let alone; that those who never held power over us shall not now attempt our subjugation by arms."

It needed now but a first blow to precipitate a war to the death. Concerning first blows, Richard Cobden once said: "From the moment the first shot is fired, or the first blow is struck, in a dispute, then farewell to all reason and argument: you might as well attempt to reason with mad dogs as with men when they have begun to spill each other's blood in mortal combat."

The first blow came speedily, but by deliberate intent of neither party. In Charleston a *status quo* had been agreed upon by both sides,

to permit negotiations. On 25 Dec. 1860, Major Robert Anderson seized Fort Sumter. He did so by night, without orders, and contrary to his instructions, abandoning Fort Moultrie and disabling its guns. President Buchanan was about to order him to return to Fort Moultrie; but before the order could be issued the act was approved so enthusiastically by northern politicians that he did not dare to reverse it. Holding Fort Sumter, he was then constrained to dispatch an armed force to provision and supply it. Thus the Civil War was begun, the Confederates not waiting for the arrival of the armed force, but making their attack.

This breaking out of hostilities brought into the Confederacy the Border States, not so vitally interested in the subject of slavery, but with every tradition and instinct keenly alert to their legal rights under the original Constitution.

This was the real issue of the War, and not slavery, as is often loosely asserted. It is attested, not only by the titles "Union" and "Rebel," universally applied to the two armies by the North, but by the passionate claim of the Confederates that their struggle was for that liberty of self-government so dear for ages to the Anglo-Saxon race. And at the Fort Monroe conference in February 1865 between President Lincoln and Vice-President Stephens, the South's surrender of her claim to integrity of the Union was the one point upon which Lincoln insisted, and the one which Stephens could not yield, although utter destruction awaited him scarcely 60 days off. It is further shown in the desperate character of the struggle upon both sides, involving, with equal ardor, individuals and communities of most diverse degrees of interest in the question of slavery.

The combatants were very unequally matched, and as each side was in deadly earnest, the final outcome of the contest was inevitable from its beginning. On the Union side was a population of over 20,000,000, with an army, a navy, a treasury, a highly developed system of transportation by land and sea, as well as of manufactures, of commerce, and of credit. On the Confederate side was a much scattered population, almost entirely agricultural, of about 5,000,000 whites, comparatively destitute of all those elements of military strength. Even their agriculture was so little devoted to food products that actual starvation of men and horses in their armies finally hastened the inevitable end.

Besides the whites, there was a population of 3,000,000 slaves. It was believed by many at the North that if their freedom was proclaimed by President Lincoln, as a war measure, while their masters were absent in the field, they would rise in insurrection, or at least desert their labor in mass. The experiment, however, being tried, proved a failure. The slaves generally remained faithful everywhere, except in the sections overrun by the enemy. During the four years of the war there were actually mustered into the Union army 2,898,304 men. The Confederate numbers cannot be accurately known, but the total white population between the ages of 18 and 45 was, by the census of 1860, 984,475. In 1864 the ages for military service were extended to include all between 17 and 50, an act which was described by Gen. Grant as "robbing the cradle and the grave." Nearly 2,000 battles and skirmishes were fought, and in them the number of killed and wounded on the Union side is officially given as 389,345. The numbers on the Confederate side are not accurately known, no complete records existing, but they are estimated at about 300,000.

Of lives lost in the war from battle, wounds, and disease, the official records of the Union army report 316,516. The lives lost in the Confederate army could not have been less than 250,000.

The Confederates appreciated the odds against them, but with firm conviction of the righteousness of their cause, they trusted to be able by fortitude and endurance to wear out and discourage their adversaries. The fighting was often very desperate as shown by the casualties upon both sides, which frequently exceeded the casualties of the severest battles of Europe. Upon three occasions, some historians have imagined, the Confederates were within reach of very important results.

At Bull Run, the first battle of the War, the Federals were more completely routed than ever again, and Washington might have been captured, it is supposed, had the victory been followed up. Gettysburg is considered by many to have been the crisis of the war, a desperate attack by the Confederates being repulsed. But there is strong evidence that the greatest period of discouragement on the Union side followed the battle of Cold Harbor, 3 June 1864. It was, however, of brief duration and of no effect. Successes elsewhere soon followed, and made it apparent that the Confederate resources were approaching exhaustion.

There are notable parallels between the war for the Union and the recent war between Great Britain and the Boers, in the issues involved, and in the course of their events. Like the Confederates, the whole of the Boer population considered themselves fighting for personal liberty as against subjection to a foreign power. Like the Confederates, the Boers fought practically without pay; and although they were inferior in numbers, their important engagements were generally victories; or, if not victories, were drawn battles. And as the end came to the Confederates, so it came to the Boers only with their utter exhaustion — through their being worn out, rather than defeated in battle.

But a great contrast is to be found in the treatment of the two peoples after their defeat. That of the Boer was liberal and generous, fully in accord with the civilization of the day. To parallel the treatment of the South every effort must have been made to put the political control of the country into the hands of the Kaffirs. Of course the efforts to give the negro political control over the Anglo-Saxon at the South were foredoomed to failure. They prolonged ill-feeling for 10 years; but subsequent events, notably the Spanish war, at last inaugurated a new era in which few traces of it yet linger. And it is due to history to record that it is unlikely that any such effort would ever have been made, but for the assassination of Lincoln. Although for this unspeakable crime and folly the South was in no way responsible, it brought upon her a whirlwind of resentment, and at the same time it removed a President who, there is evidence to show, had already risen to the height of his great opportunity as a statesman, and was now planning terms

of liberality upon which to reconstruct the Southern States.

Within the few days that intervened between the surrender at Appomattox and the assassination of Lincoln, one in his close confidence prophesied that his plans of reconstruction would "win over the South's good will and affection, and astonish the world." And in giving his plans effect, no one can doubt that he would have had the cordial as well as powerful aid of Gen. Grant, who had already set the example of magnanimity, and won the gratitude of Lee's army by the generosity of his terms of surrender.

History records no crime greater than that of the assassin, who cheated the civilization and humanity of the world of the great example which Lincoln would have set to all nations, and who sowed bitterness and ill-will between the sections, bringing poverty and distress to the South, to the North the mortifying failure of its political experiment, and to the negro only an injury. But in connection with the negro question, as it confronts us to-day, it may be remarked that the problem of the races can be safely committed to time, and to the racial instincts implanted by the Creator.

The Constitution which was adopted by the six States in Montgomery, February 1861, and in turn accepted by the others, was modeled closely after that of the United States. It forbade the slave-trade, or the importation of slaves from any foreign country other than the slaveholding States and Territories of the United States. It forbade "bounties" or "trusts," and provided a "tariff for revenue." It allowed the President to veto any part of a bill and approve the remainder, giving his reasons for such action; and fixed his term of office at six years, and made him ineligible for a second term.

The internal history of the Confederate States during the Civil War furnished a most instructive lesson as to the weakness of the bond by which they had associated themselves. Already, before the close of the war, it had proved itself but little better than the federation of the colonies for the Revolutionary War. The last message of President Davis to the Confederate Congress, and the answering report upon the message by a committee of the Senate, contained much crimination and recrimination, and revealed an utter loss of confidence between the executive and the legislative branches, fatally paralyzing all action, and impossible to be healed. In a letter to the secretary of war, on 5 March 1865, Judge John A. Campbell, assistant secretary, wrote: "The political condition is not more favorable. Georgia is in a state that may properly be called insurrectionary against the Confederate authorities. Her public men of greatest influence have cast reproach upon the laws of the Confederacy and the Confederate authorities, and have made the execution of the laws nearly impossible." In several of the other States there were also very serious issues between State and Confederate authorities.

In view of these facts, and of the history of all confederations of many small countries, it may now be clearly seen that the prize for which the South contended so strenuously would have proven but a calamity had she won it. There would have been in the country a condition of unstable equilibrium, with many centres of disturbance, which would surely have involved further division and probably further wars. To-day her people are citizens of a nation second to none in military renown or commercial strength, or in its power and influence for peace and civilization among the peoples of the earth. Were the right peaceably to secede, for which the South cheerfully endured all the bitterness of war, now tendered her as a free gift, every State would unanimously reject it as a curse.

Few generations of modern times have confronted sterner problems than did the men of the South in 1861. In the natural world, whenever the climate has changed, the fauna and flora have had to change to conform to new conditions. This is the law of evolution, the one great truth of which mankind may feel assured. It is not "Eternal Justice" which will prevail. It is "Conformation to Environment." And the natural resistance to change by all interests in possession, makes evolution mean war to the death of the least fit, and the survival of the fittest.

Had the South been quick to apprehend these truths, then being first published to the world by Darwin, she might have accepted compensation for her property in slaves, and surrendered her constitutional right to secede. Had she done so, over 500,000 lives, and $10,000,000,000 of property, would have been saved.

But the Anglo-Saxon is not a ready barterer of what he deems his "rights." Nor would any nation thus founded upon "consent" have commanded confidence, or ever inspired the national pride and loyalty which form the greatest treasures of a people. The conflict, with all its death and destruction, its sorrows, and its sufferings, was but the necessary baptism of this nation, legitimating its disputed birth by a verdict in the great high court of war, rendered in accordance with the laws of evolution, beyond which there is no appeal.

But while the generation which so lavishly poured forth blood and treasure may rightfully cherish to the last an ardent affection for its "Lost Cause," with its leaders and its heroes; not only its own children, but all succeeding generations, will enjoy great and enduring benefits and blessings, the very fruit of the desperation of its struggle, and of the utterness of its defeat.

And in its influence upon national character, and upon the standing of this nation among other nations, it is no small matter to have made the record for valor and devotion to principle which the South has set; or to have produced such leaders and types as Lee and Jackson and their colleagues.

Briefly it may be said that the rise and fall of the Confederate States of America constitute the most important feature of modern history, marking the sudden birth of a great nation. Such a nation could never have been founded in peaceful debate. The world may eventually reach a stage of development where such an event may be possible, but it had not done so in 1860. Previous to that date there was no assurance of stability to the nation. Since 1865 no convulsion could shake it. Succeeding years only demonstrate to the inhabitants of every section the increasing advantages of living in an undivided and an indivisible country.

EDWARD PORTER ALEXANDER.

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Lost Cause'; Greeley, 'The American Conflict'; Stephens, 'Constitutional View of the War Between the States'; Schwab, 'The Confederate States of America'; the Count of Paris, 'History of the Civil War in America'; Callahan, 'Diplomatic History of the Southern Confederacy'; the 'Memoirs' of Grant, Sherman, and Sheridan; and lives of Lincoln.

Confederation, Articles of. With the American resolve to be free came the necessity of a government with defined legal powers, and the Continental Congress, on the same day (10 June 1776) it appointed a committee to draft a Declaration of Independence, appointed another, one member for each colony, to frame an instrument of government. This was entitled the "Articles of Confederation and Perpetual Union," and reported 12 July; but after debate on it till 20 August, it was laid by till 8 April 1777, and not adopted till 15 November. The Congress sent a circular to the State legislatures, recommending its acceptance, and under their instructions all but five States signed it 9 July 1778, North Carolina and Georgia following on the 21st and 24th, respectively. But there had already been wrangling and heart-burning over the question of the unsettled western lands (see TERRITORIES) which, if given to the respective States according to their theoretical limits, extending to the Pacific, would have made a few overwhelmingly great, and left others too small to maintain their rights, and New Jersey, Delaware, and Maryland held aloof, insisting that the uncolonized lands should be ceded to the general government, for the common behoof of the Union whose common sacrifices must win them. New Jersey, its judgment clarified by the fact of its commerce being at the mercy of New York, protested further that the new government should have power to regulate commerce; but it signed 26 November, relying on the "justice and candor" of the rest in the territorial matter. Delaware, under protest, joined 5 May 1779, but Maryland held off nearly two years longer, till New York had ceded a blanket claim to the entire northwest, and Virginia showed signs of yielding. It finally signed 1 March 1781, and the Articles went into operation as follows:

1. "The style of this confederacy shall be 'The United States of America.'" 2. Reserving to the States full sovereignty, and all rights not expressly delegated to Congress. 3. Declaring a mutual defensive league. 4. Securing mutual citizenship of freemen, and mutual extradition. 5. Organizing a single-chamber Congress; members elected annually by the State legislatures, and subject to recall at any time; each State to have two to seven delegates, but only one vote (population not being then ascertainable). 6. Prohibiting State alliances or treaties with each other or foreign countries, grant of titles of nobility, customs dues infringing treaties already proposed, maintenance of naval or military forces except militia, or engaging in war except on declaration by Congress or imminent danger. 7. Providing for national expense by requisitions of Congress upon the States, which were to levy the needful taxes within the time set. 8. Empowering Congress (but only on the consent of nine States for the chief powers and seven for the rest) to make peace and war, treaties, etc., save that no treaty should restrain States from laying customs duties binding on their own citizens, even up to prohibition, making it the arbiter of territorial disputes between States; empowering it to fix the standard of coins, weights and measures, to manage Indian affairs (subject to State legislation), and to regulate the postal service; to direct military and naval operations; to borrow money, and make requisitions for that and men on the States; and to appoint committees. The only function it could exercise at will, however, was to adjourn from day to day. 9. On minor matters it could delegate its powers during recess to a "committee of the States," one member from each, nine being a quorum. 10. Authorizing Canada to join, but no other colony except on vote of nine States. 11. Pledging the faith of the States for the money borrowed or appropriated by Congress. 12. Binding the States to abide by the votes of Congress and to observe all these articles inviolably, and declaring that "the union shall be perpetual"; the articles not to be altered except by vote of Congress, confirmed unanimously by the State legislatures.

The organized and carefully barricaded impotence of this scheme of government is probably unequaled in history, with any nation surviving, and is only to be accounted for by a mutual fear on the part of the States greater than their fear of the common enemy — which is usual in federations. The States were independent sovereignties, united in a league of which the first object was, not to guard against Great Britain, but against each other. Its units were the State legislatures, which made and minutely controlled it, of which the delegates were the mouthpieces, and through which every power had to be exercised; and a small minority of which could at any moment quench even its feeble vitality by recalling or not appointing their delegates. Its action was entirely confined to States; it could not even order an individual to do anything, much less compel him to do it; and even as to the States its nominal orders were only requests, which they could and did disregard. If it arbitrated their quarrels, they could disregard its decisions. A "perpetual union" but if any State chose to withdraw there was no power to prevent it except by requesting the others to wage war against it; and no power to bring it about. "Solemnly pledging" their faith to pay the requisitions and abide by the determinations of Congress, they gave no guaranty of the pledge but the empty words. Congress could pass laws and make treaties, but could not move to enforce them or punish their infraction, either by States or persons; could declare war, but not raise or maintain army or navy; could make appropriations, and constitute national departments, but not raise money to make good the one or operate the other; could borrow money, but not repay it. To cap the climax of a balance of powers which paralyzed all movement, while Congress was debarred from executing national functions, the States were debarred from exercising them; all initiative was given to one and all power to the other. And as commerce of any magnitude centred in a half-dozen seaports, the States owning them could strangle their neighbors and cripple the national revenue by levying interstate duties.

The practical result of the scheme more than fulfilled all theoretical calculations of evil. The

eight years of its duration, until the Constitution was inaugurated in 1789, cover the most deplorable and discreditable section of United States history; and foreign nations looked on with a perfectly rational expectation that the republic would shortly fall to pieces, and a fresh European struggle to become its legatees ensue. So distasteful to able men was service in this paper government, issuing edicts in the air, that political ambition sought careers rather in the State legislatures. While the Articles provided for 91 delegates from the 13 States, the actual attendance rarely rose to 30, the ratification of the treaty of peace with England was delayed for some time because only seven States were represented, nine being requisite, and it was not till 14 Jan. 1784 that nine were represented, with 23 delegates. The requisitions of Congress for money were refused or delayed, scarcely ever paid by any State in full and never on time, and generally but in small part and far in arrear. Hence, not only were the principal and interest of the debt heavily defaulted, but the very soldiers were left unpaid and almost unfed and unclothed till the end of the war, and then were only given a scanty sop in terror of their leaving the country to its enemies; and a few unpaid militia broke up the session of Congress in Philadelphia by hooting and pointing muskets at them. Treaties were made which the States and individuals on our part, and foreign nations on theirs, trampled on; American commerce was barred from the markets it held before the Revolution, the powerless Congress ignored, and the States offered treaties severally. The British government refused to surrender the northwestern forts on the ground of the States refusing to keep the agreements of the treaty of peace; and the people on the frontier were subjected to the horrors of Indian warfare, which the British commandants did nothing to check, and were accused of abetting. Lastly, an insurrection in Massachusetts (see SHAY'S REBELLION) overturned civil government there for months, and showed that there was literally no power in the country to preserve public order, for the States would not let Congress do it, and could not do it themselves. This gave the final impetus to the movement which turned a commercial convention into one for remodeling the entire framework of the government (see CONSTITUTION, FORMATION OF THE), and rescuing the country from an abyss of degradation and the brink of imminent ruin. The one good piece of work to be credited to the Confederation — due to its being a paper instrument which needed no material execution at the moment — was the framing of the Ordinance of 1787, for the government of the Northwest Territory, which barred slavery from it and furnished a fighting ground for others. On 14 July 1788, the ratification of the new Constitution by the requisite nine States was announced, to be inaugurated 4 March 1789. After 1 Jan. 1789, there was no business session of the Congress of the Confederation, there being only one or two delegates present, who adjourned from day to day (the single act not requiring the assent of seven States), till 2 March, when they adjourned *sine die*. The one useful function of the Confederation was in convincing the States that they must have something better; and without the miserable practical experience of the fact they would never have admitted it. Something of the kind was an absolutely inevitable stage in the existence of the Union; and there was much honest public spirit and ability put into — but for the utility just mentioned, one would say wasted on — its attempts at action. Consult Bancroft's and Hildreth's 'Histories of the United States'; Frothingham, 'Rise of the Republic'; and Curtis, 'History of the Constitution.' See UNITED STATES — ARTICLES OF CONFEDERATION.

Confederation of the Rhine. In the war of 1805, which turned out so unfortunately for Austria, several of the princes of the south of Germany allied themselves to France. The Peace of Presburg (26 Dec. 1805) gave the first impulse to the entire dissolution of the German empire, by conferring crowns on the electors of Bavaria and Würtemberg, and on both, as well as on Baden, complete sovereignty, such as had been already exercised by the other great German states. Ultimately 16 German princes made a formal declaration of their separation from the emperor and the empire, in the act of confederation signed at Paris 12 July 1806, by the kings of Bavaria and Würtemberg, the elector arch-chancellor of the empire, the elector of Baden, the new Duke of Clèves, and Berg (Joachim Murat), the Landgrave of Hesse-Darmstadt, and other less important rulers. Other princes soon joined, and ultimately the confederacy extended over a space of 125,160 square miles, with 14,608,877 inhabitants; and the confederate forces were increased from the originally stipulated number of 63,000 to 119,180. After Napoleon's Russian campaign of 1812 the whole structure fell to pieces.

Conference. 1. In general, a meeting for consultation, discussion, instruction, or the like; or any interview for interchange of views. The term is specifically applied to consultations between committees of the two Houses of Congress in the United States, and to similar consultations between delegates of the two houses of Parliament in Great Britain. Such conferences are usually called to discuss the provisions of a bill with regard to which the two houses are disagreed, with the object of effecting an agreement between them.

2. A term much used in ecclesiastical government, etc. The annual meetings of Wesleyan preachers in England for deliberation on the affairs of the body are called conferences. In the United States the Methodist Episcopal Church has an assembly called the general conference, which meets once in four years; numerous assemblies called annual conferences; district conferences; and quarterly conferences; these assemblies variously dealing with local or general interests of the Church. In the Roman Catholic Church there are instituted pastoral conferences, chapter conferences, etc.; and in various Protestant denominations there are stated local or general assemblies of chosen delegates from individual churches, who meet to consider or adjust denominational affairs.

Conferva, kŏn-fĕr'va, a genus of green algæ. Most of the species are marine, though a few are fresh-water.

Confes'sion, in law, is when a prisoner indicted of an offense, and brought to the bar to be arraigned, upon the indictment being read to him, and the court demanding what he can say thereto, confesses the offense and indictment

to be true. Confession, in civil cases, is where the defendant confesses the plaintiff's right; or, in prosecutions under penal statutes, by which confession there may be a mitigation of a fine against the penalty of a statute, though not after a verdict. When the confession is entirely voluntary on the part of the accused it is admissible as evidence; but if it is obtained through fear or by promises of escape, it is not allowed. If the confession is made in answer to questions not containing, or in any way implying threats or bribes, it is then admissible. See CRIMINAL LAW.

It is sometimes applied to a profession of faith; for instance, the Confession of Augsburg; the Westminster Confession. (See AUGSBURG, CONFESSION OF FAITH). It sometimes also signifies a religious sect; as the three Christian confessions — the Roman Catholic, the Lutheran, and the Calvinistic.

Confession, Sacramental, the act of a penitent accusing himself of his sins to a priest who has power to grant absolution: it is called auricular confession because addressed to the ear (*auricula*) of the minister of the sacrament of penance, and not made in open congregation: though of course were such public confession to be made the priest would, unless the laws of the Church should forbid, possess the same power of absolution as in auricular confession. The law of the Catholic Church as defined by the Council of Trent, requires that the faithful shall confess to a duly commissioned priest all their mortal sins, and advised to confess venial sins, committed after baptism and since a previous confession and absolution, so far as they can recall them by a diligent examination of their conscience. The penitent is strictly required to confess all his mortal sins, their kinds and their number as well as he can recall them: wilful concealment of a mortal sin or even of what the penitent may erroneously deem a mortal sin, renders the confession of the penitent and the absolution of the minister null, and both of these acts must be done over again and made good. If a penitent, after examination of his conscience, fails to recall any mortal sin he is under obligation to confess that sin afterward and to receive absolution for it. See ABSOLUTION.

Confession of Faith, Westminster, a document prepared by the Assembly of Divines which met at Westminster in obedience to an ordinance of Parliament issued 12 June 1643. The whole number of the Assembly amounted to 174 members, 32 of whom were members of Parliament appointed as lay assessors. The greater part of the Assembly were Puritans. One of the chief results of the deliberations of the Assembly was the framing of the Confession of Faith, intended to be that of the national Church of Great Britain. In England it nominally held this position for a short time. On the return of the Scottish commissioners it was laid before the General Assembly of the Church of Scotland, by whom it was adopted as the creed of the Church by the act of Assembly of 27 Aug. 1647. It has been adopted by the other Presbyterian churches generally, in some cases, however, with certain reservations. Its theology and discipline are thoroughly Calvinistic. See CREED; WESTMINSTER ASSEMBLY.

Confessional, in Roman Catholic churches and chapels, a kind of enclosed seat in which the priest sits to hear persons confess their sins. The confessional is often not unlike a sentry-box, the priest sitting within and the penitent kneeling without and speaking through an aperture. Many confessionals are in three divisions or compartments, the centre, for the reception of the priest; the side compartments, which communicate with the centre by grated apertures, are for the penitents.

Confessions of an English Opium-eater, The, a work by Thomas De Quincey, first published in the 'London Magazine' during 1821. The book is one of the most brilliant in literature. As an English critic has said, "It is not opium in De Quincey, but De Quincey in opium, that wrote the 'Suspiria' and the 'Confessions.'" All the essays are filled with the most unexpected inventions, the most gorgeous imagery, and, strange to say, with a certain insistent good sense. As a rhetorician De Quincey stands unrivaled.

Confes'sions, Les, an autobiographical work of Jean Jacques Rousseau. It was written during the six most agitated years of his life, from 1765 to 1770; and his state of health at this time, both mental and bodily, may account for some of its peculiarities. The first six books were not published until 1781, and the second six not until 1788. According to more than one critic, the 'Confessions,' however charming as literature, are to be taken as documentary evidence with great reserve. They form practically a complete life of Rousseau from his earliest years, in which he discloses not only all his own weaknesses, but the faults of those who had been his friends and intimates..

Confessions of Saint Augustine, The, the autobiographic memoirs of Saint Augustine, written in 397. It is divided into 13 books. The first 10 contain an account of his life down to his mother's death, and give a thrilling picture of the career of a profligate and an idolater who was to become a Father of the Church. Side by side with the pictures he paints of his childhood and of his wayward youth and manhood, we have his variations of belief and his attempts to find an anchor for his faith among the Manichæans and Neo-Platonists, and in other systems that at first fascinated and then repelled him, until his conversion at the age of 32. The narrative is intermingled with prayers (for the Confessions are addressed to God), with meditations and instructions, several of which have entered into the liturgies of every section of the Catholic Church. The last three books treat of the opening chapters of Genesis, of prime matter, and the mysteries of the First Trinity. They are, in fact, an allegorical explanation of the Mosaic account of the Creation.

Confessor, in the Roman Catholic Church has two principal significations. 1. Denoting a canonized male saint outside of the classes of the apostles, evangelists, and martyrs. The only saints, who in the earliest times were publicly venerated in the Church after death were, in addition to the Blessed Virgin and the apostles, the martyrs; and such are all the saints named in the Roman canon of the Mass, though the Milan canon (Ambrosian) has the name of other saints. 2. The other meaning of the

word confessor, the priest who hears confessions, answers to the more correct Latin word *confessarius.* The confessor, minister of the sacrament of penance, does not exercise that ministry simply in virtue of his having received priestly order: he must receive jurisdiction from the bishop of the diocese. The general law of the Church requires each of the faithful to resort to the confessional at least once in every 12 months, and to make confession each to his own parochus or parish priest: but under the law they may now lawfully confess to any priest who has due authorization from the bishop.

Confidential or Privileged Communication, in law, a communication made by one person to another which the latter cannot be compelled to give in evidence as a witness. The laws of the United States and of some other countries are, that all communications made between a client and his agent, between the agent and the counsel in a suit, or between the several parties to a suit, shall be treated as confidential; but in some minor points the practice varies in the different States. Legal agents are of course required to produce any papers intrusted to them by their clients, which the clients themselves would otherwise have been required to produce. The privilege of confidentiality regarding disclosures made to a medical adviser, even although it may have been necessary for the patient to make them in order to enable the physician to understand and treat his case, have not been defined by statute, but the custom has been that such communications are privileged. The same holds true regarding confessions made to a priest. No instances are cited where the confession of a penitent has ever been revealed by a priest. Communications made between husband and wife during marriage are in some States not admissible as evidence, although in most civil cases a husband and wife may legally be called as witnesses against each other. The laws in the United States differ in different States regarding the admission of testimony of husband or wife for or against each other.

Confirma'tion, one of the seven sacraments of the Roman Catholic Church; in the Lutheran, the Anglican, and the Protestant Episcopal Church confirmation is not a sacrament, but only a solemn rite wherein the one who is confirmed renews in the face of the Church the promises made on his behalf by his sponsors in baptism. In the early times of the Catholic Church the sacrament or rite of confirmation was administered immediately after baptism, even of infants: hence the two rites have often been even by orthodox writers viewed as one; and in the Greek and Oriental churches this custom still persists. But in the present discipline of the Latin Church confirmation is usually not administered till about the 12th year, though a child might be held competent to receive it at the age of 7. It is customary for the confirmant to take an additional name as a memorial of the rite. In administering it the bishop — and the bishop is the ordinary minister of this sacrament — with chrism (q.v) marks the sign of the cross on the forehead of the recipient, and gives him a gentle slap on the cheek, in signification that he must be ready to suffer for Christ's name's sake. The formula of words used by the bishop in signing the confirmant is, "I sign thee with the sign of the cross and I confirm thee with the chrism of salvation, in the name of the Father, and of the Son, and of the Holy Ghost."

Confisca'tion, the act of condemning as forfeited, and adjudging to the public treasury, the goods of a criminal in part punishment of a crime. The subject of confiscating the property of those in rebellion was warmly discussed both in and out of the United States Congress, at the beginning of the Civil War. A bill "to confiscate property used for insurrectionary purposes," etc., approved 6 Aug. 1861, providing for the immediate confiscation of all property belonging to office-holders under the Confederate government, and confiscation, within 60 days after the President's Amnesty Proclamation, of all property belonging to disloyal citizens or privates in the Confederate army, was passed by the House 11 July 1862, and the Senate the next day; and after a slight modification suggested by the President in his veto of the same, on constitutional grounds, it was again passed by both Houses on the 16th, and approved, becoming a law the next day. On 22 July the President issued an order that property needed for the support of the armies of the United States should be seized, an account being kept of the same.

Conformity. When strata of sedimentary rocks succeed one another in unbroken order with parallel bedding planes, and have been affected similarly by earth movements, they are said to be conformable, and the structure is a conformity. A false conformity is when, on an eroded surface of horizontal strata, other strata have been laid down. In such a case there may be an enormous time-break, millions of years, between the two series of strata, yet apparently, from a single rock outcrop or the outcrops in a small area, there is no break. Such false conformities are not uncommon in the Rocky Mountains, and, if the strata are not fossiliferous, are very difficult to detect.

Confucius, kŏn-fū'shĭ-ŭs (Latinized form of Chinese K'ung-fu-tzu), Chinese philosopher: b. province of Shantung about 550 B.C.; d. 478 B.C. His father, Shuh-liang-heih, who was of royal descent, died three years later, and the boy was reared in comparative poverty by his mother, Ching-tsai. At the age of 17 he was made inspector of corn-markets; at 19 he married; and some four years later he began his career as a teacher. In 517 B.C. he was induced by two members of one of the principal houses in Lu, who had joined his band of disciples, to visit the capital with them, where he had interviews with Lao-tze, the founder of Taoism. Though temporarily driven from Lu to Tsi by a revolution, he soon returned thither with an increasing following, and at the age of 52 was made chief magistrate of the city of Chung-too. So striking a reformation was effected by him that he was chosen for higher posts, became minister of crime, and with the aid of two powerful disciples elevated the state of Lu to a leading position in the kingdom. Its marquis, however, soon after gave himself up to debauchery, and Confucius became a wanderer in many states for 13 years.

In 483 he returned to Lu, but would not take office. The deaths of his favorite disciples Yen Hwin and Tze-lu in 481 and 478 did much to further his own, which took place in the latter year. Confucius left no work detailing his

moral and social system, but the five canonical books of Confucianism are the "Yih-king"; the "Shu-king"; the "Shi-king"; the "Le-king"; and the "Chun-tsien"; with which are grouped the "Four Books," by disciples of Confucius, the "Ta-hëo or Great Study"; the "Chung-Yung or Invariable Mean"; the "Tun-yu or Philosophical Dialogues"; and the "Hi-tse," written by Meng-tse or Mencius. (See SACRED BOOKS OF THE EAST.) The teaching of Confucius has had, and still has, an immense influence in China, though he can hardly be said to have founded either a religion or a philosophy. All his teaching was devoted to practical morality and to the duties of man in this world in relation to his fellowmen; in it was summed up the wisdom acquired by his own insight and experience, and that derived from the teaching of the sages of antiquity. Consult Legge, 'Religions of China'; Douglas, 'Confucianism and Taoism'; Plath, 'Confucius und seiner schüler Leben und Lehren.'

Confusion, in metal diseases acute confusion occurs in the early stages of general paralysis, in acute mania, in melancholia, in dementia precox, and in most of the insanities. It might be called an initial symptom of insanity. The characteristic symptoms are lack of correct appreciation of external expressions, loss of continuity of thought, with a certain enfeeblement of judgment. There are certain insanities characterized purely by acute confusion. See INSANITY.

Confu'so River, Paraguay, a tributary of the Paraguay River. After a winding course in the Gran Chaco, it "pours into the Paraguay, near Villa Hayes, waters as salty as the ocean itself."

Congaree, kŏn-gą-rē', a river of South Carolina, formed by the union of the Broad and Saluda, at Columbia, near the centre of the State. After a course of about 50 miles it joins the Wateree, and the united streams take the name of the Santee, which is navigable by steamboats to Columbia.

Cong'don, Charles Taber, American journalist: b. New Bedford, Mass., 7 April 1821; d. New York 18 Jan. 1891. He edited for a time the organ of the People's Party in the Dorr Rebellion in Rhode Island, 1842. From 1857 to 1882 he was on the editorial staff of the New York *Tribune,* and a frequent contributor of critical and literary articles to the magazines. He published: 'Tribune Essays' (1869); 'Reminiscences of a Journalist' (1880).

Congé d'Élire, kŏń-zhā-dā-lēr (Fr. "leave to elect"), in England, the sovereign's warrant authorizing the dean and chapter of a vacant see to proceed with a new election. The nomination to bishoprics, originally understood to have been vested in the Christian people, who made it by election, was afterward transferred to the sovereigns of most states, and remained with them till the 11th century, when, by the assistance of the Pope, it was wrested from them and conferred upon the clergy. In England, the Constitutions of Clarendon, in 1164, conferred the election on the chapters, and this right was formally confirmed by Magna Charta, subject, however, to a right in the sovereign to grant a *congé d' élire,* and also to confirm the chapter's choice. Thus matters remained till the Reformation, when the crown made a very important encroachment, and provided by 25 Henry VIII. c. 20, that though the dean and chapter were still required to go through the form of an election, the person to be chosen should previously be absolutely fixed by the sovereign. This act is still the regulating statute, and not only provides that on every vacancy in a see the sovereign may grant a license to proceed to the election of a successor, and with it a letter containing the name of the person to be elected, but that if the dean and chapter delay the election beyond 12 days, or elect any other person than the one named in the letter, or do anything else in contravention of the act, they incur the penalties of a *præmunire,* that is, forfeiture of goods, deprivation of certain civil rights, and imprisonment. Any bishop or archbishop neglecting to assist at the consecration and investment of the bishop-elect, within 20 days after the legal announcement of his election, is liable also to the penalties of *præmunire.*

Congenital Disease, a disease which the new-born child inherits from its father or mother, or it may be its grandparents. Such diseases are extremely rare. Syphilis, gout, congenital anomalies such as hare-lip, web fingers and toes, etc., are among the few truly congenital diseases. During child-birth children may acquire infections, but these are not truly congenital diseases.

Conger, kŏn'gėr, **Edwin Hurd,** American diplomatist: b. Knox County, Illinois, 7 March 1843. He was graduated at Lombard University in 1862, served in the Union army 1862–5, studied law and was graduated at the Albany Law School in 1866. He began the practice of his profession in Galesburg, Ill., removing to Iowa in 1868. He was elected to Congress in 1884 and twice re-elected as a Republican. In 1890 he was appointed minister to Brazil, serving four years. In 1897 he was again appointed to that post and in the following year was transferred to China. He was at his post throughout the Chinese crisis of 1900, in Peking, being imprisoned with his family and the entire diplomatic corps in the British legation compound from 20 June to 15 August. He narrowly escaped slaughter at the hands of the Boxers, false reports of a general massacre of the foreign ministers being repeatedly circulated. His rescue on 20 August was effected by the allied powers barely in time to save him and his colleagues from a general massacre.

Conger Eel, a species of marine eel (*Leptocephalus conger*) with a long dorsal fin reaching forward nearly to the head and continuous posteriorly with the caudal; the pectoral fins present; strong, close-set teeth in the jaws; mouth and eyes large, and scales absent. The conger is a large eel, the ordinary specimens commonly captured along the New England shores being four feet long, while those taken in the open sea are six to eight feet, and weigh 50 to 60 pounds, or in rare cases upward of 100 pounds. Very little is known of their habits in the natural state, but they are easily kept in aquaria and are known to be ravenous creatures, which devour fishes, crustaceans, and mollusks, and even the smaller members of their own species. From observations made on specimens in captivity in England Dr. Cunningham has concluded that, as in many other fishes, spawning takes place

but once; the females, upon the approach of that period ceasing to feed and undergoing degenerative changes in respect to the skeleton and other parts. Spawning occurs in the deep sea and during development a transparent band-like larva is formed which was long ago described as a distinct genus under the name of *Leptocephalus*. The conger is a prolific fish, producing about 3,000,000 eggs. After nightfall the conger eel may be induced to take the hook and affords good sport.

Congestion, an abnormal amount of blood in the vessels of a part causes a condition of congestion. This may be present in the arteries or in the veins, arterial or venous congestion respectively. In the former case it is usually due to some acute inflammatory reaction, causing rapidity of the heart beat or dilatation of the blood vessels with consequent congestion in some area. In venous congestion, as a rule, the cause is due to some constriction to the venous return to the heart. See COLDS.

Congleton, kŏn'gl-tŏn, England, a market town and borough of Cheshire, in a deep valley, on the Dane, 24 miles south of Manchester. Among the chief buildings are the town hall, and the grammar-school. Congleton is a seat of the silk manufacture, ribbons, handkerchiefs, and other articles being made; it also carries on fustian-cutting, the manufacture of agricultural implements, rope-making, brewing, etc. Near it are collieries and quarries. Pop. 10,000.

Conglom'erate, or **Puddingstone,** a firm rock made up of rounded detrital pebbles and even boulders, the interstices usually filled with sand. Silica is the commonest cementing material, calcite, and limonite coming next. The pebbles and boulders may be of any kind of rock, though quartz and quartzite are the most frequent, since the most resistant material in gravels. According to the character of the pebbles, different names are given, as quartz conglomerate, limestone conglomerate, etc. Conglomerates grade through pebbly sands and sandstones into true sands and sandstones. Under dynamic stress, in the folding of rock strata, the pebbles of a conglomerate may be much distorted, and by further metamorphism a conglomerate may pass into a gneiss. A conglomerate is a sedimentary rock. Some notable conglomerates are the copper-bearing Calumet and Hecla conglomerate on the Keweenaw Peninsula, Michigan, of Algonkian Age; the great conglomerate at the base of the coal measures of Carboniferous Age, in Pennsylvania and adjacent States; the Roxbury conglomerate of uncertain age, near Boston, Mass.; and the famous "banket," possibly of Permian Age, on which are located the great gold mines of the Transvaal. See BRECCIA; GNEISS; ROCK; SANDSTONE.

Congo. See KONGO.

Congo Free State. See KONGO.

Congo Snake. See KONGO SNAKE.

Congrega'tion, a gathering or collection of persons; usually a religious assembly; in its most ordinary use, an assembly of Christians met in one place for worship. In the Roman Catholic Church, it often designates a sort of board of cardinals, prelates, and divines, to which is intrusted the management of some important branch of the affairs of the Church. Thus the Congregation of the Index examines books and decides on their fitness for general perusal. The *Congregatio de Propaganda Fide* is instituted for the propagation of the Roman Catholic faith and the government of the Church in non-Catholic countries. The Congregation of Relics inquires into the genuineness of supposed relics. The Congregation of the Holy Office takes cognizance of heresies, etc. The Congregation of Rites regulates the festivals and offices of new saints. There are numerous other Congregations. The word is also used in the Roman Catholic Church to describe communities of ecclesiastics who live together under rule, but without being bound by vow, or at least by solemn vow. Such are the Congregation of the Oratory, the Congregation of the Most Holy Redeemer, usually called Redemptorists, etc.

Congregational Methodist Church, an ecclesiastical body in the United States, organized in Monroe County, Ga., by seceders, lay and clerical, from the Methodist Episcopal Church, in 1852. The movement was in the direction of a more democratic or congregational polity, designed to give the members of individual churches larger and more direct control of their own affairs; but the body still preserves the more essential forms of organization and procedure, such as the conference system, etc., characteristic of the Methodist Episcopal Church. It has a membership of over 20,000 distributed among about 350 churches.

Congregationalism had its origin in an attempt in England to carry the principles of the Protestant Reformation regarding the authority of Scripture to their radical consequences. Accepting the Bible as the sole rule of faith and practice, the founders of Congregationalism sought to find in it not merely an authoritative source of Christian doctrine; but, also, a complete, adequate, and binding pattern of church government and organization. They grew out of the Puritan party of the reign of Queen Elizabeth, of which party they were the most advanced wing. They shared fully the intense Calvinism of that party and differed from it only in matters affecting church organization and government. The great majority of the Puritans held to the conception of a national Church, of which all baptized and non-excommunicated inhabitants of the kingdom were members. The reformation of this Church, though earnestly to be sought by private Christians, they viewed as ultimately the work of the national government, and hence they held it to be a duty to remain in the Church of England, while laboring for what seemed to them its betterment. This reformation involved, in the conception of the Puritans generally, the establishment everywhere of a learned, earnest, preaching ministry; of efficient discipline; of what they deemed a more scriptural organization of the Church; and the disuse of such vestments and forms of worship as seemed to them to be without Biblical authority or to savor too strongly of Roman usages.

The founders of Congregationalism sympathized with these aims and criticisms of the Puritans, but, unlike the majority of that party, they believed that the reforms which they desired in the Church of England should come about through individual initiative, by the separation

from that Church of those who criticised it. Hence the early Congregationalists of England were called "Separatists." They rejected the thought of a national Church. They held that the only proper form of the visible Church is the local congregation, composed of a company of professed disciples of Christ who can claim personal religious experience, and are united to Christ and to one another by a voluntary covenant which transforms a company of Christians into a Church. Of these congregations Christ is the immediate head. Each, they conceived, is completely self-governing, choosing its own officers and administering its own discipline. While no earthly authority outside of such a Church has jurisdiction over it, each such congregation owes advice and aid to its sister congregations as necessity may require. This mutual responsibility and helpfulness has always led American Congregationalists to reject the name "Independent" which is popularly attached to the churches of this order in Great Britain. The officers of such a local Church were conceived by the founders of Congregationalism, following what they thought the New Testament model, to be a "pastor," and a "teacher" who should preach and administer the sacraments; a "ruling elder" who should aid the "pastor" and "teacher" in the administration of discipline; "deacons" to administer the financial affairs and charities of the congregation, and "widows" to care for those in illness and the poor. In their revolt from the prescribed liturgy of the Church of England they held that public prayer should be wholly free; and, like the Calvinists generally, they gave the chief place in public worship to the sermon.

Though Richard Fitz and his associates, whose congregation at London was broken up by the English government in 1567, may be deemed the earliest organized Congregationalists, the first clear presentation of Congregational principles was made in the works of Robert Browne, a graduate of the University of Cambridge in 1572, who passed from Puritanism to Separatism, probably in 1579, organized a church at Norwich in 1580 or 1581, and issued a series of tracts in defense of his views, from his exile at Middelburg in Holland, in 1582. Though Browne not long after conformed to the Church of England, a similar work was taken up by others, notably by Henry Barrowe, a lawyer of London, and Rev. John Greenwood and Rev. Francis Johnson in the same city, where a Congregational Church was organized in 1592. In 1593 Barrowe, Greenwood, and Rev. John Penry were hanged at London for opposing the ecclesiastical authority of Queen Elizabeth, and the Church in London was driven into exile. It found a refuge in Amsterdam under the pastoral care of Francis Johnson and Henry Ainsworth.

Contemporaneously with the later of these events, an apparently independent movement in the vicinity of Gainsborough and Scrooby, led at first by William Brewster, the postmaster at Scrooby, Rev. Richard Clyfton, rector at Babworth, and later also by Rev. John Robinson and Rev. John Smyth, resulted in the organization, about 1606, of congregations at Scrooby and Gainsborough, which were compelled to seek refuge speedily in Holland. That of Scrooby settled, in 1609, at Leyden under the pastoral care of Robinson, and a portion of this congregation, led by William Brewster, William Bradford, and Edward Winslow, crossed the Atlantic in the Mayflower, and laid the foundations of Plymouth Colony in 1620, thus establishing the first of the Congregational colonies in America.

The settlers of Plymouth were Separatists, but during the years immediately succeeding their establishment in the New World the course of politics in England under James I. and Charles I., was such as to lead many of the Puritans to despair of the attainment of the reforms they desired in Church and State in the home land. The consequence was a large Puritan emigration across the Atlantic; and the establishment, in the course of a decade (1628–38), of the three Congregational colonies of Massachusetts Bay, Connecticut, and New Haven. These Puritan settlers were all led by the radical development of their own principles in a new environment, and the influence of Plymouth example, to establish churches on the Congregational model, at their settlement in New England.

These colonies differed slightly from one another in the degree in which they applied theocratic principles to the organization of the State. In Massachusetts from 1631 to 1664, and in New Haven from 1639 to 1665, when New Haven was absorbed in the Connecticut Colony, the franchise was confined to church members. In Connecticut and Plymouth colonies no such restriction existed. Doctrinal discussion aroused by Mrs. Anne Hutchinson and her adherents at Boston occasioned the meeting of the first "Synod" or council representative of the Congregational churches of New England, in 1637. At the Cambridge Synod, in 1648, these churches, by their pastors and delegates there assembled, adopted the "Cambridge Platform" as a compact manual expressive of their views of the organization, officers, and discipline of the churches. The first century of New England Congregationalism saw, however, little theological debate, for the New England churches stood on the common doctrinal ground of Calvinistic Puritanism. The chief controversy of this period was that regarding church membership known as the "Half Way Covenant" discussion. In the view of the founders of Congregationalism the reception of a parent to church membership by "owning the covenant" involved the admission into church membership of his immature children. But adult membership implied experimental Christian character. When the children of the first settlers began to grow to maturity the question of their status forced itself, therefore, on the attention of the churches. A ministerial convention, representative of Massachusetts and Connecticut, held at Boston in 1657, and a "Synod" of the Massachusetts churches convened in 1662, decided that such as were church members in childhood by reason of their parents' membership, could, when they in turn became parents, bring their children to baptism, and could confer upon such children the same degree of membership which they themselves possessed; but unless consciously and personally of Christian experience could not vote on ecclesiastical questions or partake of the Lord's Supper. Hence a distinction between members in "full communion" and in "half way covenant" was made, which continued till early

in the 19th century, when it disappeared, largely owing to the opposition which Jonathan Edwards and his disciples had manifested to it from 1749 onward.

Congregationalism, like the Calvinistic churches in general, believed in the necessity of education, and therefore the New England colonies speedily after their foundation established schools, and planted Harvard College in 1636. Yale College followed in 1701. This spirit has characterized Congregationalism throughout its history and has led Congregationalists to be preeminently founders of schools and colleges as they have extended westward in the United States. The elaborate system of church officers already described, and believed by the founders of Congregationalism to be scriptural, outlasted the first generation of the settlers of New England in only a few instances. While they existed "pastor," "teacher," and "ruling elder" all received salaries from the churches they served; but in most of the New England churches "teachers" and "ruling elders" soon disappeared, leaving only a pastor and a variable number of deacons. The more modern growth of organization and methods of Christian work has led to the establishment of other officers, such as a clerk, a treasurer, a Sunday-school superintendent, and often one or more standing committees, and no feeling now exists that officers should be limited to those mentioned in the New Testament as possessed by the early Church. The pastor remains, with rare exceptions, the only salaried officer. The support of public worship which was originally by voluntary gifts, and has always been so in Great Britain, became, between 1638 and 1655, a matter of public taxation in all the Congregational colonies. In Connecticut this relation to the State which made Congregationalism practically a State-supported Church lasted till 1818, and in Massachusetts till 1834; but since the latter date Congregationalism has nowhere enjoyed State aid.

The high-wrought spiritual impulse manifested by the first settlers of New England was followed by a period of decreasing religious interest affecting the second, third, and fourth generations on New England soil. This condition was terminated by a series of "revivals," of which the first manifestation was in that at Northampton, Mass., under the pastorate of Rev. Jonathan Edwards in 1734, and of which the culminating expression was witnessed in the two years following the preaching tour of Rev. George Whitefield in 1740. This spiritual quickening is known as the "Great Awakening," and undoubtedly added many to the membership of the churches. It was marked, however, by much excitement, and was followed by a period of spiritual decline lasting through the troubled years of public conflict and debate which ended with the adoption of the Constitution of the United States. It resulted in serious controversy in the churches of New England as to its merits, those who opposed it as on the whole harmful being called "Old Lights" while those who favored it were nicknamed "New Lights."

In the teachings of Jonathan Edwards (1703–58) a theological movement of importance in American religious history began; and the modified Calvinism of the Edwardean school was further developed by Joseph Bellamy (1719–90), Samuel Hopkins (1721–1803), the younger Jonathan Edwards (1745–1801), Timothy Dwight (1752–1817), and Nathanael Emmons (1745–1840) into a distinctive New England theology. In eastern Massachusetts, on the other hand, a "liberal" school arose before the American Revolution, which grew slowly and was made clearly evident in the Unitarian separation of the early years of the 19th century — a separation that had its most conspicuous manifestation in the adhesion of Harvard College to the "liberal" side in 1805, though the full significance of the division was not apparent until 10 years later.

With the decade beginning in 1791, the Congregational churches of New England experienced a series of revivals which were repeated at intervals until 1858. Under these impulses not only was the membership of the churches much enlarged, but a rapid development of agencies for missionary evangelization and religious education took place. The churches of Connecticut, which had already done home missionary work in Vermont and New York for more than 20 years, organized their "General Association" in 1798 as the "Missionary Society of Connecticut." A missionary society was formed in Massachusetts in 1799. In 1801 the "New Hampshire Missionary Society" was inaugurated, and in 1807 a similar organization was effected in Vermont. These societies were chiefly engaged in home missions in the then western States and Territories, though some work was done by them among the Indians; but in 1810, the "American Board of Commissioners for Foreign Missions" came into being and enlisted the activities of the Congregational churches in evangelization abroad. This society was followed, in 1815, by the formation of what is now known as the "Congregational Education Society" for assisting ministerial candidates and institutions of learning. In 1826 an "American Home Missionary Society," now known as the "Congregational Home Missionary Society" was organized to undertake home missionary work. These were followed later by the formation of the "American Missionary Association," in 1846, for labor, especially, among the negroes and Indians of the United States — a society which has done a large missionary and educational work in the South since the Civil War. In 1853, the "Congregational Church Building Society" came into being, under the title of the "American Congregational Union" — an organization the work of which is sufficiently described by its more recent name. All these societies still exist and serve as agencies for the missionary activities of the Congregational churches of the United States.

Contemporary with this awakening of missionary activity and immediately consequent upon the passage of Harvard University to the "liberal" side, occurred an extensive development of theological education, beginning with the opening of Andover Theological Seminary in 1808. Bangor Theological Seminary was founded in 1816; and, in 1822, the theological department of Yale University was organized. Local disputes in Connecticut growing out of the modified type of Edwardean theology presented by Prof. Nathaniel W. Taylor of Yale, led to the organization, in 1834, of what is now known as "Hartford Theological Seminary." The theological department of Oberlin College came into existence in 1835, and the westward growth of the denomination brought about the opening of "Chicago Theological Seminary" in 1858, and

of "Pacific Theological Seminary," now at Berkeley, California, in 1869. The latest school for ministerial training is that opened at Atlanta, Georgia, in 1901. These eight theological seminaries are the principal agencies for the training of the ministry of the Congregational churches of the United States. The Congregationalists of Canada have a seat of ministerial education in the "Congregational College of Canada," established in 1830, and now affiliated with McGill University at Montreal. In Great Britain no less than 11 Congregational "colleges" do a work similar to that of the "theological seminaries" on this side of the Atlantic.

To the close of the 18th century the Congregational churches of the United States were practically confined to New England; and, in the subsequent westward extension of New England emigration, Congregationalism and Presbyterianism long worked together in the formation of churches in the newer states under the so-called "Plan of Union" of 1801. This "Plan" was repudiated by the "Old School" wing of the Presbyterian body in 1837, and by the Congregational churches, through the "Albany Convention," in 1852. Congregationalism has now extended in force to those parts of the United States, especially, which have been settled through New England emigration. Throughout the latter half of the 19th century, the Congregational churches of the United States have felt an increasing denominational consciousness, which has found its expression, among other ways, in the gathering of bodies representative of these churches as a whole. A "Convention" met at Albany in 1852, a "National Council" at Boston in 1865, and since 1871 a "National Council" has met every three years. Besides this "National Council" in which delegates of the churches of the United States are regularly assembled, the churches of each State are represented in an annual "Conference," "Convention," or "Association"; and the churches of smaller districts, usually counties, meet in more local "Conferences" or "Associations." None of these bodies are in any sense courts of discipline, but they gather for deliberation, consultation, and joint action by committees, or otherwise, in matters of common concern.

Each Congregational church is a self-governing body, capable of choosing its own officers, expressing its creed in such forms as seem best to it, determining the conditions for the admission of its members, and ordering its public worship as it deems most fitting. But while a Congregational church is a self-governing democracy, Congregationalism, always in the United States, and increasingly in Great Britain, has insisted that its churches are knit together in sisterly fellowship, and owe, therefore, to one another, advice in all matters of importance, discipline in evident error, and mutual helpfulness. Hence in questions of serious ecclesiastical concern, such as the settlement or dismissal of a pastor, the management of a case of discipline which the local church finds it impossible to handle, the organization of a new church, and the like, Congregational usage in the United States, though not in Great Britain, requires the summons of an "advisory council" composed of a variable number of churches, chiefly from the vicinity, which are represented in the council by their pastors and a delegate each. These councils oftentimes also include a few individuals summoned by name as experts in the matter under consideration. By such an "advisory council," met for the particular occasion, advice is given; and, though this advice is not obligatory, it is seldom that the opinion of such a council is disregarded.

Membership in a Congregational church is conditioned on the vote of the local church itself, in view of the candidate's profession of faith in Christ, evident determination to live a Christian life, and acceptance of the covenant obligations of Christian service in connection with the local company of Christian disciples of which he desires to become a member. While all matters of concern in a local congregation are determined, ultimately, by the votes of the membership, Congregational churches transact their business chiefly through the use of committees, and a standing "prudential committee" to assist the pastor and deacons is appointed in most churches of numerous membership.

But while each church is thus free to establish such a test of the faith of candidates for its membership as it deems proper, Congregationalists in representative assemblies or in a more informal way, have always been ready to testify to their faith by public creed declarations. Examples of such witness-bearing have been the approval of the doctrinal portions of the Westminster Confession by the New England churches by the Cambridge Synod in 1648; the modification of that confession by delegates of the English churches gathered at the "Savoy," London, in 1658, and its publication as the "Savoy Declaration"; and the substantial confirmation of this "Declaration" by the churches of Massachusetts in 1680, and of Connecticut in 1708. Later examples of the same readiness of Congregationalists to witness to their beliefs is seen in the "Principles of Religion" adopted by the "Congregational Union of England and Wales" in 1833; the "Burial Hill Declaration" approved by the "National Council" of the United States in 1865; and the "Commission Creed" issued by a committee of the same American body in 1883. All of these statements have been regarded, however, as testimonies rather than as tests of ministerial fitness or church-fellowship.

Aside from its representation in the United States, Congregationalism is strongly entrenched in Great Britain, where its adherents are often known by the name "Independents." The churches of this order in Great Britain are grouped together in county and district "Unions" and "Associations" and are represented in the "Congregational Union of England and Wales" and the "Congregational Union of Scotland." In general, however, the Congregational churches of Great Britain have emphasized mutual accountability and organization into representative bodies much less than those of the United States. Congregationalism is creditably represented in the Dominion of Canada and in Australia, as well as on missionary soil, where the two extensive Congregational missionary agencies, the "American Board," and the "London Missionary Society," have labored. An "International Council," representative of all lands in which Congregationalism has found a home, held its first session at London in 1891, and its second at Boston in 1899.

The statistics of the Congregational churches, as given in the "Year Book" for 1902, are as follows:

Churches in the United States	5,753
" " Great Britain	4,873
" " Canada and Newfoundland	137
" " Australia, New Zealand, and Tasmania	349
" " Jamaica and British Guiana	120
" " South Africa	308

The churches of the United States reckoned their members at 647,225, those of Great Britain 436,279, while those of the other districts above mentioned amounted to 43,025. The Congregational ministers on the roll in the United States, as given in the "Year Book" for 1902, numbered 5,717. The enrollment in Congregational Sunday-schools of the United States was 658,405. The home expenses of the churches of the United States for the year 1901 were $7,580,665; their benevolent contributions $2,233,722.

The "American Board of Commissioners for Foreign Missions" by which the missionary work of Congregational churches of the United States is carried on, reported the following statistics for the year 1902: Mission stations, 101; out stations, 1,301; American missionaries, 549; native laborers, 3,581; churches, 524; communicants (members), 55,645, of whom 5,609 had been added during the previous 12 months. The "London Missionary Society" through which the foreign work of the churches of Great Britain is chiefly carried on, reported, during the same period, 1,357 stations and out stations, 437 missionaries, 6,203 native laborers, and a church membership of 64,716, of whom 6,657 had been added the previous year.

While the title "Congregational" designates a particular fellowship of churches, or religious denomination, in the United States and Great Britain, the Congregational form of church organization, especially in its aspect of the self-government of the local congregation, is that of many other religious bodies, notably of the Baptists, the Christians, the Unitarians, and of certain branches of the Adventists, and Lutherans, so that the Congregational polity is much more widely extended than the adherents of the churches which officially or popularly bear the Congregational name.

WILLISTON WALKER.

Congregations, Religious, communities or orders, bound together by a common rule either without vows or without solemn vows. In France the name is so used as to include associations or confraternities of the laity. A group of monasteries is sometimes called a Congregation; when they unite themselves closely by ties of government and discipline and by similarity of rule. The Cassinese congregations of Benedictines, and the Congregation of Cluny are examples.

Congregations, Roman, boards or committees of cardinals who have charge of certain matters and affairs of the Roman Catholic Church throughout the world. The Roman Congregations are as follows:

1. The Congregation of the Consistory, the duty of which is chiefly relating to the preconization and the translation of bishops; the erection, removal, and discontinuance of churches.

2. The Congregation of the Holy Office of the Inquisition. See INQUISITION.

3. The Congregation of the Index. See INDEX.

4. The Congregation of Rites has charge of certain devotions, as to their novelty and the need of consulting the Pope; the rites and ceremonies to be observed in the celebration of Mass, the vestments, and other matters, to see that all is in accordance with apostolic discipline and tradition.

5. The Congregation of Immunities dealt formerly with the right of asylum and clerical immunity, but civil legislation has done away largely with all such immunities. The Congregation is now chiefly concerned with matters relating to ecclesiastical jurisdiction when it comes in contact with the civil power.

6. The Congregation of the Fabric has in its charge everything relating to the preservation of the Vatican basilica.

7. The Congregation of the Council deals with the interpretation of the decrees of councils in matters relating to discipline. In matters relating to faith, the interpretaion is made by the Pope.

8. The Congregation of the Bishops and Regulars deals with matters of questions which may arise between bishops and the regular communities within their dioceses.

9. The Congregation of Discipline has charge of the question of discipline which may arise in monastic orders.

10. The Congregation of the Propaganda has charge of foreign missions.

11. The Congregation of Indulgences examines the authenticity of relics, the history of grants of indulgences, the way used, etc.

There are minor Congregations which treat of subjects brought before them from time to time. Special Congregations are sometimes created, and commissions are frequently appointed to examine new questions that arise and that cannot be classed under the head of duties belonging to the present existing Congregations. Consult: Ferraris, 'Congregationes'; 'Decrees of Council of Trent'; 'Life of Sixtus V.'

Congress (Lat. "coming together," "meeting"), a meeting of rulers or representatives of several states, to adjust disputes between different governments. It is necessary to distinguish the meeting in which preliminaries are settled, from the principal congress, which is to bring the affair in question to a decision. The plenipotentiaries when they meet, after mutual greetings, appoint, in a preliminary conference, the day on which the congress is to be opened, and determine the manner in which business is to be transacted, the forms of negotiation, the order of precedence among the different powers, and the time of session. The congress opens by the exchange and perusal of credentials among the plenipotentiaries, which, in case the negotiating parties have referred to the arbitration of a mediator, are given to him. The envoys of the contending powers then carry on their negotiations directly with each other, or by the intervention of a mediator, either in a common hall or in their own residences by turns, or, if there is a mediator, in his residence. These negotiations are continued either by writing or by verbal communication, until the commissioners agree upon a treaty, or until one of the powers dissolves the congress by recalling its minister. Such meetings of the representatives of different countries are sometimes called conferences. The nominal difference between a conference and a

congress is this, that the representatives of the different countries at the former are the ordinary ambassadors of the respective countries at the court at which the conference is held, while the representatives at the latter are specially deputed for the purpose. Among congresses of the 19th century the chief are the Congress of Vienna, 1815; of Paris 1856; and of Berlin 1878.

Congress, Continental. The first recognition of a solidarity of interests among the English colonies in America, and attempt at joint action against a common foe, was in 1690, by Jacob Leisler, the revolutionary dictator of New York; and this perception was stimulated by the fact that New York bore the first brunt of Canadian invasion, and needed help. He invited the other colonies to send delegates to New York and contribute men and money for a counter-invasion; but none farther south than Maryland responded. A much more comprehensive plan was devised by Franklin in 1754 (see ALBANY CONGRESS), but fell through. In 1765, on occasion of the Stamp Act (q.v.), a colonial congress from all the North except New Hampshire, and only South Carolina of the South below Maryland, met at New York 7–25 October; but took no action except to petition Parliament. In 1773, when the Revolution was impending, Franklin renewed his former suggestion in a letter to the assembly of Massachusetts, whose agent in London he was; but still nothing was done.

The next year, however, on receiving news of the Boston Port Bill, Virginia proposed to the other colonies a Continental Congress in the fullest sense; that is, including Canada, for it was not doubted that this recently subjugated province would gladly join in a revolt against its conqueror. Massachusetts responded 7 June, others followed, and the first real American Congress met in Philadelphia, 5 Sept. 1774, sitting till 26 October. Canada, however, was not represented; nor was Georgia, though it shared in all succeeding Congresses. The instructions to the delegates did not contemplate separation or forcible resistance, but only the proposal of measures to "restore harmony" with Great Britain; and the Congress merely drafted addresses to the king and the people of that country, to the Canadians, and to their own constituents, and recommended non-importation and non-exportation agreements, and the forcible resistance to any forcible attempt to carry out the Parliament's taxation measures. It also advised the immediate election of delegates to a fresh Congress in Philadelphia 10 May 1775; which was carried out by various bodies — legislative assemblies in some cases, popular conventions or committees of safety (q.v.) in others. None of these had any legal power to act for this purpose, and the title of all alike was the will of the *force majeure* of the people; for the loyalist section had equal right to oppose the elections, and it was tacit acceptance of superior fighting force that gave the title. The fact that this Congress was considered necessary at all, and was to have power to organize combined resistance to Great Britain, would be conclusive evidence that the leaders of public opinion had determined on independence unless highly improbable concessions were made, were it not for the extreme reluctance the Congress displayed in declaring it, only doing so under irresistible urgency from public opinion; and had we not the memory of the hopes of accommodation and conciliation by Union leaders not only in 1860–1, but all through the War. The now frequent charge of hypocrisy against the Revolutionary leaders involves one against all the patriotic statesmen of the decade before 1860.

As soon as war was actually proclaimed by Great Britain the second Congress assumed the fullest powers of sovereignty; much greater than those of the British Parliament, for it combined the powers of that body with those of the king, being itself both executive and legislative head of the nation. It raised military and naval forces and directed belligerent operations with them, authorized privateering, contracted treaty alliances, issued national currency, etc., in both capacities. This was by no usurped power, but by the urgency of the people, who were far more anxious to have it take the powers than it was to exercise them. The provincial congresses appealed to it for authorization, and the people urged it to more energetic action. Its crowning act was the Declaration of Independence; its business from 12 July to 20 August the debating of the scheme of government it had drafted (see CONFEDERATION, ARTICLES OF), but which was not put in force for five years, and for which it was perhaps slight misfortune to have waited. It sat till 12 Dec. 1776.

The session of 20 Dec. 1776 has been hesitantly called the third Continental Congress; for the delegates were selected entirely by the State legislatures, and the body as a whole had a title more definite and regular, though not in reality more legal. But in fact, the second Congress, from the opening on 10 May 1775, was a continuing body in perpetual session; with no definite term of sitting or terms of membership; the State legislatures which had selected members did not specifically send new ones for the new session, but each chose them for such terms as it pleased — Congress exercising no right of control in this matter — and recalled them at will. Each State had but one vote, being thus equal, as in the Senate, where each has two; but in the Senate the members have individual votes. This provision in the Continental Congress was avowedly made only because a census could not then be taken to ascertain the relative populations. As under the Confederation, the Congress dealt with States, not individuals; and much of the impotence with which it is reproached in the Revolution was involved in this, though not all of its follies are thus excusable. Some of its worst performances, however — as the misdealing with the officers which drove some of them from the service permanently and others temporarily, and deeply injured the cause — were directly due to the tenacious individuality of the States, which claimed their share of the military patronage then as they do of the civil patronage now.

A history of the Congress is a history of the country during its lifetime; but some of its migrations are significant of military reverses and recoveries. From 20 Dec. 1776 to 4 March 1777 it sat at Baltimore; 4 March to 18 Sept. 1777, at Philadelphia; 27 Sept. 1777, at Lancaster, Pa.; 30 Sept. 1777 to 27 June 1778, at York, Pa.; 2 July 1778 to 21 June 1783, at Philadelphia. But before this it had ceased to be the Continental Congress, and become the Congress of the Confederation, on 2 March 1781, after the ratification of the Articles by Maryland. Con-

sult: Histories of the United States by Bancroft, Hildreth, Schouler, Von Holst, etc.; Fiske, 'Critical Period of American History' (1888).

Congress, Library of, an institution in Washington, D. C., which, despite its restricted name, is really the National Library of the United States. The Library of Congress was established in 1800, destroyed in 1814 by the burning of the capitol, afterward replenished by the purchase by Congress of the library of ex-President Jefferson, 6,760 volumes (cost, $23,950); in 1851, 35,000 volumes destroyed by fire; in 1852, partially replenished by an appropriation of $75,000; increased (1) by regular appropriations by Congress; (2) by deposits under the copyright laws; (3) by gifts and exchanges; (4) by the exchanges of the Smithsonian Institution, the library of which (40,000 volumes) was, in 1866, deposited in the Library of Congress, with the stipulation that future accessions should follow it. Fifty sets of government publications are placed at the service of the Library of Congress for international exchanges through the Smithsonian. Other special accessions have been: the Peter Force collection (22,529 volumes, 37,000 pamphlets), purchased 1867, cost $100,000; the (Count de) Rochambeau collection (manuscript), purchased 1883, cost $20,000; the Toner collection (24,484 volumes, numerous pamphlets), gifts in 1882 of Dr. Joseph M. Toner; the Hubbard collection (engravings), gift in 1898 of Mrs. Gardiner G. Hubbard.

The collection in the main library is now the largest single collection in the western hemisphere. It comprises 750,000 printed books, 250,000 pamphlets, 26,500 manuscripts, 52,000 maps and charts, 277,000 pieces of sheet music, and upward of 90,000 photographs, prints, engravings, and lithographs. Of the printed books, probably one third are duplicates. The law library of 103,000 volumes (which remains at the capitol) is not included in the above. The main collection is rich in Federal documents, history, political science, jurisprudence, and Americana in general, including important files of American newspapers and original manuscripts (colonial, revolutionary, and formative periods). The exhibition cases on the second floor contain many rare books, including the records of the Virginia Company. The Smithsonian deposit is strong in scientific works, and includes the largest assemblage of the transactions of learned societies which exists in this country.

In 1897 the main collection was removed from the capitol to the Congressional Library Building (q.v.). Congress makes an annual grant for the maintenance of the library. In 1899–1900 the grant was $25,000 for printing and binding and $31,680 for books and periodicals.

Congress of Religions, an assemblage of representatives of all the Christian denominations and other religious bodies of the world, held at Chicago during the World's Columbian Exposition of 1893. Among these were Buddhists, Mohammedans, and the followers of other Asiatic religions, and the tenets of the various faiths were expounded in many strange tongues. The greatest harmony prevailed, and the meeting was one of the most interesting events of the great exposition.

Congress of the United States. The discussion of this body falls naturally into three parts: (1) the constitutional mandates concerning it; (2) its own rules and usages; (3) its practical functions as developed by historical evolution.

1. By the first article of the Constitution, the legislative power of the country, so far as granted at all, is "vested in a Congress of the United States, which shall consist of a Senate and House of Representatives."

The Senate must consist of two senators from each State (thus equalizing the power of the States to safeguard their own interests), elected by the State legislatures for six years; the terms so arranged that one third are vacated every two years, making it a continuing body. Each legislature fills any vacancy in its State delegation caused by death or resignation, but if one occurs while it is not in session, the governor of the State may fill it pro tem till the legislature meets. A senator must be 30 years old, 9 years a citizen, and an inhabitant of the State which elects him; but the legal definition of residence is impliedly left to the State. The president of the Senate is the Vice-President of the United States, who has only a casting vote; but in his absence, or on his accession to the presidency, it shall choose a president pro tem. All impeachment trials are its prerogative, to be decided by a two thirds vote; if the President is impeached, the chief justice presides; it can inflict no punishment but removal from and disqualification for office. No treaties are valid without the consent of two thirds of the Senate; nor any appointment to office by the President without the consent of a majority of it, unless Congress takes away this power from the senatorial half of itself, which it is not likely to do.

The House must consist of members chosen for two years by popular election, so that each House is a new body; the voters to be the same who choose the most popular branch of each legislature; each member must be 25 years old, seven years a citizen, and an inhabitant of the State. The number from each State must be graded by population, determined by a decennial national census (in the body of the Constitution, three fifths of the slaves are to be counted in, a provision made obsolete by the Thirteenth Amendment). These representatives must not exceed one to 30,000 inhabitants — which would allow a maximum of about 2,550 at present, in place of the actual 386. In case of vacancy, the State executive is to issue a writ of election to fill it. The House chooses its own speaker. And lastly, it has the sole power of presenting the impeachments which the Senate has the sole power of trying.

The State legislatures were to fix the times, places, and manner of electing members of either House, subject to the right of Congress to change anything but the place of electing senators, which of course is the legislative chamber. But the numerous deadlocks and failures to elect, due to the two branches of the legislature being under different political control, and the minority House refusing to meet the other for an election, led to the law of 2 July 1866, prescribing a uniform rule for all States. Congress is to meet at least once a year; on the first Monday in December unless it orders otherwise. The President can convene a special session on

"extraordinary occasions"; but he cannot adjourn or prorogue it except in case of disagreement between the Houses — a provision suggested, like so many others, by the quarrels of the English Parliaments with the kings. Each House is the judge of the qualifications of its own members. A majority of each constitutes a quorum; but a single member can adjourn from day to day, and can compel the attendance of enough absent members to make a quorum if the House will provide a rule for so doing. Each House makes its own rules of procedure, can punish members for disorderly behavior, and two thirds can expel a member. Each must keep a journal of its proceedings (see CENSURE, *Congressional*, for argument on the implications of this), and publish it, except such part as the House judges best to keep secret. One fifth of the members present at any time may compel a yea and nay vote to be taken on any question, and entered on the journal. Neither House during a session shall adjourn for more than three days or to any other place, without consent of the other. Members of both Houses shall be paid by the nation. They shall be exempt from arrest during the session and in journeys to and from, and from liability for any utterances in debate — a reminiscence of the burning need of such provision in older English history; not often invoked now, and still less often for creditable reasons. No member shall be appointed to any office created or its pay increased during his term — again a souvenir of temporary political squabbles; and no officeholder shall be at the same time a member. Bills for raising revenue must originate in the House (originally a safeguard for the large States, against the small ones using their power in the Senate to throw the financial burdens on their richer neighbors); but the Senate can propose amendments. Bills vetoed by the President must be reconsidered by, and the objections entered in full on the journal of, the House where they originated: and a two thirds vote may pass it to the other House, a two thirds concurrent vote of which makes it a law. (The first Congress, on the question arising, decided this to mean two thirds of those present and voting, not of the whole membership.) Such votes must be yea and nay, and entered on the journals. A bill not returned by the President within 10 days (Sundays excepted) becomes a law *ipso facto*, unless Congress adjourns meanwhile, when it lapses. No order, resolution, or vote of the concurrent Houses is valid without the assent of the President, except one to adjourn.

The powers of Congress are generally those inherent in every sovereign assembly of the people; but there are two important restrictions. The President's veto (above) is a very real restraint on tyranny by a bare majority, perhaps not honestly obtained and always inviting dishonesty with such supreme power; and it retains full vitality, while the English royal veto has perished. Still more important is its confinement by the Constitution to the powers expressly granted: its laws are invalid if pronounced by the supreme court contrary to the Constitution, while a majority vote of the English Parliament could theoretically abolish the monarchy or hang the entire population. Too much is sometimes made of this, however. The "implied powers" of caring for the national welfare have been found in practice elastic enough for every claim of sovereignty. As to the supreme court, it is the creature of an act of Congress and could be abolished by another (as a whole system of national courts actually was); more simply, it can be and has been swamped and packed to reverse an unpopular decision, and if its decisions are defied (as they were under Jackson), it is powerless to enforce them. Hence it is very cautious about deciding "political" issues of burning intensity (see CHEROKEE CASE), except in the sense of the majority, or opposing a strong current of popular feeling. In a word, Congress is the ultimate sovereign. Its inhibitions by the Constitution reflect past history and the politics of the time curiously enough. It is not to prohibit the slave-trade before 1808, and not to grant titles of nobility — conversely, no one is to receive office, title, or gift from any foreign potentate without its consent; it is not to suspend the habeas corpus except on account of rebellion or invasion, not to pass bills of attainder, not to lay export taxes, nor direct taxes except in proportion to population, not to give preferential duties between the States, or enforce clearances at ports outside a vessel's destined State. Not all of these things were needless fetters; and certainly the prohibition from drawing money except on regular appropriations, and the injunction to publish the disposition of the money drawn, was not one.

There being at present 45 States, the number of senators is 90. The number of representatives has never been determined by the Constitutional provision, whose minimum was fixed when the country had but 2,500,000 or so of inhabitants. A maximum of desirable numbers has been fixed, and this has been slowly enlarged from the reluctance at each census to reduce the actual number of representatives in Congress from any given State; hence each has retained all it had, but the States with increased population have been given more members. In January 1901, on the basis of the census of 1900, Congress fixed the number at 386, to take effect 3 March 1903. The State membership was as follows: Arkansas, 7; California, 8; Colorado, 3; Connecticut, 5; Delaware, 1; Florida, 3; Georgia, 11; Idaho, 1; Illinois, 25; Indiana, 13; Iowa, 11; Kansas, 8; Kentucky, 11; Louisiana, 7; Maine, 4; Maryland, 6; Massachusetts, 14; Michigan, 12; Minnesota, 9; Mississippi, 8; Missouri, 16; Montana, 1; Nebraska, 6; Nevada, 1; New Hampshire, 2; New Jersey, 10; New York, 37; North Carolina, 10; North Dakota, 2; Ohio, 21; Oregon, 2; Pennsylvania, 32; Rhode Island, 2; South Carolina, 7; South Dakota, 2; Tennessee, 10; Texas, 16; Utah, 1; Vermont, 2; Virginia, 10; Washington, 2; West Virginia, 5; Wisconsin, 11; Wyoming, 1.

2. Each house has its own system of rules for business (78 in the Senate, 45 in the House), with vital differences. The most far-reaching is the previous question in the House and the absence of it in the Senate. The reasons for the difference are obvious: the great number of representatives, and the fact that most bills are first introduced there, would make business not merely difficult but impossible if every one could talk at will to any length; the smaller numbers and lesser business of the Senate enable free debate to be retained. The House restricts speeches to an hour; the Senate has no restriction except that a member cannot speak

over twice a day on the same question. Each system of course has its attendant possibility of evil: the suppression of needful public light on bills in the one case, "filibustering" and holding up of public business by a factious or interested minority in the other. The business of both Houses is done by committees; neither will consider bills or memorials at once on presentation, except on suspension of the rules — which to be sure, during the latest days of a session, lets through vast numbers of undebated, unexamined, and unknown bills. But by rule they must be referred to some standing committee, of which there are now 48 in the House and 32 in the Senate, besides 10 select committees in the House and 12 in the Senate; and three joint standing committees. The functions of these committees are assigned by the rules; but as these lap over, two or three committees often contend vigorously for the possession of some one bill. In the Senate, these bills are presented in open session on the floor; in the House, they are handed to the clerk, indorsed with such reference or disposition as the presenting member wishes made. These committees are appointed in the House by the speaker; in the Senate they are chosen by caucus of the majority party, and elected by a single yea and nay vote, though the rules say by ballot "unless otherwise ordered." In case of difference between the Houses, which continually occurs, they are harmonized by committees of conference, three senators and three representatives. The most steadily powerful of these committees, which can obtain the floor at any time, are those on Appropriations in each House, disbursing the money in the treasury, and on Privileges and Elections, deciding the right of every member to his seat; next to these, on revenue (Ways and Means in the House, Finance in the Senate), with enormous power to help or harm the great businesses of the country — many think too much — and on Printing, which of course is an immediate matter. Next in actual favor come, perhaps, those on Rivers and Harbors and on Pensions, branches of that on Appropriations which they involve; and when new States are to be admitted, on Territories. In formal dignity the Senate committees on Foreign Affairs, on the Judiciary, and on Military and Naval Affairs, take high rank; so in the House do those on Rules, Foreign Affairs, Judiciary, Military Affairs, and Naval Affairs; and of course special circumstances at any time may temporarily make any one of these, or almost any other committee, the centre of interest to which everything else must give way. In some respects most important of all except the Appropriations Committee are the special conference committees, which do an immense share of the actual legislation of the country: they compromise conflicting business and political interests, include or exclude bills, decide on appropriations, etc., and being usually appointed in the crowded closing days of a session, generally have their recommendations heeded.

3. The changes in congressional functions and relations, from the intent of the framers of the Constitution, come under three heads: (1) the position of Congress as a whole regarding the executive; (2) the position of the two Houses regarding each other; (3) the position of the whole body regarding legislation.

(1) The Constitution attempted a total separation and absolute equality between the executive and legislative branches, the latter deciding on measures of public welfare and the former carrying them out. How far this would be desirable if perfectly accomplished — altogether forbidding one branch of the government to think and the other to act — might be questioned, but will not be argued here. At any rate, it was never remotely realized except when both were in deadly need of the same thing, or one was content to forego thinking. The ideal example of its best is probably the Lincoln administration, a strong executive and a strong Congress with the same essential purposes; of its worst, the Johnson administration, where the thoughts of the one and the acts of the other were at irreconcilable variance, and what the one most wished done was what the other was most set on not doing. More usually, one side or the other has been master. The extreme instance of executive mastery was the Jackson administration, where a resolute and aggressive leader, with a not too reflective popular majority behind him, got such legislation as he wished; of congressional mastery, each reader may prefer to choose his own instance. But there can be no question that the balance inclines more and more decisively to the congressional side. Of late years the results of attempted executive independence have been more picturesque than successful. The Senate, which has the confirmation of treaties and appointments, cannot be prevented from signifying in some form what treaties and appointments it will confirm; and the body which can grant or refuse money for public purposes can decide what those purposes shall be.

(2) The change of power between the Houses is not so dramatically obvious, but it is quite as notorious, and is easily explicable. The Senate has some superiorities: its long terms both attract superior men on an average, and enable them to acquire parliamentary knowledge and public weight; its committees are still its servants rather than its masters — preparing legislation for it to discuss, rather than merely killing most of it, and leaving the rest to run in an undiscussed huddle through the open sluice at the last; and it has time and rules that permit some genuine argument, for its own and the public's enlightenment. But these very terms render seats so valuable and desirable that members are more loath to peril them than House seats; and the Senate, which was expected to have more independence than the House from the length of terms, has actually of late years had less backbone and less willingness to run counter to popular currents within its own party than the House. Moreover, the license of debate has too often been a mere license of wanton obstruction, bringing forward no new facts or illuminating discussion, but only exhibiting the spectacle of the will of 80,000,000 people nullified by one or two of its servants. This does not contradict, but only supplements, the other evil. On the other hand, the unity and despatch of public business made possible in the House by the nominal autocracy and real leadership of the speaker, aided by the committees and the previous question, have made it seem more and more the body where something is accomplished, and the will of the people carried into execution.

(3) The drift of our form of government, and the coming position of Congress and its organs within it, are to some extent matters of prophecy rather than fact; and political philosophers have been busy with them. But some things are certain, and though commonplace, must be recited. Chief of them are the control of the speaker and the committees over legislation. That the speaker is a totally different officer from the English speaker is obvious. He puts motions, decides question of rule and order, and represses disorder, it is true; but instead of being a sworn judge he is a recognized party chief, with functions which approximate the English premier much more closely than the other. By his appointment of the committees he determines the line which legislation shall take, and in a broad way the bills which shall or shall not be considered; and by his daily power of recognizing members who wish the floor, in which he is held to none but party responsibility, he still further molds the total impression which the measures shall make on the public. But he is no autocrat; his very influence can only be exercised by appointing the chief party leaders to the committees, and once there, it is they and not he who hold the decisive power; he and they together, in fact, form something like the shaping committee which is what the English Cabinet, headed by the premier, has fully become. The Cabinet officers, moreover, are fast becoming advisers of the committees rather than of the President: he does not need their advice in knowing how to act, nearly as much as the committees need it in knowing what to think. These approximations to the English position have caused many to think that the transformation will be fully carried out, and the parliamentary system established in fact if not in form in the future; the speaker having the full power of the premier, and the President becoming a dignified nullity like the sovereign of England. But there are still some vital differences, and it is not easy to foresee the process by which they will be overcome. It is true that the admission of Cabinet officers to the floor of either House, to expound their views and needs and explain doubtful questions, is within a simple permissive vote of that House at any time, and can perfectly well be made a standing rule; and that the consequent necessity of their being skilful speakers and capable expositors would profoundly modify the character of men chosen for that position. But the committee do not want information on the floor of the House of Representatives at least: they have no time to attend to it there, and the rules would mostly shut it off before anything material had been communicated. They want it in their committee rooms, and that needs no change in the men and would involve none before the public. The officers cannot become primarily public speakers and secondarily executive officers unless the House gives up its time to debate; and the whole tendency is the other way, nor is it evident where the new time would be found or taken. The place where the change would have to take place is in the Senate if at all: but the power of legislation more and more drifts away from the Senate except as concurrent; and the new debaters, if they arrive, will seemingly be more in the position of those in the House of Lords than of Commons, which would be immaterial. Still greater is the obstacle of fixed terms. The English members of the Commons remain no longer when the people vote that they do not want them, and it is consequently the great party object to obtain such a vote, and to put the other party in a position where they must be disgraced if they do not ask the people to give one pro or con. But the American member must serve out his term, and he can do so if his party has lost all public favor: the tremendous sweep of 1874 did not shorten any Republican member's term for a day, nor imperil any piece of Republican legislation, for which they had an entire session after they were voted down, and as many special ones as the President had chosen to call; and similarly with reverses of the other side. This alone prevents debate from taking up time in the House; it is mainly a sham battle, the real one having been fought in committee. Still further, the English committee called the Cabinet is all of one party, represents it, goes down with it; and the bills it puts forward are the party's bills. But the American committees, though with a party majority, include both parties, and the measures they bring in are not specifically or nominally the party's programme; still less are the bills which are hammered into shape by the conference committees, representing neither one party nor one House. The American Cabinet of speaker and committees cannot be held to such corporate responsibility, and there is no prospect of their so being held.

SESSIONS OF CONGRESS.

I. 1st session, 4 March to 29 Sept. 1789; 2d session, 4 Jan. to 12 Aug. 1790; 3d session, 6 Dec. 1790 to 3 March 1791.

II. 1st session, 24 Oct. 1791 to 8 May 1792; 2d session, 5 Nov. 1792 to 2 March 1793.

III. 1st session, 2 Dec. 1793 to 9 June 1794; 2d session, 3 Nov. 1794 to 3 March 1795.

IV. 1st session, 7 Dec. 1795 to 1 June 1796; 2d session, 5 Dec. 1796 to 3 March 1797.

V. 1st session, 15 May to 10 July 1796; 2d session, 13 Nov. 1797 to 16 July 1798; 3d session, 3 Dec. 1798 to 3 March 1799.

VI. 1st session, 2 Dec. 1799 to 14 May 1800; 2d session, 17 Nov. 1800 to 3 March 1801.

VII. 1st session, 7 Dec. 1801 to 3 May 1802; 2d session, 6 Dec. 1802 to 3 March 1803.

VIII. 1st session, 17 Oct. 1803 to 27 March 1804; 2d session, 5 Nov. 1804 to 3 March 1805.

IX. 1st session, 2 Dec. 1805 to 21 April 1806; 2d session, 1 Dec. 1806 to 3 March 1807.

X. 1st session, 26 Oct. 1807 to 25 April 1808; 2d session, 7 Nov. 1808 to 3 March 1809.

XI. 1st session, 22 May to 28 June 1809; 2d session, 27 Nov. 1809 to 1 May 1810; 3d session, 3 Dec. 1810 to 3 March 1811.

XII. 1st session, 4 Nov. 1811 to 6 July 1812; 2d session, 2 Nov. 1812 to 3 March 1813.

XIII. 1st session, 24 May to 2 Aug. 1813; 2d session, 6 Dec. 1813 to 18 April 1814; 3d session, 19 Sept. 1814 to 3 March 1815.

XIV. 1st session, 4 Dec. 1815 to 30 April 1816; 2d session, 2 Dec. 1816 to 3 March 1817.

XV. 1st session, 1 Dec. 1817 to 30 April 1818; 2d session, 16 Nov. 1818 to 3 March 1819.

XVI. 1st session, 6 Dec. 1819 to 15 May 1820; 2d session, 13 Nov. 1820 to 3 March 1821.

XVII. 1st session, 3 Dec. 1821 to 8 May 1822; 2d session, 2 Dec. 1822 to 3 March 1823.

XVIII. 1st session, 1 Dec. 1823 to 27 May 1824; 2d session, 6 Dec. 1824 to 3 March 1825.

XIX. 1st session, 5 Dec. 1825 to 22 May 1826; 2d session, 4 Dec. 1826 to 3 March 1827.

XX. 1st session, 3 Dec. 1827 to 26 May 1828; 2d session, 1 Dec. 1828 to 3 March 1829.

XXI. 1st session, 7 Dec. 1829 to 31 May 1830; 2d session, 6 Dec. 1830 to 3 March 1831.

XXII. 1st session, 5 Dec. 1831 to 16 July 1832; 2d session, 3 Dec. 1832 to 3 March 1833.

XXIII. 1st session, 2 Dec. 1833 to 30 June 1834; 2d session, 1 Dec. 1834 to 3 March 1835.

XXIV. 1st session, 7 Dec. 1835 to 4 July 1836; 2d session, 5 Dec. 1836 to 3 March 1837.

XXV. 1st session, 4 Sept. to 16 Oct. 1837; 2d session, 4 Dec. 1837 to 9 July 1838; 3d session, 3 Dec. 1838 to 3 March 1839.

XXVI. 1st session, 2 Dec. 1839 to 21 July 1840; 2d session, 7 Dec. 1840 to 3 March 1841.

XXVII. 1st session, 31 May to 13 Sept. 1841; 2d session, 6 Dec. 1841 to 31 Aug. 1842; 3d session, 5 Dec. 1842 to 3 March 1843.

XXVIII. 1st session, 4 Dec. 1843 to 17 June 1844; 2d session, 2 Dec. 1844 to 3 March 1845.

XXIX. 1st session, 1 Dec. 1845 to 10 Aug. 1846; 2d session, 7 Dec. 1846 to 3 March 1847.

XXX. 1st session, 6 Dec. 1847 to 14 Aug. 1848; 2d session, 4 Dec. 1848 to 3 March 1849.

XXXI. 1st session, 3 Dec. 1849 to 30 Sept. 1850; 2d session, 2 Dec. 1850 to 3 March 1851.

XXXII. 1st session, 1 Dec. 1851 to 31 Aug. 1852; 2d session, 6 Dec. 1852 to 3 March 1853.

XXXIII. 1st session, 5 Dec. 1853 to 7 Aug. 1854; 2d session, 4 Dec. 1854 to 3 March 1855.

XXXIV. 1st session, 3 Dec. 1854 to 18 Aug. 1855; 2d session, 21–30 Aug. 1856; 3d session, 1 Dec. 1856 to 3 March 1857.

XXXV. 1st session, 7 Dec. 1857 to 1 June 1858; 2d session, 6 Dec. 1858 to 3 March 1859.

XXXVI. 1st session, 5 Dec. 1859 to 18 June 1860; 2d session, 3 Dec. 1860 to 3 March 1861.

XXXVII. 1st session, 4 July to 6 Aug. 1861; 2d session, 2 Dec. 1861 to 17 July 1862; 3d session, 1 Dec. 1862 to 3 March 1863.

XXXVIII. 1st session, 7 Dec. 1863 to 2 July 1864; 2d session, 5 Dec. 1864 to 3 March 1865.

XXXIX. 1st session, 4 Dec. 1865 to 28 July 1866; 2d session, 3 Dec. 1866 to 3 March 1867.

XL. 1st session, 4–29 March, 3–20 July, 21 Nov. to 2 Dec. 1867; 2d session, 2 Dec. 1867 to 27 July, 21 Sept. 16 Oct. and 10 Nov. 1868; 3d session, 7 Dec. 1868 to 3 March 1869.

XLI. 1st session, 4 March to 10 April 1869; 2d session, 6 Dec. 1869 to 15 July 1870; 3d session, 5 Dec. 1870 to 3 March 1871.

XLII. 1st session, 4 March to 20 April 1871; 2d session, 4 Dec. 1871 to 10 June 1872; 3d session, 2 Dec. 1872 to 3 Dec. 1873.

XLIII. 1st session, 1 Dec. 1873 to 23 June 1874; 2d session, 7 Dec. 1874 to 3 March 1875.

XLIV. 1st session, 6 Dec. 1875 to 15 Aug. 1876; 2d session, 4 Dec. 1876 to 3 March 1877.

XLV. 1st session, 15 Oct. to 3 Dec. 1877; 2d session, 3 Dec. 1877 to 20 June 1878; 3d session, 2 Dec. 1878 to 3 March 1879.

XLVI. 1st session, 18 March to 1 July 1879; 2d session, 1 Dec. 1879 to 16 June 1880; 3d session, 6 Dec. 1880 to 3 March 1881.

XLVII. Special session of the Senate, 10–29 Oct. 1881; 1st session, 5 Dec. 1881 to 8 Aug. 1882; 2d session, 4 Dec. 1882 to 3 March 1883.

XLVIII. 1st session, 3 Dec. 1883 to 7 July 1884; 2d session, 1 Dec. 1884 to 3 March 1885.

XLIX. 1st session, 7 Dec. 1885 to 5 Aug. 1886; 2d session, 6 Dec. 1886 to 3 March 1887.

L. 1st session, 5 Dec. 1887 to 20 Oct. 1888; 2d session, 3 Dec. 1888 to 4 March 1889.

LI. 1st session, 2 Dec. 1889 to 1 Oct. 1890; 2d session, 1 Dec. 1890 to 3 March 1891.

LII. 1st session, 7 Dec. 1891 to 5 Aug. 1892; 2d session, 5 Dec. 1892 to 3 March 1893.

LIII. Special session of the Senate, 4 March to 15 April 1893; 1st session, 7 Aug. to 3 Nov. 1893; 2d session, 4 Dec. 1893 to 28 Aug. 1894; 3d session, 3 Dec. 1894 to 4 March 1895.

LIV. 1st session, 2 Dec. 1895 to 11 June 1896; 2d session, 7 Dec. 1896 to 3 March 1897.

LV. 1st session, 15 March to 24 July 1897; 2d session, 6 Dec. 1897 to 8 July 1898; 3d session, 5 Dec. 1898 to 4 March 1899.

LVI. 1st session, 4 Dec. 1899 to 7 June 1900; 2d session, 3 Dec. 1900 to 4 March 1901.

LVII. 1st session, 2 Dec. 1901 to 1 July 1902; 2d session, 1 Dec. 1902 to 4 March 1903.

LVIII. Special session of the Senate, 5 to 16 March 1903.

PRESIDENTS PRO TEM. OF THE SENATE.

Years	Name	State
1789-1792	John Langdon	N. H.
1792	Richard H. Lee	Va.
1792-1794	John Langdon	N. H.
1794-1795	Ralph Izard	S. C.
1795-1796	Henry Tazewell	Va.
1796-1797	Samuel Livermore	N. H.
1797	William Bingham	Pa.
1797	William Bradford	R. I.
1797-1798	Jacob Read	S. C.
1798	Theo. Sedgwick	Mass.
1798-1799	John Laurence	N. Y.
1799	James Ross	Pa.
1799-1800	Samuel Livermore	N. H.
1800	Uriah Tracy	Conn.
1800-1801	John E. Howard	Md.
1801	James Hillhouse	Conn.
1801-1802	Abraham Baldwin	Ga.
1802-1803	Stephen R. Bradley	Vt.
1803-1804	John Brown	Ky.
1804-1805	Jesse Franklin	N. C.
1805	Joseph Anderson	Tenn.
1805-1808	Samuel Smith	Md.
1808-1809	Stephen R. Bradley	Vt.
1809	John Milledge	Ga.
1809-1810	Andrew Gregg	Pa.
1810-1811	John Gaillard	S. C.
1811-1812	John Pope	Ky.
1812-1813	Wm. H. Crawford	Ga.
1813-1814	Jos. B. Varnum	Mass.
1814-1818	John Gaillard	S. C.
1818-1819	James Barbour	Va.
1820-1826	John Gaillard	S. C.
1826-1828	Nathaniel Macon	N. C.
1828-1832	Samuel Smith	Md.
1832	L. W. Tazewell	Va.
1832-1834	Hugh L. White	Tenn.
1834-1835	Geo. Poindexter	Miss.
1835-1836	John Tyler	Va.
1836-1841	William R. King	Ala.
1841-1842	Samuel L. Southard	N. J.
1842-1846	W. P. Mangum	N. C.
1846-1849	D. R. Atchison	Mo.
1850-1852	William R. King	Ala.
1852-1854	D. R. Atchison	Mo.
1854-1857	Jesse D. Bright	Ind.
1857	James M. Mason	Va.
1857-1861	Benj. Fitzpatrick	Ala.
1861-1864	Solomon Foot	Vt.
1864-1865	Daniel Clark	N. H.
1865-1867	Lafayette S. Foster	Conn.
1867-1869	Benjamin F. Wade	Ohio.
1869-1873	Henry B. Anthony	R. I.
1873-1875	M. H. Carpenter	Wis.
1875-1879	Thomas W. Ferry	Mich.
1879-1881	A. G. Thurman	Ohio.
1881	Thomas F. Bayard	Del.
1881-1883	David Davis	Ill.
1883-1885	Geo. F. Edmunds	Vt.
1885-1887	John Sherman	Ohio.
1887-1891	John J. Ingalls	Kan.
1891-1893	C. F. Manderson	Neb.
1893-1895	Isham G. Harris	Tenn.
1895-	William P. Frye	Me.

CONGRESSIONAL LIBRARY, WASHINGTON, D. C.

SPEAKERS OF THE HOUSE OF REPRESENTATIVES.

Years	Name	Party	State
1789-1791	F. A. Muhlenburg....	Dem.	Pa.
1791-1793	Jonathan Trumbull...	Fed.	Conn.
1793-1795	F. A. Muhlenburg...	Dem.	Pa.
1795-1799	Jonathan Dayton.....	Fed.	N. J.
1799-1801	Theodore Sedgwick...	Fed.	Mass.
1801-1807	Nathaniel Macon.....	Dem.	N. C.
1807-1811	Joseph B. Varnum...	Dem.	Mass.
1811-1814	Henry Clay.....	Dem.	Ky.
1814-1815	Langdon Cheves.....	Dem.	S. C.
1815-1820	Henry Clay.....	Dem.	Ky.
1820-1821	John W. Taylor.....	Dem.	N. Y.
1821-1823	Philip P. Barbour....	Dem.	Va.
1823-1825	Henry Clay.....	Dem.	Ky.
1825-1827	John W. Taylor.....	Dem.	N. Y.
1827-1834	Andrew Stevenson...	Dem.	Va.
1834-1835	John Bell.....	Whig	Tenn.
1835-1839	James K. Polk.....	Dem.	Tenn.
1839-1841	R. M. T. Hunter....	Whig	Va.
1841-1843	John White.....	Whig	Ky.
1843-1845	John W. Jones.....	Dem.	Va.
1845-1847	John W. Davis.....	Dem.	Ind.
1847-1849	Robert C. Winthrop..	Whig	Mass.
1849-1851	Howell Cobb.....	Dem.	Ga.
1851-1855	Linn Boyd.....	Dem.	Ky.
1855-1857	Nathaniel P. Banks..	Rep.	Mass.
1857-1859	James L. Orr.....	Dem.	S. C.
1859-1861	Wm. Pennington.....	Rep.	N. J.
1861-1863	Galusha A. Grow....	Rep.	Pa.
1863-1869	Schuyler Colfax.....	Rep.	Ind.
1869-1875	James G. Blaine....	Rep.	Me.
1875-1876	Michael C. Kerr.....	Dem.	Ind.
1876-1881	Samuel J. Randall...	Dem.	Pa.
1881-1883	John W. Keifer.....	Rep.	Ohio.
1883-1889	John G. Carlisle....	Dem.	Ky.
1889-1891	Thomas B. Reed.....	Rep.	Me.
1891-1895	Charles F. Crisp.....	Dem.	Ga.
1895-1899	Thomas B. Reed.....	Rep.	Me.
1899-1903	David B. Henderson.	Rep.	Ia.
1903-	Joseph G. Cannon....	Rep.	Ill.

F. M. COCKRELL,
United States Senator from Missouri.

Congressional Library Building, the home of the library of the United States Congress, opened in 1897 and authorized by acts of Congress of 15 April 1886; 2 Oct. 1888, and 2 March 1889, at a cost of $6,347,000 (limit by law), $6,500,000) exclusive of the land, which cost $585,000. The building occupies three and three quarter acres upon a site 10 acres in extent at a distance 1,270 feet east of the capitol, and is the largest and most magnificent library building in the world. In the decorations, some 40 painters and sculptors are represented, all American citizens. The floor space is 326,195 square feet, or nearly eight acres. The book stacks contain about 45 miles of shelving, affording space for 2,200,000 volumes. Were the long corridors, now used in part for exhibition purposes, completely shelved, the building would accommodate over 4,000,000 volumes. The library contains a reading room for the blind, open daily. The library is maintained by annual appropriations by Congress for various purposes. For the year 1899–1900 this amounted to $213,452 for services (including the copyright department, and including, also, the care of the building); and $26,500 for fuel, supplies, miscellaneous purposes, including contingent expenses.

Congressional Record, a journal of the proceedings of the Congress of the United States, dating from 1799. Prior to that date the Senate held secret sessions only, but thereafter publication was required, save in the case of "executive sessions." 'Record' has been the title since 1875; before that date the journal was entitled 'Annals of Congress' (1789–99 for the House, and 1799–1824 for both branches), 'Register of Debates' until 1837, and through 1874 'Congressional Globe.' Undelivered speeches on the grant of "permission to print" appear in the 'Record' as if they had actually been given, and stenographic reports of debates are revised by the participants before being printed.

Congressman at Large, a national representative elected by the entire State and not as a member for some district. There is no permanent system of the sort, though many able political thinkers have wished for it, and believed it would greatly raise the average of ability in the House; preventing the restriction of choice to the mediocre notabilities who chance to reside in a given district. In fact, however, there is no legal obstacle now to the voters of a district electing an outsider if they wish; but they rarely wish it, and if the general system were introduced, the experience of other political affairs makes it probable that the memberships would be "claimed" by given districts in rotation. At present, the only use of the plan is in giving a State the fresh memberships assigned to it by the apportionment under a new census, until it can be redistricted, which is sometimes a long process with fierce political opposition. Many States have had one congressman at large, and some two.

Congreve, kŏn'grēv, **Richard,** English essayist: b. Leamington, Eng., 4 Sept. 1818; d. Hampstead, Eng., 5 July 1899. He was educated at Rugby and Oxford and was subsequently a tutor in Wadham College, Oxford, resigning his post on becoming a Positivist. Beside editing Aristotle's 'Politics' with notes (1855); he published 'The Catechism of Positivist Religion' (1858); 'Elizabeth of England' (1862); 'Essays: Political, Social, and Religious' (1874).

Congreve, William, English dramatist: b. Bardsey, near Leeds, 1670; d. London 19 Jan. 1729. He entered the Middle Temple, London, to prepare himself for the legal profession, but soon deserted the law for literature. At a very early age he wrote a novel entitled 'Incognita,' followed by his comedy of the 'Old Bachelor,' produced in 1693, and pronounced by Dryden the greatest first play that he had ever beheld. His next play, the 'Double Dealer' (1693), was not so successful in representation; but his third, the comedy of 'Love for Love' (1695), proved extremely popular. Its success acquired for the author the patronage of Lord Halifax, who conferred on him several very lucrative posts, so that he was far more prosperous than most men of letters. Not content with his fame in comedy, he essayed tragedy; and in 1697 produced his 'Mourning Bride,' the reception of which was extremely favorable. The composition of four such plays before he had attained the age of 28 is a remarkable proof of early genius in a line of composition demanding great observation and experience. The license of his writings caused him to be attacked by Jeremy Collier in his 'Short View of the Immorality and Profaneness of the English Stage,' to which Congreve published a lame and ineffective reply. He soon after closed his dramatic career with the 'Way of the World' (1700), considered by many critics as the most perfect of his comedies, but which was received so coldly that he resentfully determined to relinquish a species of writing in which, upon the whole, he had been eminently successful. A masque, entitled the 'Judgment of Paris,' and 'Semele,' an opera, the

latter of which was never presented, close the list of his labors for the stage. He, however, continued to write occasional verses on public subjects; and in 1710 published a collection of his plays and poems. Dryden declared him to be the equal of Shakespeare. Steele dedicated to him his 'Miscellanies,' and Pope his translation of the Iliad. He was buried in Westminster Abbey, where a monument was erected to him by the Duchess of Marlborough. Congreve's comedies are chiefly distinguished for the sustained flow of wit in the dialogue. But his characters are repulsive. It is now rare for any of his plays to appear on the stage, which without pruning, to adapt them to modern manners, it would be impossible for them to do. His poetry is of little value. Consult Macaulay, 'Comic Dramatists of the Restoration'; Hazlitt, 'Lectures on the English Comic Writers'; Gosse, 'Life of Congreve' (1888).

Congreve, Sir **William,** English inventor: b. 20 May 1772; d. Toulouse, France, 16 May 1828. After passing through the Royal Academy at Woolwich he entered the artillery in 1791, served under his father, a lieutenant-general, and in 1814 succeeded him in his post of comptroller, and also as second holder of the baronetcy, conferred in 1812. He invented the rocket which bears his name about 1804. It was first used in active service in the attack on Boulogne, 1806, and on Copenhagen 1807. He took an active part in army improvements; became a Fellow of the Royal Society in 1811; obtained a patent for manufacturing gunpowder in 1815; and one for the manufacture of bank-note paper in 1819.

Con'gruism, Congruist, terms derived from the expression *meritum e congruo,* which signifies the view of some writers on the doctrine of divine grace and human merit, that though a man may not in the strict sense merit a given grace or favor of God he may be said to merit in a looser sense, on the ground that there is a certain congruity, a certain fitness with what we believe concerning the relation between man and his Creator, in assuming that the Creator will out of his infinite mercy grant to his faithful servants favors that they do not in any tolerable sense of the word merit. An example of *meritum e congruo* is had when a saintly man by his prayers obtains the conversion of a sinner: that conversion is not merited at all in any strict sense: but it is congruous, it is what we like to think about the Creator's love for his chosen ones, that he should be moved to grant the petition of one who is admitted to his friendship.

Conhydrin, kŏn-hī'drĭn, a substance contained, along with conia, in the flowers and seeds of the hemlock. The physiological action of conhydrin resembles that of conia, but it is not nearly so rapid or powerful. See Conia.

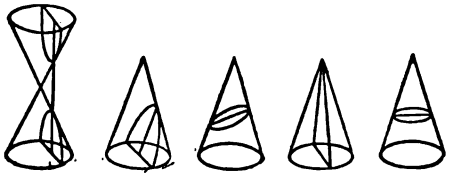
Coni, kō'nē, or **Cuneo,** koo-nā'ō, a town of Italy, capital of the province and district of Coni, on a high hill, at the confluence of the Stura and the Gesso, about 50 miles south of Turin, in a pleasant, well-cultivated district. The old fortifications, the arcades along the principal street, a Franciscan church of the 12th century, a handsome town-house, with a tall tower, and a cathedral, are the picturesque items of the town. There are silk spinning-mills, and manufactures of silk and woolen goods. Grain, hemp, and silk form articles of commerce. It was taken by Napoleon in 1796, by the Austrians in 1799, and again given up to the French in 1801. Pop. (1901) 27,065.

Conia, or **Coniine** ($C_8H_{17}N$), an alkaloid in the hemlock, discovered in an impure state by Giesecke in 1827, and subsequently prepared in the pure state by Geiger, who recognized it as a vegetable base. It exists, combined with malic acid, in all parts of the plant, but especially in the not quite ripe seed. When pure it is a colorless oily liquid, specific gravity 0.89, which changes by exposure to air to a brown fluid, and ultimately to a resinous, bitter mass, slightly soluble in water, soluble in alcohol, and when purified yielding a jelly with a butyric odor. It can be distilled without much alteration, provided the air be excluded, its boiling-point being 168° C. At a higher temperature it burns with a bright smoky flame. It is slightly volatile even at ordinary temperatures. It has a very disagreeable odor, sharp and choking when strong; its taste is nauseous. It is somewhat soluble in water, readily in alcohol, ether, and oils, and itself acts as a solvent of sulphur. It has a strong alkaline reaction when moist, and combines with the acids to form salts, most of which are crystalline but deliquescent. The salts are unstable in aqueous solution; they evolve the odor of the base and gradually change color. It precipitates the oxides of iron, zinc, manganese, aluminum, copper, and the other heavy metals, from solutions of their salts. It is attacked by chlorine, bromine, and iodine, and oxidized by nitric acid, yielding butyric acid. The poisonous action of conia has been minutely investigated, but although it has been proved to be rapidly fatal to all classes of animals when administered in doses of from 3 or 4 to 10 or 12 grains, the nature of its action is not fully ascertained; but the breathing and pulse are affected, and the extremities paralyzed. Some experimenters have tried its effect upon themselves, and according to their account the minutest doses produce burning in the mouth, salivation, nausea, and vomiting, pressure in the head, tottering, indistinct vision, cramps, and other symptoms. Similar observations have been made on persons to whom the alkaloid has been given therapeutically. It has been shown that conia can be detected in a poisoned animal, even after a considerable time. The tonic power of conia seems to be little if at all affected by the introduction into it of the alcoholic radicals, methyl, and ethyl. The action is perhaps not so rapid, but it is the same in character, and takes place with quite as small quantities. In this respect conia differs from some other alkaloids, for instance, codeia.

Conibo, kō-nē'bō, a tribe of Indians in eastern Peru, allied to the Ucayali tribe. They were an agricultural people and built villages. The Spanish missionaries tried to convert them in 1683, but were driven out after 1695, when Father Ritchie was killed by the savages. They are now partially civilized and are often employed as canoe men and rubber gatherers.

Conic Sections, three curves, the hyperbola, the parabola, and the ellipse, are called the conic sections, because these curves are formed by the intersection of the surface of a cone with planes that cut the cone in various directions. If the cutting-plane be parallel to the axis of the cone (fig. 1), the curve formed is

the hyperbola, which has two branches, as shown in the figure. If the cutting-plane be parallel to a straight line on the surface of the cone (fig. 2), the curve formed is a parabola. Any other section is an ellipse (fig. 3). It must be noticed, however, that this general description includes three peculiar cases. In the case of a plane parallel to the axis of the cone, when that plane contains the axis, the section, instead of being a hyperbola,



is in this limiting case a pair of straight lines meeting each other at an angle equal to that of the angle of the cone so as to form a triangle (fig. 4). When a plane, which would otherwise form a parabolic section, is a tangent plane to the cone, the parabola degenerates into a straight line passing through the vertex of the cone. Lastly, when a plane that would otherwise form an ellipse is perpendicular to the axis of the cone, the ellipse becomes a circle (fig. 5). The properties of these curves are discussed under their several names. It will there be seen that other definitions may be given of the curves; and that from these their properties are more conveniently derived than from the consideration that they are formed by the sections of a conical surface. The properties of these curves are of the greatest physical interest; and the geometry of the conic sections has, ever since the time of the Greek mathematicians, been considered as the best of the more advanced geometrical studies.

Coniferæ, kō-nĭf'ẹ-rē, a natural order of trees and shrubs consisting of about 40 genera and 300 species, which are most numerous in the temperate regions of the world, especially in the northern hemisphere. Among the few species found in the tropics, the most important are those belonging to the genera *Araucaria* (q.v.), *Dammara, Phyllocladus,* and *Dacrydium.* In the Arctic region and the correspondingly cold mountain climates various conifers approach very nearly the line of perpetual snow, and like other plants of such climates are reduced to gnarly dwarfed specimens which bear but slight resemblance to those of the same species in less rigorous climates. In the United States and Canada 15 genera and about 100 species and sub-species are indigenous and of these the majority are native to the Pacific coast. In addition to the number of species mentioned fully 400 horticultural varieties must be added. These are listed in Bulletin No. 17 of the Division of Forestry, U. S. Dept. of Agriculture.

No forest trees are of more economic importance than the conifers. Their notable blending of maximum strength, stiffness and durability with minimum weight, and their abundance have won them prominence in house, ship, and bridge building, wharf making and sidewalk constructing, etc. They are also of great importance in planting, both for use and ornament, their evergreen habit (except in Ginkgo and Larix) and the retention of their lower limbs until comparative age, making them especially good for wind breaks; and these characters coupled with their conical form and the striking colors of their foliage rendering them particularly useful for grouping with deciduous trees and shrubs or for individual specimens in parks and upon lawns.

The species are characterized by straight shafts which elongate terminally, and like the shape of the trees, form a more or less attenuated cone, the species of which have broad leaves. They have either needle-shaped or awl-shaped leaves (except in *Podocarous*) which are specially adapted by these forms and by the thickened epidermis to resist excessive transpiration, a necessary adaptation since the leaves are usually retained throughout the year. They have naked ovules which are fertilized directly by the exceedingly light pollen which is produced in enormous quantities and carried by the wind even miles away from the forests, to fall as so-called "showers of sulphur." These ovules are borne in a "strobilus" which enlarges after fertilization into what is popularly known as the cone, the order being named from this character. The cone is an aggregation of scales, above the bases of which are borne the seeds. These are in some species utilized as food, and have been introduced in the markets of the United States by the Syrians. The internal structure of the *Coniferæ* is also peculiar to the group. Like the dicotyledons, the woody cylinder increases in girth by the external development, beneath the bark, of homogeneous woody fibres marked on two sides with circular disks and among which are few true vessels. Since these woody fibres are fitted together without overlapping, the grain of the wood is fine and uniform, which accounts for its easy working qualities, especially in the direction of the "grain."

Botanists divide the species into two great sub-orders, the *Taxaceæ* and *Pinaceæ.* The former includes two tribes, *Podocarpeæ,* the leading genus of which is *Podocarpus,* with about 40 species, and *Taxeæ,* which consists of the genus *Taxus,* the yew. The species of this sub-order have more or less fleshy fruits. The *Pinaceæ* embraces four tribes: *Abietineæ,* the pine family proper, of which the principal genera are: *Pinus,* pine; *Picea,* spruce; *Tsuga,* hemlock; *Abies,* fir; and *Larix,* larch; *Taxodieæ* which includes *Taxodium,* the bald cypress; and *Sequoia,* the redwood; *Cupressineæ,* which includes *Thuya,* arborvitæ; and *Juniperus,* juniper; *Chamæcyparis,* cedar; *Araucariæ,* including *Araucaria,* Norfolk Island pine and its allies. (See separate articles upon the various groups, under their popular name titles, except *Araucaria* and *Sequoia* (qq.v.). The most widely distributed of these groups are undoubtedly the genera *Pinus* and *Juniperus,* and the most restricted are *Taxodium,* two species of which are indigenous to the United States and one to China; and *Sequoia,* of which only two species are known, both found in occasional groves on the Pacific Coast. During geological ages these two genera were far more widely distributed.

So far as is known from fossils conifers appeared on the earth in Silurian Time, though they may have appeared earlier. They increased and developed during Devonian Time and the Carboniferous. Unlike the acrogens (ferns,

ground-pines, and horse-tail rushes), the conifers have increased rather than declined since the Carboniferous. Species of the yew were abundant in North America in early Devonian Time. In the Carboniferous the gymnosperms that grew in the great swamps were related to the cycads and yews. True conifers may have grown upon the drier hillsides. The genus *Walchia* began near the close of the Carboniferous, and in Permian Time the conifers included species of *Dadoxylon, Pinites, Ullmania,* etc.; common Triassic conifers are the genera *Voltzia, Baiera,* and *Araucarites.*

Conifers are propagated by means of seeds which may usually be obtained in autumn, though some species open their cones at irregular intervals through the winter and others only when artificial heat such as that of a forest fire is applied. The seed should be planted in a sandy loam, given a light mulch, of pine needles or sphagnum moss, and the seedlings kept free from weeds. They must be kept moist but not wet until they have formed their crown buds, which appear when they are about three months old. If proper methods are practised, transplanting may be done at any time of year, but spring is generally much the best season, since the roots are then most active and the check to growth is then least. As a rule conifers do best upon light soils. They are attacked by a large number of insects and diseases both in foliage and trunk, but since these trees and shrubs are planted mainly for ornament or are growing in the forest where systematic war cannot often be successfully carried on, little attention has been given to the control of these pests. Standard fungicides and insecticides may be used effectively in some cases, care being taken to determine the mode of attack of the particular pest.

Consult: Veitch, 'Manual of Conifers'; Beissner, 'Handbuch der Nadelholzkunde'; Carrière, 'Traité des Conifères'; Bailey, 'Cyclopedia of American Horticulture.'

Coni'ine, kō-nī'īn, **Coneine, Conia,** or **Conine,** a volatile alkaloid having the formula $C_8H_{17}N$, and constituting the active poisonous principle of the hemlock, *Conium maculatum.* It exists in all parts of the plant, but especially in the not quite ripe seeds. When pure it is a colorless oily liquid with a strong, mouse-like odor, oxidizing, upon exposure to air, to a brown fluid, and ultimately to a resinous mass. It boils at 336° F., and, at ordinary temperatures has a specific gravity of about 0.86. It absorbs about 25 or 30 per cent of its own weight of water, and freely mixes with alcohol, benzene, chloroform, and ether. It also dissolves sulphur, though it does not dissolve phosphorus. Coniine is a violent poison, causing death by paralysis of the motor nerves.

Con'ingsby, a novel by Benjamin Disraeli, Lord Beaconsfield, published 1844. It was his sixth and most successful novel. In three months it had gone through three editions, and 50,000 copies had been sold in England and the United States. It was a novel with a purpose; the author himself explained that his aim was to elevate the tone of public life, to ascertain the true character of political parties, and especially to vindicate the claims of the Tories. Incidentally he wished to emphasize the importance of the Church in the development of England, and he tried to do some justice to the Jews. There are more than threescore characters in the book, and part of its popularity came from people's interest in identifying them with men and women prominent in English social and political life.

Co'nington, John, English classical scholar: b. Boston, Lincolnshire, 10 Aug. 1825; d. there 23 Aug. 1869. He was educated at Beverley, Rugby, and Oxford, and in 1854 was appointed to the newly founded chair of Latin language and literature at Oxford, which he filled until his death. His greatest work is his edition of 'Virgil' (3 vols. 1861–8), with its singularly subtle and suggestive essays. His edition of the 'Agamemnon' (1848), and 'Choephori' (1857), of Æschylus are of less moment, though indeed the latter is admirable. In his last years he gave himself much to translation, the results of which were his metrical version of the 'Odes' of Horace (1863), the 'Æneid' (1866), in Scott's ballad-metre, the 'Iliad' (1868), in the Spenserian stanza, and the 'Satires and Epistles' of Horace (1869), in the couplet of Pope.

Coniston (kŏn'ĭs-tŏn) **Lake,** England, a lake in north Lancashire at the eastern foot of the Coniston Fells, nine miles west of Bowness on Windermere. It is five miles long, one half mile broad, 147 feet above the sea, and it greatest depth is 260 feet. Its waters abound with trout and perch. On the eastern shore stand Ruskin's home, Brantwood, and Tent House, once Tennyson's residence. The Old Man of Coniston, to the northwest, is 2,633 feet high.

Co'nium ("spotted hemlock"), the full-grown fruit of *Conium maculatum* gathered while green. *Conium maculatum* is a stout, erect biennial, three to six feet high, with a much branching, smooth, furrowed, dark green hollow stem, covered with purplish spots, very widely present throughout Europe and introduced into the United States in ballast. It grows commonly in wet places, wayside brooks, swamps, and dark, moist gardens. All parts of the spotted hemlock are active, but the poisonous principle coniine is found most abundantly in the full-grown but unripe seed, the principle being a volatile alkaloid. Only fresh hemlock is of any service, and much of the lack of uniformity of results in the use of this drug as a remedy has come from the neglect of this precaution on the part of the manufacturers of the drug. The composition of conium is complex. It contains a slight amount of volatile oil and two or three alkaloids, the most important of which is coniine. Coniine is present in small amounts only. It is strongly basic, colorless, oily liquid, with a penetrating odor and a sharp taste resembling tobacco. It boils at 166° C.; its chemical formula is $C_5H_9NH,CH_2CH_2CH_3$. It has been made synthetically, being one of the first of the alkaloids thus synthetized. The physiological action of conium is practically identical with the action of coniine. The general effect is paralysis of the motor end organs of voluntary muscles; it is thus a motor depressant. It is an irritant to the stomach, increasing the salivary secretions. Its effect on the heart is slight; its effect on the nervous system is very little save in extreme poisoning, when blood changes cause changes in the nervous system. The early symptoms of poisoning

are heaviness of the muscles of the legs, and of the eyelids, ptosis, staggering gait, muscular relaxation and muscular paralysis; paralysis of the vocal chords causing derangement of speech, dilatation of the pupil and finally paralysis of the muscles of respiration with asphyxia, convulsions, and death. Treatment of the poisoning is by means of the stomach-pump, strychnine, coffee. Alcohol and rapid elimination by hot baths are desirous.

The therapeutics of conium is restricted. It is very questionable whether it is of use in any affection other than habitual motor spasms of voluntary origin such as spasmodic tics, torticollis, and other like affections. It is certainly of very little value in spasmodic affections not associated with voluntary action such as chorea, epilepsy, myoclonus, etc.

Conjeveram, kŏn-jĕ-vėr-ŭm′, **Canchipura** ("the Golden City"), a town of Hindustan, in the presidency of Madras, district of Chinglepat. It stands in a valley, is irregularly built, and from five to six miles long, resembling a series of villages, intermingled with gardens and cocoanut plantations. Conjeveram is one of the Hindu sacred cities, and is sometimes called the "Benares of the south." There are here two splendid pagodas; one dedicated to Vishnu, richly sculptured, and highly venerated; the other, a larger and more imposing structure, dedicated to Siva, from the summit of which a magnificent view is obtained. There are many smaller pagodas; and houses of accommodation for travelers abound. Cottons are manufactured. There is a flourishing school here connected with the Free Church of Scotland. Pop. 43,000.

Conjugal Rights, in law, the right which husband and wife have to each other's society, comfort, and affection. The suit for restitution of conjugal rights is a matrimonial suit, cognizable in the divorce court, which may be brought whenever either the husband or wife lives separate from the other without any sufficient reason.

Conjugate Focus. See LENS.

Conjuga'tion. In some unicellular plants and in one-celled animals (*Protozoa*), after multiplying by self-division perhaps for many generations, reproduction by germs is brought about by a process called conjugation. It may be illustrated by a flagellate monad (*Heteromita*). In this form two individuals come together and completely fuse, the result is a thin-walled sac (the zygote), the protoplasm of which divides by multiple fission into very minute spores or germs. Each of these spores finally grows to become an adult *Heteromita.* In a much more specialized protozoan (*Paramœcium*), after self-division has been repeated for a certain number of generations, it is interrupted by conjugation. In this case two individuals become applied by their ventral faces, but do not fuse, but the nuclei melt together, so that the fusion of the two individuals takes place, after which the two original infusorians separate. This process is akin to and anticipates sexual reproduction in animals higher than protozoa. The process seems to lend new life to the species; it is a process of rejuvenescence, and is necessary for the maintenance of the life and vigor of the species.

Conjunction, in astronomy, one of the aspects of the planets. Two heavenly bodies are in conjunction when they have the same longitude — that is, when the same perpendicular to the ecliptic passes through both. If they have, at the same time, the same latitude — that is, if they are both equally far north or south of the ecliptic — they appear from the earth to be in the same spot of the heavens, and to cover one another. The sun and moon are in conjunction at the period of new moon. In the case of the inferior planets Mercury and Venus, the conjunction is inferior when the planet is between the earth and the sun, and superior when the sun is between the earth and the planet. In general, a heavenly body is in conjunction with the sun when it is on the same side of the earth, and in a line with the sun, and it is in opposition to the sun when it is on the opposite side of the earth, the earth being in a line between it and the sun. Planets are invisible when in conjunction with the sun, except in rare cases when an inferior planet passes over the sun's disk, and may be seen as a speck on his surface. Conjunctions are either geocentric or heliocentric, according as they are actually witnessed from the earth, or as they would be witnessed if observed from the sun. In observing a conjunction from the earth's surface it is usual to reduce the observation to what it would be if made from the earth's centre; by this means the exact times of conjunction are more accurately fixed, and the observations of one astronomer made available to every other, wherever he may be on the earth's surface. Grand conjunctions occur when several stars or planets are found together. Chinese history records one in the reign of the Emperor Tehuen-hiu (2514–2436 B.C.), which astronomers calculate actually took place.

Conjunction, that grammatical part of speech which couples words, clauses, and propositions. Conjunctions differ from prepositions in their mode of affecting the cases of the nouns which they connect with the previous word or phrase. The preposition is said to govern the noun, that is, to determine its case; the conjunction also determines the case of the noun, but in a different manner; it always requires the case of the noun or pronoun which follows it to be the same as that of the noun with which it connects the second noun. The conjunction also affects actively the modes of verbs, though less frequently in English than in other languages.

Conjunctiva, kŏn-jŭnk-tī′vą, the mucous membrane which lines the inner surface of the eyelids and is continued over the forepart of the globe of the eye. See EYE.

Conjunctivitis. See EYE, DISEASES OF.

Conjuration, in law, an unlawful compact formed by oath, a term formerly used, especially in the sense of having personal conference with the devil or some evil spirit to discover secrets or effect some malicious purpose.

Conjuring, the production of effects apparently miraculous by natural means. The earlier professors of the art claimed *bona fide* supernatural powers; and in ages when the most elementary principles of physical science were unknown beyond a very limited circle, it was not difficult to gain credence for such a preten-

sion. The modern conjurer makes no such claim, but tells the public frankly that his marvels are illusory. Of the conjurers of remote antiquity we have few reliable records; though it is a tolerably safe conjecture that the prestige of the ancient mysteries rested in no small degree upon effects of natural magic. Perhaps the earliest really trustworthy authority is Reginald Scot, who in his 'Discoverie of Witchcraft' (1584) has enumerated the stock feats of the conjurers of his day.

The conjurers of Scot's time, and even of much later date, were accustomed, in order to facilitate the substitutions on which a great part of their tricks depended, to wear an apron with pockets, known (from its resemblance to a game-bag) as the *gibeciere*. A later school suppressed this tell-tale article of costume, and used instead a table, with cover reaching nearly or quite to the ground. This table concealed an assistant, who worked most of the required transformations, etc., either handing the needful articles to the conjurer as he passed behind the table, or pushing them up through traps in the table-top. Conus the elder, a French conjurer who flourished at the close of the 18th century, made a further improvement by discarding the concealed assistant, and using an undraped table with a secret shelf (now known as the *servante*) behind it, on which his substitutions were made. His immediate competitors did not follow his example, a whole generation of later conjurers, including Comte, Bosco, and Philippe, retaining the suggestive draped table. Its death-blow, however, was struck by Robert Houdin (1805–71), with whom about 1844 a new era began. The most modern school of conjurers, following the lead of Wiljalba Frikell, etc., represented by Hartz, Herrmann, Buatier de Kolta, Verbeck, Lynn, Bertram, etc., generally aim at producing their magical results with the minimum of visible apparatus.

Conk'lin, Edwin Grant, b. 24 Nov. 1863. Graduated Ohio Wesleyan University (S.B. 1885, A.B. 1886, A.M. 1889), Johns Hopkins University (Ph.D. 1891). Investigator Marine Biological Laboratory 1890–1901; Professor of Biology Ohio Wesleyan University 1891–1894; Profesor of Zoology Northwestern University 1894–1896; Professor of Zoology University of Pennsylvania 1896—. Trustee Marine Biological Laboratory; Member American Society of Zoologists, American Society of Naturalists, Felow of American Association for the Advancement of Science, Vice President Academy of Natural Sciences of Philadelphia, Secretary of American Philosophical Society, Past President American Morphological Society; Associate Editor of Biological Bulletin and of the Journal of Morphology. Author of 32 scientific papers published between the years 1891 and 1902 among which the following are the most important: 'Fertilization of the Ovum'; 'The Embryology of Crepidula'; 'Syllabus of Six Lectures on Organic Evolution'; 'Evolution and Revelation'; 'The Phenomena and Mechanism of Inheritance'; 'Factors of Evolution'.

Conk'lin, Jennie Maria (DRINKWATER), American author: b. Portland, Maine, 14 April 1841; d. New Vernon, N. J., 28 April 1900. She was educated in the public schools, and while still in her teens won fame with her stories for children. In 1880 she married Rev. Nathaniel Conklin. Her works include: 'Miss Prudence'; 'Tessa Wadsworth's Discipline'; and 'Fifteen.' She originated the "Shut-In Society," an organization of invalids for correspondence.

Conklin, Viola A., American historical writer: b. New York 15 Nov. 1849. She has published 'American Political History to the Death of Lincoln' (1901).

Conkling, Alfred Ronald, American lawyer: b. New York 28 Sept. 1850. He graduated at Yale 1870; was geologist in the United States Engineer Corps 1875–7; admitted to the New York bar 1879. He has been active in republican municipal politics, and was a member of the New York board of aldermen 1887–8, and of the State legislature 1892–5. In the Greater New York election of 1897 he was a prominent member of the Citizens' Union Party. He has written much for the New York *Tribune, Evening Post,* and *Herald,* and has published: 'Guide to Mexico' (1884); 'Letters of Roscoe Conkling' (1889); 'City Government in the United States' (1894); 'Hand-book for Voters' (1894). While a member of the Engineer Corps, he prepared several valuable reports (1875–7).

Conkling, Roscoe, American legislator: b. Albany, N. Y., 30 Oct. 1829; d. New York 18 April 1888. He removed to Utica in 1846, studied law and was admitted to the bar in 1850. He was mayor of Utica in 1858, and sat in Congress as a Republican 1858–62, and 1864–6. During the Civil War he was an active supporter of the administration, appearing constantly in debates and on committees. He was elected to the United States Senate in 1867, 1873, and 1879, and as senator he supported the reconstruction policy, actively opposed President Johnson and was a staunch supporter of President Grant. He became an extremely influential member of his party; in 1876 receiving 93 votes for the presidential nomination, and in 1880, by his support of Grant and his personal opposition to Blaine, dividing the Republicans into two sections. In May 1881, he and his colleague, Thomas C. Platt, suddenly resigned from the Senate, owing to a dispute with President Garfield on a question of patronage, and sought re-election; but after a warm canvass, both were rejected, though vigorously supported by Vice-President Arthur. Conkling afterward practised law in New York. He was appointed associate chief justice of the United States supreme court in 1882, but declined the position.

Conn, Herbert William, American biologist: b. Fitchburg, Mass., 10 Jan. 1859. He was educated at Boston University and is professor of biology at Wesleyan University, Middletown, Conn. He has published 'Evolution of To-day' (1886); 'The Living World' (1891); 'The Story of Germ Life' (1897); 'The Story of the Living Machine' (1899); 'The Method of Evolution' (1900); 'Agricultural Bacteriology.'

Conn, Lough, lŏH kŏn, a lake in the north of Mayo County, Ireland, united with Lough Cullin by a narrow channel. The two extend for about 13 miles and are studded with islands.

Connaught, kŏn'nât, **Arthur William Patrick,** DUKE OF, English prince, third son of Queen Victoria: b. Buckingham Palace, 1 May 1850. Besides his position of Duke of Connaught, he is Prince of the United Kingdom, Duke of Saxony, Earl of Sussex, and Prince of

Coburg and Gotha. He entered the Woolwich Military Academy in 1866, became general of brigade in 1880; was created Duke of Connaught and Strathern, and Earl of Sussex, 26 May 1874; and received a seat in the House of Lords 8 June of that year. He married Princess Louise Margaret of Prussia, 13 March 1879. In January 1900 he succeeded Lord Roberts as commander-in-chief in Ireland, becoming commander of the Third Army corps in 1901.

Connaught, Ireland, one of the four provinces, bounded east and northeast by Leinster and Ulster, south by Munster, and north and west by the Atlantic; length, north to south, 112 miles; breadth, 99 miles; area, 6,867 square miles. Its west coast is much broken up by numerous bays and inlets, and is thickly studded with islands. The surface is rugged and mountainous, except in the central part, which is comparatively level. It is, on the whole, the least fertile of all the provinces. Connaught was formerly one of the Irish kingdoms. Its kings were of the race of O'Connor, but they were almost exterminated at Athenry in 1305. In 1590 the English divided it into six counties, one of which, county Clare, was afterward transferred to Munster. Pop. (1901) 649,635.

Conneaut, kŏn ne ât', Ohio, a town of Ashtabula County, situated at the mouth of Conneaut Creek, on the Lake Shore & M. S., the New York, C., & St. L., and the Pittsburg, S., & L. E. R.R.'s. It is a coal and ore port of importance, and also exports the agricultural produce. It has railroad shops and other manufacturing interests. Pop. (1900) 7,133.

Connecticut, kŏn-nĕt'-ĭ-kŭt, "the Nutmeg State," "the Land of Steady Habits," or "the Constitutional State" (having framed the first written constitution in America), is the southwesternmost of the six New England States. It is bounded by Massachusetts on the north, Long Island Sound on the south, Rhode Island on the east, and New York on the west. Capital, Hartford. Area, 4,845 square miles land, 145 square miles water. Pop. (1900) 908,420.

There is no doubt that the claim of the Dutch to Connecticut by right of discovery was well founded, for the accounts of the voyages of Henry Hudson in 1609 and of Adrian Bloch in 1614 give the first descriptions which history records of this region. The attempts of the Dutch to maintain their foothold by this right were few and ineffectual, failing to prevent William Holmes of Plymouth colony from establishing a trading post at or near Hartford in 1633.

Settlement.— The first permanent settlement by the English was made in 1636, though a disastrous attempt had been made in the previous year by a party from Massachusetts to occupy the three original towns. In June 1636 Rev. Thomas Hooker and Rev. Samuel Stone, with about 100 men, women, and children, made their way from Massachusetts to the Connecticut valley, and there re-established the almost abandoned settlements at the three towns which bore the transplanted Massachusetts names of Newtown, Watertown, and Dorchester, but were, in the following year, respectively named Hartford, Wethersfield, and Windsor. Within a year from the time of this settlement about 30 of the settlers had been wantonly killed by the Pequot Indians, who appeared to be plotting the extermination of the English. In May 1637 Major John Mason, with a band of 90 men, was despatched to attack the Pequots at their stronghold in the present town of Groton. Reaching, by strategic movements, the stockade, where a large number of them were encamped, he took them completely by surprise, killing about 700 by setting fire to their inflammable wigwams and putting to death in hand-to-hand conflict those who escaped the flames. This resulted in the extermination of the Pequot tribe, and secured to the settlers exemption from Indian depredations for all time to come.

The colonists now began to prosper under the leadership of the pastors, Hooker and Stone. Finding themselves outside of the jurisdiction of Massachusetts, to which they at first supposed that they were answerable, they proceeded to form a civil government of their own, adopting in 1639 the Constitution which stands unique in history as the first written constitution of a self-governing people. Its principles had been preached from the pulpit by Thomas Hooker, and its spirit, if not its form, prevailed in the Federal Constitution which was adopted through the influence of Oliver Ellsworth, Roger Sherman, and William Samuel Johnson of Connecticut just 150 years later. By this Constitution of 1639 much less rigid ecclesiastical control prevailed than in Massachusetts Bay and Plymouth colonies, the people were recognized as sovereign, and the authority and even the existence of the ruler of Great Britain was ignored. Meantime there had sprung up in Quinnipiack a budding colony, afterward known as New Haven Colony, under the leadership of Theophilus Eaton and the Rev. John Davenport. This colony in 1639 adopted resolutions which vested the government in seven pillars of the Church, and disfranchised all who were not church members. In 1662 John Winthrop, the younger, then governor of Connecticut, obtained in England from Charles II., a charter which established Connecticut as an independent colony under the constitution already adopted, and defined the boundaries to include New Haven colony, which was thus absorbed, though sorely against its will.

Charter Rights.— From this time onward, for 50 years, Connecticut was engaged in a constant struggle to maintain the rights which the charter had granted. Conflicting grants by Charles II. to his brother, then Duke of York; boundary disputes; conflicts of authority with other colonial governors; and the fear that the charter might be annulled by royal decree, kept the statesmen of the day in an attitude of continual vigilance, and schooled them in diplomacy, tact, and political alertness. But once in her history, and then only for a year and a half, did Connecticut lose that autonomy which she cherished as her birthright. This was during the usurpation of Andros, in 1687. But the charter was preserved, though Andros demanded it. Its preservation was the result of one of the Yankee tricks for which Connecticut has always been famous, and which may have had something to do with giving her the equivocal title of "the Nutmeg State." The charter was brought into the general court toward nightfall at Andros' request. Candles were lighted and, by some mysterious agency, suddenly extinguished. During the darkness which prevailed the charter disappeared. Andros assumed the government,

and Secretary John Allyn wrote "FINIS" at the close of the record of the proceedings. In May 1689 came the downfall of Andros, and the government and charter reappeared, with the astute Gov. Treat once more in the chair, and an undying reverence established for the old charter oak, where, as tradition tells us, Capt. Joseph Wadsworth hid the precious document when it so suddenly disappeared.

War Services.— From the resumption of the government under the charter to the close of the French war in 1763, Connecticut saw much military service, for which she furnished her full quota, on other soils than her own. The short intervals of peace during this long period did not suffice to regain prosperity, and the year 1763 found the colony impoverished by contributions of men and money in the French and Spanish wars, and confronted with the odious news of the Stamp Act. The enforcement of this measure was prevented by compelling the stamp-master to sign a paper stating that he resigned "of his own free will."

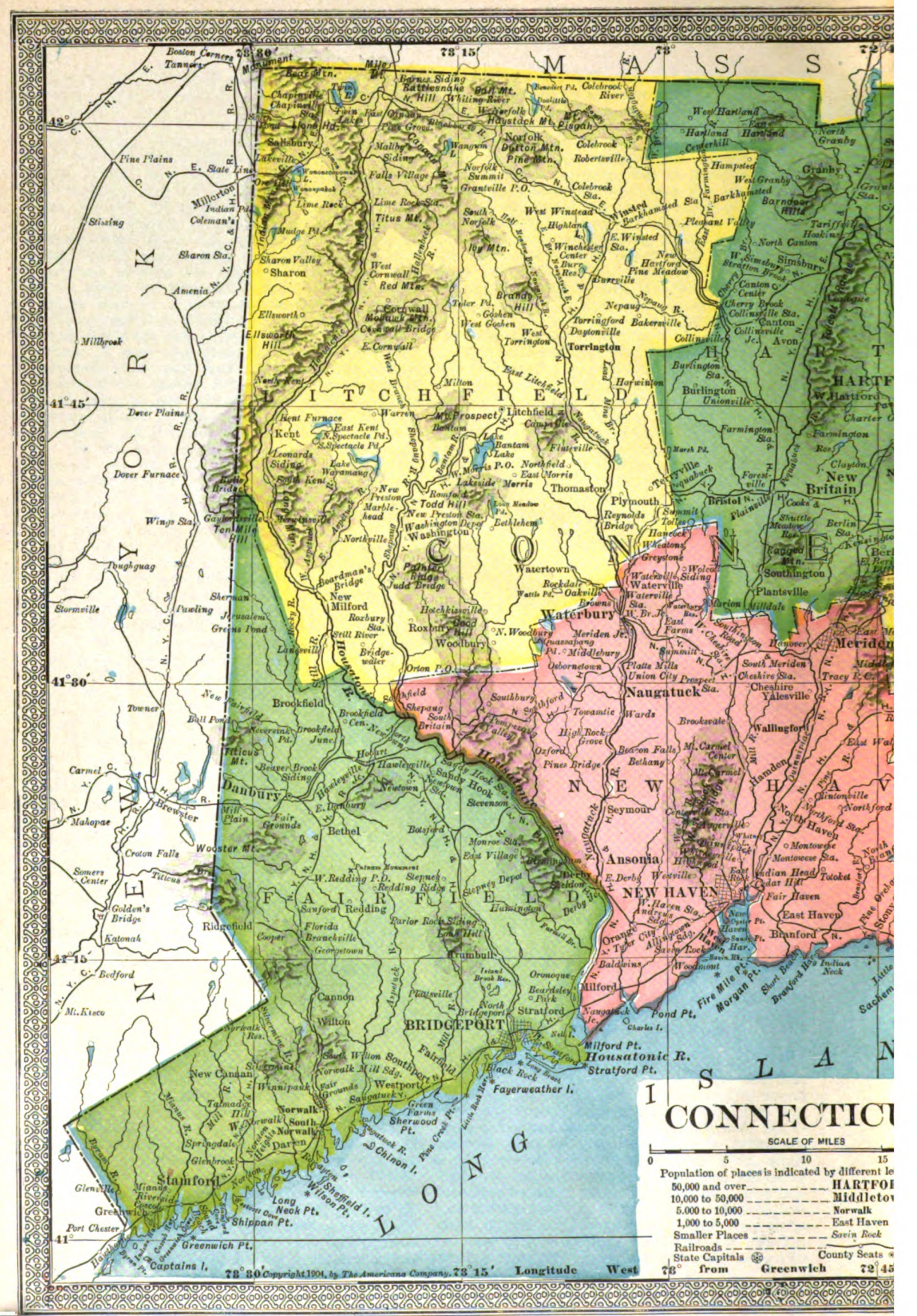
In the War of the Revolution which followed, the share of Connecticut forms a most important feature, still hardly appreciated by historians. The colony was amply, though quietly, prepared in every way for the coming struggle in 1775. Perfect unanimity prevailed. It was unnecessary either to reconstruct the government, as was done in Massachusetts, or to depose the governor, as was done in all the other colonies. Connecticut alone of all the 13 colonies had from the beginning a governor, Jonathan Trumbull, who was an ardent believer in the cause of his country. He became a trusted adviser and helper to Washington. A cherished Connecticut tradition asserts that the national nickname, "Brother Jonathan," is derived from the fact that Washington had used this sobriquet in speaking of Gov. Trumbull. From recent compilations of muster-rolls it is safe to assert that Connecticut furnished 40,000 men in her various enlistments in this war. In the adoption of the Declaration of Independence she was the first colony to instruct her delegates to vote for this measure. During the war, she gained the title of "the Provision State," owing to the unstinted supplies which she sent to the front in all times of need, relieving, for example, the sufferings of the starving soldiers at Valley Forge by sending forward droves of live cattle when Washington wrote Trumbull that the army must disband unless supplies were forthcoming.

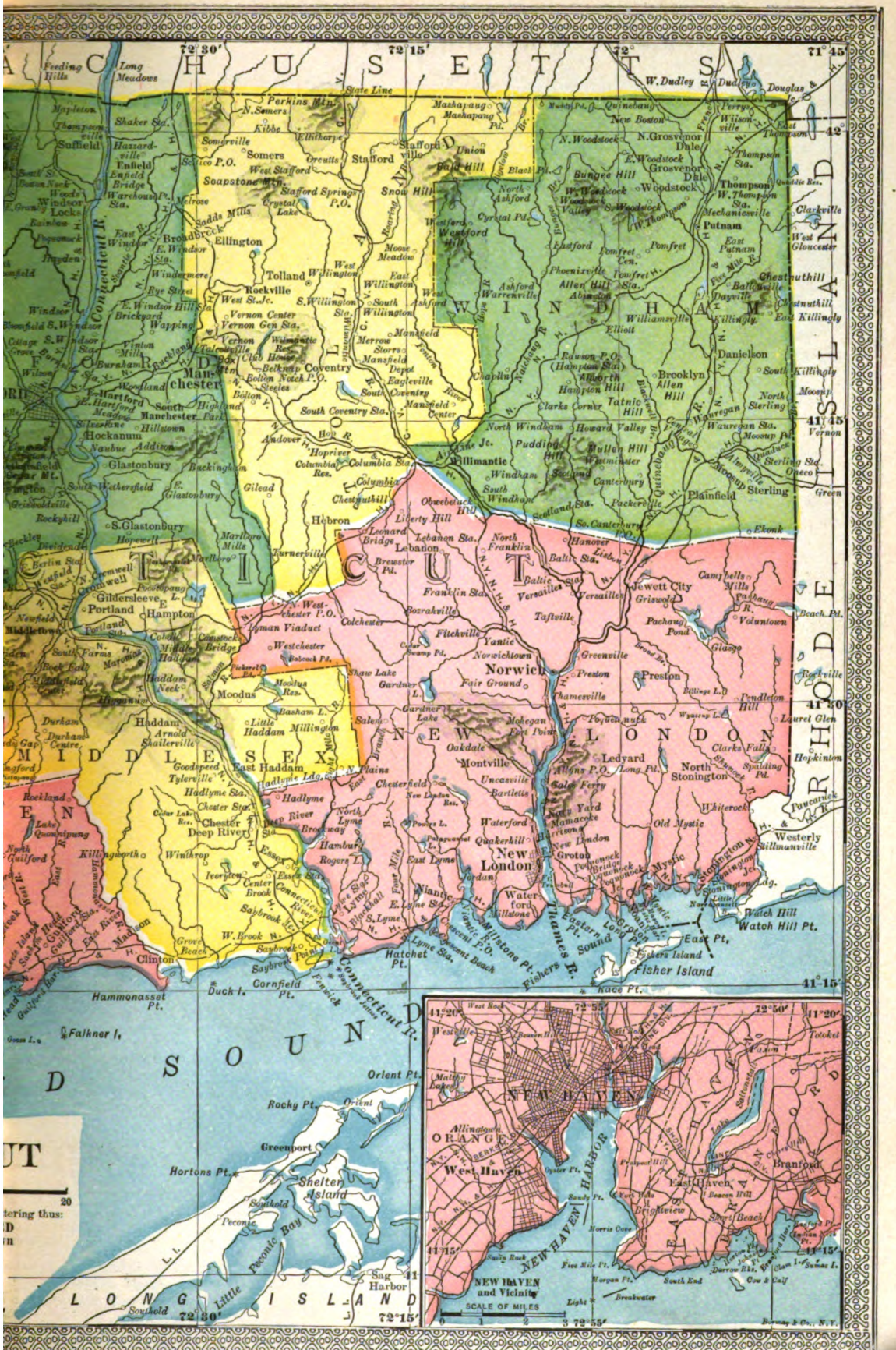
As in the French, Spanish, and Indian wars, so in the Revolution, Connecticut's position was, in a certain sense, altruistic, for but little fighting was done on her soil, and it was done at times when her own fighting men were serving their country beyond their own immediate borders. The ravages of two of the most savage massacres and two of the most barbarous raids of the war brought their horror and devastation to this little commonwealth. The Wyoming massacre was an attack on Connecticut settlers on disputed Connecticut soil, justly claimed under grants of the charter, which extended the western boundaries to the "South Sea" or Pacific Ocean, whose location was majestically ignored by Charles II. and his advisers. Wyoming or Westmoreland, now in Pennsylvania, was at the time of the horrible massacre of July 1778 a county of Connecticut, having been previously a part of Litchfield County, and having been for 25 years settled by a Connecticut company after repeated repulses which only served to strengthen resistance and establish an apparently permanent foothold on the part of the settlers. The refugees, of whom women and children composed a large majority, fled to their homes in Connecticut after the massacre, the terrible results of which did not prevent many of the former inhabitants from returning to Wyoming, and once more establishing themselves in that beautiful region from which they had been so often ruthlessly driven. The other massacre, at Groton, occurred toward the close of the war, 6 Sept. 1781. The raid was commanded by Benedict Arnold, to whom it is unfair to attribute the most disgraceful part of it. He was in New London at the time of the occurrence, his troops having burned a large portion of the town. The little garrison of Fort Griswold at Groton made a brave resistance against forces outnumbering them six to one. When, at last, the British entered the fort, Ledyard, the American commander, presented his sword to the officer in command of the British in token of surrender. This brute, whose name, fortunately for his memory, has never been discovered, received the sword and plunged it at once through Ledyard's heart. This was a token for indiscriminate slaughter, in which hardly a man of this surrendered force was left unhurt, and but few left alive.

The raids of Gov. William Tryon on Danbury in April 1777, and on New Haven, Fairfield, and Norwalk, in July 1779, resulted in great destruction of property by fire and plunder, and in the loss of many lives on both sides. It may be truly said that never but twice did these invaders remain on Connecticut soil over night, and in each case took to their ships the next morning with Connecticut troops in hot pursuit.

Notwithstanding the terrible drain which the Revolution made upon her resources, Connecticut, through her wise financial policy, was better prepared, at the close of the war, to avail of the advantages of peace than were any of the other States with the exception of Delaware. It is hardly surprising that the war of 1812 should have been unpopular in Connecticut as well as in all New England; but too much opprobrium has been heaped on Connecticut by giving the protesting convention for all New England the name of the Hartford Convention for the simple reason that it was held, for convenience, in Hartford. It will be found that Connecticut furnished for this war, too, a goodly number of men, though there were some disputes as to the manner and form of doing it. For the half century following this war, peace and prosperity prevailed, broken only by the comparatively insignificant, but sufficient, contribution which was made to the Mexican war.

The outbreak of the Civil War in 1861, like the outbreak of the Revolution in 1775, found Connecticut with a governor in office who was equal to the emergency. Gov. William A. Buckingham, upon his own responsibility, called for a regiment of volunteers, 16 April 1861, when there was not a regiment of organized militia in the State to meet Lincoln's first call. The private citizens and the towns voted money to forward troops; and soon, instead of one, three regiments of volunteers reported for service, making it necessary for the governor to go to




MASSACHUSETTS
RHODE ISLAND
CONNECTICUT
MIDDLESEX
NEW LONDON
WINDHAM
TOLLAND
HARTFORD
Middletown
Portland
Hampton
Chester
Deep River
Essex
Old Saybrook
Saybrook
Clinton
Westbrook
Madison
Guilford
Branford
East Haven
West Haven
NEW HAVEN
ORANGE
Milford
Stratford
Bridgeport
Norwich
New London
Groton
Mystic
Stonington
Watch Hill Pt.
Fisher Island
Montville
Ledyard
Preston
Griswold
Jewett City
Plainfield
Putnam
Thompson
Danielson
Brooklyn
Willimantic
Coventry
Manchester
Glastonbury
Rockville
Ellington
Tolland
Stafford
Somers
Enfield
Suffield
Windsor Locks
Windsor
Hartford
Wethersfield
Rocky Hill
Berlin
Meriden
Wallingford
North Haven
Hamden
Cheshire
Durham
Middlefield
Middletown
Haddam
East Haddam
Lyme
Old Lyme
Niantic
Waterford
Montauk Pt.
Block Island
Long Island Sound
Fishers Island Sound
Thames R.
Connecticut R.
Housatonic R.
Quinebaug R.
Shetucket R.
Willimantic R.
Pachaug R.
Yantic R.
Moosup R.
Quinebaug R.
Hammonasset Pt.
Falkner I.
Duck I.
Cornfield Pt.
Hatchet Pt.
Saybrook Pt.
Lynde Pt.
Millstone Pt.
Race Pt.
Orient Pt.
Rocky Pt.
Greenport
Hortons Pt.
Shelter Island
Southold
Peconic Bay
Sag Harbor
LONG ISLAND
NEW HAVEN and Vicinity
SCALE OF MILES
NEW HAVEN HARBOR
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Washington to have three times the quota accepted under the call. At the close of the war, the official record shows that Connecticut had furnished 54,882 volunteers, which number was largely in excess of her quota.

Industries.— This war stimulated the industries of Connecticut, which had, at the time, reached a high stage of development. The demand which the large and suddenly equipped army and navy of the country made upon these industries could not fail to have this effect. During the 40 years which have followed the War, the development of manufactures has continued to keep up a healthy growth. This little commonwealth, originally composed of intelligent farming communities, has, by a perfectly natural process of evolution, developed into a manufacturing State which, small though it is in area, holds the rank of eleventh in the gross value of its manufactured products, and the rank of second in the per capita value of these products among the 52 States and Territories enumerated in the census of 1900. Still more significant is the fact that a larger number of patents in proportion to the population have been issued to Connecticut inventors than to those of any other State in the Union during the past 10 years.

It appears to be a fact that in early colonial times the same inventive genius which has developed in this little commonwealth was born of necessity, and that it was transmitted by heredity down to the present day. The first settlers brought with them intelligence, broadened views of ecclesiastical control, and little or nothing more. There were no industrial specialists among them; and a century after the towns of the colony had taken root in various parts of the soil the leading townsmen, besides being still farmers with a growing tendency to trade, were each of them equal to any industrial or political emergency which might arise. Diaries covering the first half of the 18th century show, for example, that the diarist was a ship-carpenter, house-carpenter, millwright, surveyor, judge of probate, soldier, and deputy to the general assembly, while pursuing the regular occupation of a trading farmer; and that his neighbors were equally versatile in their industrial and political pursuits. This diversity of individual talents naturally grew, in time, to specializing, as the resources and needs of the commonwealth developed. In 1705 the Granby copper mines were discovered, and unprofitably worked, leaving as souvenirs the Granby copper coins, and the old mine itself, which was used as a prison during the Revolution, and abandoned at the time of establishing the State prison at Wethersfield in 1827. Other attempts at mining for precious metals were equally unsuccessful, but the working of the Salisbury iron mines, which have been in operation since 1730, proved to be a lasting success. From these mines cannons, balls, camp-kettles, and other useful articles were furnished during the Revolution, including the chains which were used to bar the progress of the British fleet on the Hudson. The anchor of the famous ship Constitution was forged from Salisbury iron in later days. The ore is a rich hematite, which, prepared by the use of charcoal, yields pig-iron which rivals the famous product of the Swedish and Norwegian mines.

As early as 1749 we find that John Allyn had experimented in brass-making; and in 1768 the first paper-mill of Connecticut, if not the first in the country, was successfully established by Christopher Leffingwell of Norwich. Tinware was first made in Berlin in 1770, and furnished for a century or more an important industry in which the Yankee peddler exercised his wit and shrewdness. In 1773 Thomas Harland from London established at Norwich a shop for making and repairing watches and clocks. In this shop Eli Terry learned the mechanism of the timepieces of the day, and afterward applied his inventive genius to the manufacture of pillar-scroll and case clocks, which he perfected in 1793. Other Connecticut inventors, especially Seth Thomas and Chauncey Jerome, have brought clock-making to, or very near, its present advanced stage. Eli Whitney, the inventor of the cotton-gin, though not a Connecticut man by birth, owed his fortune to the successful manufacture of firearms at New Haven in 1798, after having been robbed of his great invention in the South in 1792.

The first manufacture of sewing-machines on an extended scale was established by Elias Howe, at Bridgeport, followed in the same city by the improvements of Wheeler and Wilson. In 1844 Charles Goodyear of New Haven obtained his first patent for the process of vulcanizing india-rubber, a process entirely of his own discovery, which revolutionized this important industry in his day, or rather made a new and still enormously increasing industry in the use of material which, without this invention, would have continued to occupy an unimportant place in the industries of the world. The invention of electro-silver plating is traced to the Rogers Brothers of Hartford. In 1846 these three brothers, Asa H., William, and Simeon S., succeeded, after much experimenting, in finding a successful way of applying this process to articles made of various metals. From small beginnings, the business grew to large proportions, resulting in great establishments in Hartford, Meriden, Waterbury, Norwich, and elsewhere.

The manufacture of textile fabrics had its beginnings in a small woolen factory in Hartford in 1788, and a small cotton-mill in Vernon in 1804, but the growth of this industry to its present proportions did not begin in any marked degree until after the enactment of the joint-stock act in 1837, allowing small sums to be capitalized and small proprietors to join their forces in manufacturing. It may be remarked in passing that this act, forming a long step in the evolution of the modern "trust," was copied by nearly every State in the Union, and by Great Britain. The cotton-mills of the State have found their most available water-power on the Shetucket and Yantic rivers and their tributaries, which form the Thames River at Norwich. Of these mills the Ponemah Company at Taftville has one which, when it was built, was said to be the largest cotton-mill in the world. At Baltic, farther up the Quinebaug River, the large cotton-mill, which had been destroyed by fire, has been rebuilt within a few years. The Willimantic Linen Company is one of the largest thread-producing companies in New England. More than seven tenths of the cotton spindles in the State are operated at Norwich, Thompson, Plainfield, Killingly, and Willimantic. The woolen mills are more widely distributed

throughout the State, at Vernon, Stafford, Broad Brook, New Britain, Norwich, and elsewhere. Among the textile manufactures silk forms an important feature, the industry having had its small beginnings as early as 1732. The silk mill of the Cheney Brothers at South Manchester, established in 1838, and still in active operation, is one of the largest in the country. Connecticut holds it own well in its rank as a textile manufacturing State, having been sixth of all the States in 1900 in the value of its textile products. Of the smaller and more varied manufactures of all kinds, the number, like the aggregate product of the larger ones, has increased largely. The leading industries may be enumerated as brass manufactures, carriage-making, and the manufacture of clocks, corsets, cutlery, electrical apparatus, foundry and machine-shop products, hats, paper, plating, rubber goods, sewing-machines, and textiles.

The most important industry which the State has acquired of late years is that carried on at the large establishment of the Eastern Shipbuilding Company at Groton on New London harbor. Here has just been launched the steel steamship Minnesota, soon to be followed by her sister ship, the Dakota, of the same model and dimensions. It is claimed for these two ships that, although their length is 70 feet less than that of the great steamship Cedric, their excess in other proportions makes them the largest ships in the world. Their length is 630 feet each, width 73½ feet, depth 53 feet, with a displacement of 40,000 tons when loaded to a draft of 40 feet. Their approximate cost is $2,500,000 each. They are intended for the Pacific and Oriental trade. Among the new and important industrial establishments of the State and of the world is that at Norwich for supplying compressed air as a motive power through long conduits from a central station. After several years of experiment, and a large expenditure of money, this station is now in successful operation as a pioneer in a new and probably vastly important invention.

The amount of capital invested in manufactures in this State in 1900 was $314,696,736, and the value of the manufactured product was $352,824,106, showing an increase of 42 per cent over the same values of 10 years before, which is the largest increase since 1870. The number of wage-earners engaged in manufactures was 176,694, or 19½ per cent of the total population. The number of officials, clerks, etc., in the same business was 9,981.

Agriculture.— Although the history of agriculture in Connecticut presents a contrast to the history of manufactures by showing a decline in proportion to the population, agriculture is still second in importance among the industries of the State. In considering this industry it must be remembered that it has for its limits a little commonwealth, being fiftieth in area of the 52 States and Territories enumerated in the census of 1900. In its relation to agriculture, as to physical geography, its area may be rather indefinitely divided into the central lowland, the coast, the eastern upland, and the western upland. Of these the central lowland, lying in the valley of the Connecticut River, is, from Middletown to the northern boundary, best adapted to cultivation; and here it was, that, after spying out the land, the first colonists, whose sole industry was agriculture, settled. From Middletown to the coast the river leaves the lowland, and cuts a narrow valley through the eastern upland. The portion of the central lowland between Middletown and New Haven is less fertile. Along the lower portions of the coast some market-gardening is carried on, as the cities nearby offer suitable outlets for the products. The eastern upland varies in fertility, but contains some rich farming land. It has also the advantage of a lower average elevation than the western upland, where the only mountains of the State are found. One of these, known as Bear Mountain, reaches an elevation of 2,000 feet or over.

The cultivation of tobacco began in the Connecticut valley, near Hartford, as early as 1680; and the crop of the present day probably reaches a higher value than any other single product of the soil grown in the State. Improved methods of curing the harvested plant have added much to its value of late years. Peach orchards have been quite productive, and after a lapse of many years they again yield an important product. The dairy farms contribute to the central creameries, or are still carried on by individual farmers who can reach a city market. The raising of cattle for food has decreased as an industry.

The amount of capital invested in agriculture is $113,305,580; and the value of farm products in 1899 was $28,276,948. The value of domestic animals in 1900 was $10,247,634. The number of persons engaged in agriculture is reported as 45,596, and the number of farms as 26,948.

Railroads.— The railroads are: the New York, N. H. & H., 4,072 miles; the Central N. E., 233 miles; the New London N. (leased to the Central V. R.R.), 160 miles; and the South Manchester, 5 miles, making a total of 4,470 miles of railroad operated by companies of the State. The latest reported gross earnings of these railroads are:

New York, New Haven & Hartford....	$43,521,087.11
Central New England.....	593,965.43
New London Northern.....	992,546.67
South Manchester.....	18,049.49
Total	$45,125,648.70
Total of operating expenses.....	32,627,503.35
Total net earnings.....	$12,498,145.35

The street railways of the State number, at last reports, 28, and are rapidly extending, two additional charters having been recently granted. The main lines, exclusive of sidings, etc., cover 517½ miles, according to the report of the State railroad commissioners to 30 June 1902. The gross earnings of these companies for the year ending 30 June 1902 were $3,937,771.46; expenses, $2,550,236.69; net earnings, $1,387,534.77.

Banking.— In the banking business of the State the most important item is the deposits in the 90 savings banks, making a total of $205,908,034.80 on 1 Jan. 1903, showing an increase during the year 1902 of $10,180,796.74. There are in the State 81 national banks of deposit, with an aggregate capital of $20,257,070 and a surplus amounting to $9,455,220.48; 8 State banks, with capital amounting to $2,240,000 and a surplus of $878,000; 25 trust and investment companies, capitalized at $6,143,474, with surplus of $1,326,487.41; and 16 building and loan associations, with assets amounting to $4,145,197.32. The oldest bank of

deposit in the State is the Union Bank of New London, chartered in 1792, and still doing business under its old State charter. The Hartford National Bank was chartered at the same session of the general assembly, and changed to a national bank 13 June 1865.

Insurance.— The insurance business of the State centres in Hartford, where there are six of the eight stock fire-insurance companies, representing $9,750,000 in capital, and $13,939,214.03 in surplus. The other two companies represent $350,000 in capital, and $213,420.26 in surplus. Of the 16 mutual fire-insurance companies, 11 only appear active, representing gross assets of $2,198,677.31, and surplus of $1,715,019.24. The six life insurance companies of the State are all in Hartford. The latest report of their assets shows an aggregate of $180,302,652.64, with policies in force amounting to $35,405,746. There are also in the State six fraternal societies with assets amounting to $863,769.08, and policies or certificates in force amounting to $30,246,750.

Religion.— The ecclesiastical history of Connecticut would fill a large volume, and could only be properly treated by a profound theologian. It is enough to say that, at the beginning, the colony stood unique as a compromise between the rigid ecclesiasticism of Massachusetts Bay and Plymouth colonies, and the religious liberty which Roger Williams was, at the time, establishing in Rhode Island. Unique though it was, it can only be called a theocracy at the beginning, for the State was then the Congregational Church, pure and simple, and though others than church members could vote, they were obliged by the early code to vote taxes for the support of the Church. The process of emancipation from these theocratic conditions was slow, and did not reach perfection until the adoption of the new Constitution in 1818. Through this period of nearly two centuries there were executions for witchcraft; at Stratford in 1651; at Fairfield in 1653; and possibly at Windsor in March 1646 or 1647, if the journal of John Winthrop is to be taken as authority; and in the theological tenets which were adopted from time to time under direction of the general court and otherwise, we pass through a maze of solemn discussions of the Half-way Covenant, the Cambridge Platform, the Saybrook Platform, with the later New Lights and Old Lights arrayed against one another as Separatists and Conservatists. Legislation exempting the Church of England from taxation for support of the Congregational Church was had in 1727, and in 1729 was extended to cover the cases of Baptists and Quakers. In 1791 the right of incorporation was allowed, under certain restrictions, to all religious bodies. The first Baptist elder was ordained at New London in 1726, but the sect did not gain largely until the beginning of the 19th century. The Protestant Episcopal Church was not established under a regularly ordained bishop until after 1784, although it had made beginnings before that time, but was practically exterminated during the Revolution, owing to the toryism of its clergy. In 1789 the first Methodist Episcopal Church in the State was established at Stratford. The first Roman Catholic Church in Connecticut was established in 1830, and in 1843 the diocese of Hartford, embracing the entire State, was established.

The statistics of religious denominations are but partially available, only a few of the denominations publishing reliable figures, most of them none whatever, and some inflated "estimates." The Protestant denominations are as usual divided into many sects. Of these the strongest is the historic original Church, and for generations the established one, the Congregational; it has nearly twice as many churches as any other one denomination, and fully twice as many members. The Protestant Episcopal and the Methodist Episcopal are about equal, next in order; and the Baptist not very far behind. The Roman Catholic Church is very strong, numbering from a third up to nearly half of the population of the cities and manufacturing villages, but less numerous in the rural districts. There are small numbers of Presbyterian, Lutheran, Universalist, and Catholic Apostolic churches, a few Unitarian, and some Jewish synagogues.

Charitable Institutions.— The educational institutions which are partly or wholly sectarian in character will be mentioned later in speaking of the general subject of education. The Roman Catholic Church maintains the following charitable institutions: one hospital, two orphan asylums, one home for the aged poor. Other charitable institutions in the State, not dependent on church support, but wholly or in part dependent on public funds are: 14 hospitals, 8 temporary county homes for children, 1 home for disabled soldiers, 1 home for soldiers' orphans, 1 hospital for the insane, 1 retreat for the insane, 2 institutions for instruction of the deaf, one institute and industrial home for the blind, 1 school for imbeciles, 1 almshouse for State paupers, 88 almshouses for town paupers, the paupers in 80 towns being provided for by securing board for them, or by assisting them at their homes. The charitable institutions depending solely on private support, are: 5 hospitals, 15 homes for the aged and friendless, 13 homes and asylums for the young. In addition to the foregoing there are 10 private sanitariums licensed by the State. A fee is charged to patients in these institutions. An additional State hospital for the insane has been authorized by the General Assembly of 1903.

Penal and Reformatory Institutions.— These are: 1 State prison, 8 county jails, 1 reform school for boys, called "the Connecticut School for Boys," 1 industrial school for girls.

The total amount expended for charities and corrections in 1901 was $1,598,514.

Education, etc.— The educational system of Connecticut was planted almost literally with the first corn that was planted by the early settlers. From the small beginnings in the few towns the present system of public schools has evolved, aided materially in 1795 by the proceeds of Western Reserve lands, now in the State of Ohio, which were sold in order to establish a school fund. These lands, to the extent of about 3,500,000 acres, were granted to Connecticut by the United States in 1786, as a tacit compensation for her loss of the Wyoming territory by a decree of 1782. About 500,000 acres were granted by Connecticut to those within her jurisdiction who had suffered from the incursions of the British during the Revolution, and the remaining 3,000,000 acres were sold for the establishment of a school fund. This fund remains intact to the present day, and amounts to $2,020,732.91, yielding an income of $107,824.39, being less than one fourth of the amount paid by the State for the support of public schools under

the law providing for payment by enumeration. Another fund, which the State has appropriated to the towns, is known as the town deposit fund, which was Connecticut's share of the apportionment from the surplus of the United States treasury in 1837, and which was apportioned by the State to the towns. Under the law of 1859, the entire income of this fund was to be used for education; but it has become so merged in the general treasuries of the various towns that it is difficult to get any specific account of the manner in which it is used. It amounted in 1901 to $763,661.83, yielding a nominal interest of $29,151.96. According to latest reports of the State board of education, "in most cases this interest exists on paper only." Beyond this State support, the common school system depends on taxation in the various towns and school districts to meet expenses. By a recent decision of the courts, a school district may, in lieu of the payment made by the State of $2.25 for each enumerated school child, receive from the town the actual expense of conducting the schools for 36 weeks in the year. Education is compulsory, the limit of age for school attendance being from 7 to 16 years.

The control of the common school system is varied. A single town may conduct its schools by means of a committee, or it may divide itself into an indefinite number of school districts, each in charge of a committee, and all under the supervision of school visitors; or these districts may each be incorporated under the sole control of a board of education. The tendency, of late years, is toward the consolidation of the various districts in each town. Recent legislation provides for the extension of high school education. In addition to the common schools, to whose support it contributes, the State now supports three normal training schools for teachers, and has made an appropriation for the establishing of a fourth. It also controls and supports an agricultural college and experiment station. The public school buildings number 1,592, employing continuously 3,973 teachers, with many others employed during portions of the year. The number of children between the ages of 4 and 16 enumerated in 1902 was 209,019.

In addition to the public schools, there are in the State 161 private schools, of which 59 are parochial schools of the Roman Catholic Church, 4 parochial schools of the Lutheran Church, and the rest non-sectarian, being business colleges, boarding schools, and secondary or high schools. These 161 private schools employ 929 teachers, and are attended by 31,347 pupils. The higher institutions of learning are all supported by endowments or church funds. The principal of these are Yale University, Wesleyan University, Trinity College, the Hartford Theological Seminary, the Berkeley Divinity School, St. Thomas Catholic Seminary, and St. Joseph Catholic Seminary. Each of these has a large library of its own, that of Yale University being the largest in the State.

The State Library contains a large and valuable collection of the laws and official documents of other States and the general government; besides which it has accumulated a general collection, in which history is prominent. It also contains many rare and original documents, including the charter of 1662. There were, at last reports, 130 general public libraries in the State, of which 99 were free and 33 charged fees for the use of books. Library legislation encourages the establishment of free libraries by giving books to the value of $300 annually to towns which make appropriations to that extent.

The newspapers published in the State number 141, of which 37 are daily, 11 semi-weekly, and 93 weekly.

The principal historical societies are the Connecticut, New Haven Colony, New London County, Middlesex County historical societies, and the Bridgeport Scientific and Historical Society.

Government.— The government of Connecticut has been conducted under two different constitutions, the first of which was adopted in January 1638–9, and was fortified and protected by the charter of 1662; and the second of which was adopted as the result of a constitutional convention in 1818. This constitution, with its subsequent amendments, forms the organic law of Connecticut at present. Under it the governor, lieutenant-governor, secretary of state, treasurer, comptroller, and members of the General Assembly are chosen biennially by the people. Other State officers are appointed either by the governor, sometimes with and sometimes without the consent of the Senate, or by the General Assembly. This body is composed of a Senate, consisting of 24 members, and a House of Representatives, consisting of 255 members. One senator is elected from each of the 24 senatorial districts; two representatives each from 87 towns; and one representative each from 81 towns. The courts are the supreme court of errors, the superior court, the court of common pleas, and the district court, the judges of which are appointed by the General Assembly on nomination by the governor. Judges of city, borough, and town courts are appointed by the General Assembly. There are in the State 112 probate districts, the judges of which are elected by the people.

Population.— The population of the State is 908,420 by the census of 1900, showing an increase of 162,162 in 10 years. Of this population 670,210 are native born, and 238,210 foreign born. Only 3.8 per cent of the entire population are classified as illiterate, being the smallest percentage of illiterate population of any State in the Union except Massachusetts, which shows 3.5 per cent of illiterates.

The latest reported total of grand lists of taxable property is $649,571,791. The State debt is $1,663,100. The receipts for the year ending 30 Sept. 1902, were $3,275,112.23; expenses $3,113,687.57.

Owing mainly to dissatisfaction with the unequal town representation in the House of Representatives, a constitutional convention was called in January 1901, which drafted a new constitution, which was rejected by popular vote 16 June 1902. The representation in the House for the largest city and the smallest town thus remains often equal and practically the same as that for which the original constitution of 1638–9 provided. The division of senatorial districts, though intended to remedy this inequality, is not entirely a satisfactory solution of the difficult problem of establishing equal representation.

JONATHAN TRUMBULL,
Librarian of Otis Library, Norwich.

Connecticut, a river of the United States, rising on the northern border of New Hampshire; it forms the boundary between Vermont and New Hampshire, passes through the western part of Massachusetts and the central part of Connecticut, and falls into Long Island Sound. The western branch forms by treaty the boundary between the United States and Canada to lat. 45° N. It is navigable for vessels drawing from 8 to 10 feet to Hartford, 50 miles from its mouth. Above this the navigation is impeded by rapids and falls, but subsidiary canals now make navigation possible for 250 miles above Hartford. The river is famed for its shad fisheries.

Connecticut Lakes, four small lakes in the northern part of Coos County, N. H., which are connected with the Connecticut River in the beginning of its course. They are named in numerical order, from southwest to northeast, the largest one, Connecticut Lake proper, being known as First Lake. The smallest two, Third Lake and Fourth Lake, which are very near the Canadian boundary, are the ultimate sources of the river.

Connecticut Reserve. See WESTERN RESERVE.

Connecticut Yankee in King Arthur's Court, a humorous tale by Mark Twain published in 1889. It is the story of a superintendent of an arms factory in Hartford, Conn., who one day lost consciousness from a blow received in a quarrel with his men, and when he awoke found himself in England at the time of King Arthur. The contact of Connecticut Yankeedom with Arthurian chivalry gives rise to strange results; yet amidst all the fun and pathos, the courtliness, the sincerity, and the stern virtues — as well as what seems to us the ridiculousness — of the age are well shown.

Connective Tissue, the most important supporting tissue in the body. It is one of a general class, being associated with cartilage and bone. In connective tissues in general the cellular elements are inconspicuous, the intercellular substance giving character to the tissue. Connective tissue, in the limited sense, as well as the other connective tissues belonging to the group, are developed from the mesoderm, and consist of variously branched cells which possess a small amount of protoplasm and relatively large nuclei. The branches of the neighboring cells are united by threads of protoplasm, and between the cells there is usually a homogenous network. Three main types of connective tissue proper are described. These are mucous connective tissue, fibrillar connective tissue, and reticular connective tissue. The mucous connective tissue, such as is seen in the Wharton's jelly of the umbilical cord, consists of round or star-shaped branched cells with a large amount of differentiated mucous-like intercellular substances. This contains a few fine fibrils sometimes collected in bundles. It is very common in developing animals, and is not often represented in the adult human animal, but is very common in many adult lower animals. The fibrillar connective tissues or fibrils are of several kinds. In these there is an abundant intercellular substance, composed of fibrils which are fine filaments less than one micromillimetre in diameter, which are united in small bundles by a cement substance. The fibres vary somewhat in color and somewhat in elasticity, and according to these minute variations they are white fibrous tissue, elastic fibrous tissue, yellow elastic fibrous tissue (qq.v.). Reticular connective tissue consists of a delicate network of anastomosing star-shaped cells, or a fibrous connective tissue in which the intercellular substance has disappeared. Such tissues are very common in the lymph nodes, spleen, and the mucous membrane of the intestinal canal.

Con'nelley, William Elsey, American author: b. Johnson County, Ky., 15 March 1855. Though almost entirely self-educated, he was for a number of years a school teacher in Kentucky and Kansas 1872–82. For four years (1888–92) he was in the wholesale lumber business, and then engaged in banking. His leisure has been chiefly devoted to the study of the history and antiquities of the North American Indians, and the States of the middle west. He compiled the first vocabulary of the Wyandot language, and has made valuable studies of the languages of the Delawares, Shawnees, and other tribes. His papers have mostly appeared in the publications of the Ontario, Kansas, Nebraska, and Ohio Historical societies, the Bureau of Ethnology, and Smithsonian Institution. Some of their titles are: 'The Provisional Government of Nebraska Territory' (1899); 'Notes of the Clan System of the Wyandots' (1899); 'Notes on the Folk-Lore of the Wyandots' (Journal of American Folk-Lore, 1900); 'James Henry Lane, the Grim Chieftain of Kansas' (1899); 'Kansas Territorial Governors' (1900); 'John Brown: the Last of the Puritans' (1900); 'The Overland Stage to California' (with Root, 1902).

Con'nellsville, Pa., a borough in Fayette County, on the Youghiogheny River, and the Baltimore & O. and the Pennsylvania R.R.'s, 57 miles east of Pittsburg. It is the centre of the most extensive coke-burning region in the United States, the ovens here producing half of the total coke output of the country. It also contains one of the largest lock factories in the country. Other important industries are machine shops, pump works, brick works, and coal mining. It is the seat of Cottage State Hospital. Pop. (1900) 7,160.

Con'nelly, Celia Logan, American journalist: b. Philadelphia 1837. She is a daughter of C. A. Logan (q.v.), and was married to an American artist, M. K. Kellogg, in 1859. Her literary career began in London, but she returned to the United States after the death of her husband, and in 1872 married James H. Connelly (q.v.). Her novels include: 'Her Strange Fate' (1891); 'Sarz' (1891); etc. She has also written plays, notably 'An American Marriage'; and 'Gaston Cadol.'

Connelly, James H., American journalist: b. Pittsburg, Pa., 1840. He began newspaper work when 17 years old, writing for leading Chicago, New York, and San Francisco journals, and was a volunteer officer in the Civil War. His writings include short stories and special articles for newspapers and magazines, 'My Casual Death' and other novels. Since 1889 he has been prominent in the Theosophist movement.

Connemara, kŏn-nẹ-mā'rạ, Ireland ("the Bays of the Ocean"), a boggy and mountainous district occupying the western portion of county

Galway, about 30 miles long and 15 to 20 miles wide. Its coasts are very broken, and there are numerous small lakes. It is subdivided into Connemara Proper in the west, Jar-Connaught in the south, and Joyce County in the north.

Con'ner, David, American naval officer: b. Harrisburg, Pa., 1792; d. Philadelphia, 20 March 1856. He entered the navy as a midshipman in 1809; took part in the action between the Hornet and the Peacock, 24 Feb. 1813, becoming lieutenant on the former, 24 July 1813. He was severely wounded on the Penguin 23 March 1815, and his gallantry was rewarded by a medal from Congress, and a sword from his native State. During the Mexican war he blockaded the Gulf ports of Mexico, captured the port of Tampico; directed the landing of Gen. Scott's army at Vera Cruz, and took part in the reduction of San Juan de Ulloa. He was commandant at the Philadelphia Navy Yard when he died.

Con'nersville, Ind., the county-seat of Fayette County, situated on the Whitewater River and on the Cincinnati, C., C. & St. L. and the Cincinnati, H. & D. R.R.'s. It has a number of manufactures, including furniture, carriages, blowers, and woolens. There are several natural gas wells, and also electric lights. Pop. (1900) 6,836.

Con'nery, Thomas Bernard Joseph, American journalist: b. Ireland, 13 Oct. 1838. The greater part of his career was spent in the service of the New York *Herald,* on which he held nearly every position except that of financial editor, 1856–84. He was editor of New York Truth, 1885; 'Once a Week,' 1893–5; 'Collier's Weekly,' 1895. He was United States secretary of legation and *charge d'affaires* in Mexico, 1866–8. He has published: 'Don Tiburcio'; 'Black Friday'; 'History of American Comic Journalism'; 'Character Marks Autorial'; 'Essays on Literary Women of England.'

Conning Tower, the place in modern battleships where the commander stands during a naval engagement, and from which he directs the movements of the ship and men. The conning tower is built over the forward turret and is a circular chamber, scarcely six feet across and protected by walls of steel 12 inches thick. The roof is also of solid steel. Between the arched roof and the walls is a narrow slit from which the eye can sweep the whole horizon. The sharp pointed bow of the boat is just below, and directly in front are the two big guns that protrude from the turret. Throughout the engagement the commander is invisible to his men, his voice alone being heard through the speaking tubes and telephone with which the turret is fitted. In its centre are the steam-steering wheel, binnacle, and compass, and by the directing hand of the commander, standing beside the compass, the battle is fought. He touches one button and the great engines drive the boat through the water; another signals the discharge of the heavy guns; the touch of a third loosens the torpedoes, while a word through a tube sends a storm of steel and lead flying from the machine guns on the upper decks and in the round top.

Con'nor, Ralph. See GORDON, CHARLES WILLIAM.

Connor, Selden, American soldier: b. Fairfield, Maine, 25 Jan. 1839. He graduated at Tufts College, 1859; enlisted as a private in the 1st Vermont regiment 1861; became lieutenant-colonel of the 7th Maine regiment 1861, colonel of the 19th Maine 1864, and brigadier-general of volunteers June 1864. He was present at the battles of Fredericksburg, Gettysburg, and the Wilderness, where he was severely wounded. After the War he held several minor Federal offices, was governor of Maine 1876–8, United States pension agent 1882–6, and 1897. On 3 October 1889 he delivered the oration at the dedication of the Maine monuments at Gettysburg.

Conodonts (Gr. "cone-teeth"), minute fossils found in Palæozoic strata. They look very like the teeth of different kinds of fishes, some being simple slender pointed sharp-edged cones, while others are more complex, resembling in form the teeth of certain sharks. The old opinion was that they are minute teeth of fishes allied to the living hag-fishes and lampreys, but it is more likely that they are the jaws of annelids and naked mollusks.

Co'noid, in geometry, a surface generated by a straight line moving in such a manner that it constantly touches a curve and another straight line; similar to the cone, but having a straight line instead of a point for its apex.

Co'non, Athenian general: d. after 392 B.C. Having been defeated in a naval engagement at Ægospotamos by Lysander, he for a time went into exile; but being aided by Artaxerxes, king of Persia, he returned and defeated the Spartans near Cnidos, 394 B.C. Conon then began to rebuild the fortifications of Athens, and restored it to liberty and security.

Conon, of Samos, Greek astronomer and geometer who lived in the 3d century B.C. He was a friend of Archimedes and invented the curve known as the Spiral of Archimedes.

Conon'icut, R. I., an island in Narragansett Bay, eight miles long by one broad, about nine miles south of Providence. On its south end is a lighthouse.

Conoscope, kō'nō-skōp. See POLARISCOPE.

Conquest, Ida, American actress: b. Boston, Mass. Her first stage experience was at the age of eight, when she appeared as Little Buttercup in the Boston Museum juvenile production of 'Pinafore,' a part she played over 300 times. Her professional début was made in 1892 with Alexander Salvini at a special matinee performance at the Tremont Theatre, Boston, in which she played Isobel in 'Rohan, the Silent.' Others of her parts are Phyllis Lee, in 'The Charity Ball'; Carey, in 'Alabama'; Sybil, in 'The Dancing Girl'; Renée de Cochefort, in 'Under the Red Robe'; Babiole, in 'The Conquerors.' See Strang, 'Famous Actresses of the Day.'

Conquest of Mexico, The, a noted history by William Hickling Prescott, published 1843. It was most favorably received by the public, 4,000 copies being sold in America within four months of the date of issue.

Conquest of Peru, The, a history published by William Hickling Prescott (1847). Of the five books into which this work is divided, the first treats of the wonderful civili-

zation of the Incas; the second of the discovery of Peru; the third of its conquest; the fourth of the civil wars of the conquerors; and the fifth of the settlement of the country. The first book hardly yields in interest to any of the others, describing as it does, on the whole, an unparalleled state of society. From the necessities of its material, the work is more scattered in construction than is the 'History of the Conquest of Mexico,' usually regarded as the author's most brilliant production.

Conrad I., emperor of Germany: d. 23 Dec. 918. He was elected king of Germany in 911; but Arnulf, Duke of Bavaria, and Henry, Duke of Saxony, disputed his title, and engaged the Huns to overrun Germany. Conrad is said to have received a mortal wound in combat with these revolted chiefs. He is chiefly noteworthy for the revival in his case of the elective title to the crown.

Conrad II., emperor of Germany: d. Utrecht 4 June 1039. He was the son of Henry, Duke of Franconia, and was elected king of Germany in 1024. Attempts were made to displace him, but without success, and in 1027 he was crowned emperor at Rome, in the presence of Canute, king of England, and Rudolph, king of Burgundy. He is regarded as the true founder of the Franconian or Salic line. He was often engaged in contests with the greater barons and princes of the empire, and endeavored to form a counterpoise to their influence by encouraging the formation of minor independent fiefs. With the same view he endeavored to appropriate several of the larger duchies to members of his own family, and thus convert the elective empire into a hereditary monarchy similar to that of France. These designs, though conducted with considerable ability, failed, mainly in consequence of the incessant contests in which he was engaged with the popes.

Conrad III., emperor of Germany: b. 1093; d. Bamberg, Germany, 15 Feb. 1152. He was of the house of Hohenstauffen; and was elected emperor in 1138. His title was disputed by Henry the Proud, Duke of Saxony, and the rivalry of these two princes was the germ of the factions afterward so famous under the names of Guelfs and Ghibellines. In 1146, at the diet held at Spire, Conrad was persuaded by the eloquence of St. Bernard to undertake a crusade, on which he set out the following year. It was fruitless and disastrous, and Conrad returned with the wreck of his army in 1149.

Conrad IV., emperor of Germany: b. Andria, Italy, 25 or 27 April 1228; d. Lavello, Italy, 21 May 1254. He was chosen king of the Romans in 1237, was a son of the great Emperor Frederick II., and like him excommunicated by the Pope, Innocent IV., who set up a rival emperor in William, Count of Holland. On the death of his father in 1250, Conrad marched into Italy to recover the towns which had declared against him. He took Naples, but could not get the investiture of the kingdom of Sicily from the Pope.

Conrad V., or **Conradin,** German prince: b. 1252; d. Naples 22 Oct. 1268. He was the son of Conrad IV., and the last of the Hohenstauffen. He accepted the invitation of the Italian Ghibellines to place himself at their head and the sale of a large portion of his possessions enabled him to raise troops. In the autumn of 1267 he crossed the Alps with 10,000 men, and at Verona was warmly received by the Scala family, the chief of the Ghibelline party. His relatives here, persuading him to part with his remaining possessions at a low price, deserted him with their followers, leaving but 3,000 men. The Ghibellines, however, remained true to him. Verona raised a large army, Pisa a fleet, and Rome, whose pontiff was forced to flee to Viterbo, opened its gates to him. Conradin entered lower Italy, and at Tagliacozzo met the French army under Charles d'Anjou, on whom the crown of Naples had been bestowed by Pope Urban IV. He beat Charles back, and his men, supposing the victory won, dispersed in search of plunder, when they were attacked by the French and utterly routed, 23 Aug. 1268. Conradin escaped, but was betrayed into the hands of Charles at Astura, who caused him to be beheaded in the market place of Naples.

Conrad, kōn'räd, **Frederik Willem,** Dutch engineer: b. Delft 1769; d. 1808. He was the pupil and friend of Brunings, who did so much for the construction of the sea dykes of Holland, and on his death succeeded him in his situation of inspector-general of sea dykes in the province of Rynland. He afterward held the office of administrator-general of the sea dykes in the Low Countries. He rendered a lasting service to his country by reclaiming large tracts of land from the sea, and more especially by the formation of a proper outlet for the waters of the Rhine.

Conrad, George, pseudonym of Prince George of Prussia (Friedrich Wilhelm Georg Ernst), German dramatist: b. 12 Feb. 1826. He has experimented successfully with various forms of dramatic literature; and among his productions are: 'Cleopatra'; 'Yolantha'; 'The Talisman'; 'Christine of Sweden'; 'Elfrida of Mount Salerno' (1875); 'Catharine de Medici' (1884); 'Sappho' (1887); ''Where is Happiness?'; 'The Marchioness of Brinvilliers'; 'Phædra.'

Con'rad, Joseph, English novelist: b. Poland, the son of a Polish revolutionist. He was educated in Cracow, and at 13 went to sea, becoming subsequently a captain in the merchant service. After a long experience as a sea rover, he settled in England and began putting his various experiences into literature. His writings include: 'Almayer's Folly' (1895); 'An Outcast of the Islands' (1896); 'The Nigger of the Narcissus,' issued in America as 'The Children of the Sea' (1897); 'Lord Jim' (1900); 'The Inheritors' (with F. M. Hueffer, 1901); 'Youth and Other Tales' (1902); 'Typhoon' (1902).

Conrad, kōn'räd, **Michael Georg,** gā'örg, German novelist: b. Gnodstadt, Franconia, 5 April 1846. He founded at Munich, in 1885, 'Society,' a journal intended to be an organ of the «naturalistic» school. He spent several years in Paris, and many of his sketches relate to phases of life in France. Among his novels are: 'The Wise Virgins'; 'The Fool's Confession.' He is author of a comedy, 'The Emancipated,' and the drama, 'The Firm of Goldberg.' On social and political questions he has written: 'The German Reveille'; 'Justice, the State, and the Modern Spirit.'

Con'rad, Robert Taylor, American lawyer and dramatist: b. Philadelphia, 10 June 1810; d. there 27 June 1858. He wrote: 'Aylmere' (1852), a tragedy in which Edwin Forrest played the role of Jack Cade; 'Conrad of Naples,' a tragedy; 'Poems' (1852); etc.

Conrad, Timothy Abbott, American naturalist: b. New Jersey Aug. 1803; d. Trenton, N. J., 9 Aug. 1877. His special study was American palæontology, but he investigated many other departments of natural history. He prepared the New York State geological report for 1837, was palæontologist of the New York Geological Survey, 1838–41, and made the reports on the palæontological discoveries in the Pacific R.R. survey and the Mexican boundary survey. He published: 'American Marine Conchology' (1831); 'Fossil Shells of the Tertiary Formations of the United States' (1832); 'Monography of the Unionidæ' (1835–47); 'Check List of the Invertibrate Fossils of North America' (1866). A very full list of his numerous papers will be found in the Royal Society's 'Catalogue of Scientific Papers.'

Conrad von Wurzburg, kōn'räd fōn vürts'-boorH, German poet: d. Basel 1287. Fertile in imagination, learned, and, although marking the decline of Middle High German poetry by his prolix and artificial style, he was probably the most perfect master of German versification that had appeared up to his own day. His last poem, left unfinished, has for its subject, 'The Trojan War.' But he appears to most advantage in his smaller narrative poems, of which the best are: 'Engelhart'; 'Otto'; 'Der Welt Lohn'; 'Silvester'; 'Alexius'; 'Der Schwanritter'; and 'Die Goldene Schmiede.' His 'Lieder' have been edited by Bartsch (1870).

Conradi, Hermann, hĕr'mān kōn-rä'dē, German literary critic and essayist: b. Jetznitz 1862; d. 1890. As lyrist and critic he was a representative of radical realism, a follower of Tolstoy, Ibsen, and Nietzsche. His genius was forceful, but undisciplined, and his writings lack repose and polish.

Conradin (kōn'rä-dēn) **of Suabia.** See CONRAD V.

Conried, Heinrich, American impresario: b. Bielitz, Austrian Silesia, 13 Sept. 1855. Graduated from the Oberrealschule of Vienna, he came to the United States, and was for several years a manager of German theatrical and operatic organizations. As director of the Irving Place Theatre, New York, he became known for excellent presentations of German classic drama, frequently repeated at Cambridge and other university centres. In 1903 he became director of the Metropolitan Opera-house, where on 24 Dec. of that year he presented Richard Wagner's 'Parsifal' for the first time outside of Bayreuth.

Conring, Hermann, hĕr'mān kōn'rĭng, Dutch scholar: b. Norden, East Friesland, 9 Nov. 1606; d. Helmstedt, Brunswick, 12 Dec. 1681. He studied at Helmstedt and Leyden, devoting himself chiefly to theology and medicine; was appointed, in 1632, professor of philosophy at Helmstedt, in 1636 professor of medicine, and remained in this city until his death. He was distinguished in almost every department of knowledge, and the title of a counselor was conferred on him by the kings of Denmark and Sweden and the elector of the Palatinate. He was then made professor of law. The German emperor likewise distinguished him. From far and near his advice was sought in political and legal cases. He did a great deal for the history of the German empire, and for the improvement of German public law, in which he opened a new path. He wrote: 'De origine juris Germanici' (1643); 'Excertationes de re publica Germanica' (1675); and very many other treatises to the number of over 100. His works, with his biography, were published in 1730.

Consalvi, Ercole, ĕr-kō'lē kōn-säl'vē, Italian statesman and cardinal: b. Toscanella 8 June 1757; d. Rome 24 Jan. 1824. Having in 1797 entered the public service of the court of Rome in an humble capacity, he was four years later one of the 12 auditors of the Rota, a commission in effect a supreme court of appeal in all matters secular as well as ecclesiastical. The French having taken possession of Rome, Consalvi falsely accused of having had part in an assassination, was for a while held in prison and then banished. When Pius VI. died, Consalvi was largely instrumental in procuring, in the conclave held at Venice, the election of Cardinal Chiaramonti to the papal throne as Pius VII., and thereafter was that pontiff's chief counselor; he was now second only to the Pope in all dealings with the European powers and specially with Napoleon. In the course of the controversies between Rome and the French emperor, he showed a firmness that won for him the unwilling respect indeed of Napoleon, but also his irreconcilable enmity. It was while the emperor was flushed with the victory of Austerlitz that he sent to Consalvi through Cardinal Fesch the message, "Tell Consalvi that if he loves his country he must either resign or do what I demand"; and the cardinal prudently withdrew from public life for a season. In 1809 he had an interview with Napoleon at Paris, in which the emperor in effect made an apology for that act; but Consalvi persisted in his opposition to Napoleon's designs; and was one of the 13 cardinals who refused to concede the lawfulness of the second marriage of Napoleon. In punishment of his obstinacy in that matter he was held in confinement three years at Rheims. After the fall and banishment of Napoleon, he resumed his station in the papal court and devoted himself to the institution of many reforms in the government, being in effect chief governor of Rome and the papal states. He was always a liberal patron of art, literature and science. He left the bulk of his property to the poor. Consult Crétineau-Joly, 'Mémoires du Cardinal Consalvi.'

Conscience, kôn-syäns, Hendrik, Flemish novelist: b. Antwerp, 3 Dec. 1812; d. Brussels 10 Sept. 1883. Having educated himself, he taught for a short time in a school, and then served in the army from 1830 till 1836. He was for a time tutor in Flemish to the royal princes, and from 1868 conservator of the Wiertz museum at Brussels. His novels are partly based on the history of his country, partly pictures of everyday Flemish life. Among the former may be mentioned: 'The Year of Wonders' (1837); 'The Lion of Flanders' (1838); 'Jakob van Artevelde' (1849); 'The Peasants' War' (1853); 'Batavia' (1858); 'The Burgomaster of Liège' (1866); and 'Everard T'Serclaes' (1874); and of the latter, which

are well written, very accurate and highly sympathetic, the chief are: 'What a Mother Can Endure' (1843); 'The Conscript' (1850); 'Wooden Clara' (1850); 'Blind Rosa' (1850); 'The Poor Nobleman' (1851); 'The Miser' (1853); 'The Young Doctor' (1860); and 'Maternal Love' (1862). He wrote also a musical drama, 'The Poet and His Dream' (1872). Many of his works have been translated into almost every European language. In 1881, on the occasion of the appearance of his hundredth volume, the Flemish people paid him a splendid tribute. The 10th anniversary of his death was observed in Antwerp with public ceremonies.

Con'science, the judgment or dictate of the practical intellect which from general moral principles pronounces that something is to be avoided because it is evil, or to be done because it is good. (See ETHICS.) Conscience Clause is the term applied to a clause in an act or law when it relieves persons who object on religious grounds to do something enjoined by the act or law, from any penalty to which they would otherwise be liable.

Conscience Money, stolen or wrongfully acquired money returned to its rightful owner when conscience is awakened to a sense of right dealing. In the United States such money paid into the treasury at Washington by self-avowed debtors anonymously is known as the conscience fund. In England the phrase is applied to money forwarded, as a rule anonymously, to the chancellor of the exchequer for unpaid income tax. It amounts to some thousand pounds a year.

Conscience Whigs. See WHIGS.

Consciousness (Ger. *Bewusstsein;* Fr. *conscience;* It. *conscienza*) is the term by which modern psychology aims to distinguish that which is characteristically and actively mental from that which is merely physical or vital. A number of statements regarding the inclusions and exclusions of the concept might be made, but a concise and accurate definition, in the present state of psychological knowledge, is impossible. This for two reasons: First, no particular group of objective phenomena can be pointed out as answering to what we mean when we employ the term, though there are numerous groups which may be taken as signs or manifestations of consciousness. Hence one common means of definition in the sciences, namely, the designation, analysis, and reduction to common and indispensable properties of similar phenomena, is unavailing in the present instance. Secondly, consciousness cannot be in any sense identified with any of the manifestations which signalize its presence. When I am actively engaged in some thought process, I am certainly conscious, but this is not what I mean by consciousness; for the term means something more than the sum of the states or manifestations of mind.

In lieu of a definition the best way of approaching a knowledge of the meaning of the term is analysis of its connotation. The word consciousness is an abstract noun derived from the more concrete adjective conscious. When we apply this latter adjective we mean to call attention to the awareness characterizing the normal mind when active, that is, when not asleep or in a swoon. Conscious is therefore used in opposition to unconscious, and implies a condition of mind in which the subject is to some degree, be it ever so slight, aware of his own activity. The use of the two words conscious and unconscious brings to our notice a peculiar fact. An unconscious state is more striking than a conscious state just because it is less an integral part of the subject's ordinary experience. It is also from the observer's point of view wholly objective for the simple reason that the observation of an unconscious state in one's self would be in the nature of things a contradiction in terms. When we are in the profoundest sleep, we can make no observations upon our own states. This peculiarity permits us to draw one accurate distinction between consciousness and non-consciousness (including unconsciousness), namely, the state of consciousness is always to some degree its own object, or, in other words, the possessor of conscious mind is always in some wise looking in upon his own active ongoings. On the contrary, the non-conscious can never be an object for itself, but must always be an object for some (other) consciousness. It follows that one of the principal means of psychological investigation, introspection, can never apply to the unconscious. It would be no more absurd to ask a log of wood how "woodiness" feels than to ask an unconscious mind to give a first-hand account of itself. And when people speak of their experiences during a fainting fit what they really refer to is their sensations just as they are coming back to the world of life and light. Although introspection is not applicable to unconscious conditions of the normally conscious, observation and experiment can be applied with good results, and some interesting data have been secured in this way; though they are strictly speaking physiological rather than psychological.

This reference to the unconscious has seemed necessary here because the conscious has to be determined so largely by limitation. All that has been said, it will be observed, does not aim to define the term we are discussing, but simply seeks to make its psychological application better known by connecting it with ordinary usage. Bearing this purpose in mind, we cannot do better than to quote the explanation of the word given in Ladd's 'Psychology, Descriptive and Explanatory' (p. 30).

> Whatever we are when we are awake, as contrasted with what we are when we sink into a profound and dreamless sleep, that it is to be conscious. What we are less and less, as we sink gradually down into dreamless sleep, or as we swoon slowly away, and what we are more and more, as the noise of the crowd outside tardily arouses us from our after-dinner nap, or as we come out of the midnight of the typhoid fever crisis, that it is to become conscious.

We detect in this descriptive statement of the characteristic phenomena of consciousness a recognition of degrees or stages, as well as of a limen or threshold, at which the unconscious mind awakes to consciousness, even though it be but a minimal consciousness. Of these we must now speak.

The phrase, threshold of consciousness, which has figured very largely in recent psychological literature, is a metaphorical expression for the common experience that a certain intensity of stimulus is necessary in order that the subject may have a conscious state. It might be used with perfect propriety broadly enough to include every form of coming to consciousness. In reality, however, the phrase, which Herbert

coined and Fechner used in his psycho-physical investigations, is limited to sense experience, being employed to designate the point where an increasing stimulus arouses a responsive sensation, or where a decreasing stimulus ceases to be perceived. In this instance there is a case of arising to the consciousness of a given object, rather than the return to consciousness as a mode of mind. However, the two cases are not so unlike as might at first sight appear, for the return from consciousness after sleep is usually signalized by the tardy perception of a sensory stimulus that has perhaps been knocking at the vestibule of consciousness all unheeded for some time.

We may pass over the various intervening degrees of consciousness with a mere allusion, and go on to consciousness in its most alert form, namely attention. Psychologists are accustomed to recognize two sub-species of attention, voluntary and non-voluntary. The distinction between them is based upon the presence or absence of volition at the initial moment of the redirection of consciousness. Otherwise they are essentially the same; and as non-voluntary or forced attention usually becomes voluntary after the first reception of the stimulus, both may be described by an inventory of the attributes of the voluntary variety. Prof. James in his interesting chapter on 'Attention' (Psychology,' Vol. I., ch. xi.) calls our notice to the neglect of attention by the psychologists of the English empiricist school, and assigns as the reason their proneness to neglect and minimize the spontaneous tendencies of the mind. It is on attention as marking something especially self-initiated in mental activity, that the advocates of a rationalistic view of mind love particularly to dwell. This furnishes us with a clue to one of the attributes of attention. It is in a very special sense an active and energizing state of mind. When a sense stimulus impinges on an end-organ, the state of mind ensuing is in a way passive and receptive; but the moment consciousness awakens to the presence of the sensation and grows absorbed in contemplating it, there is an end to passivity. Whatever be said of sensation, attention, once aroused, is a pre-eminently active form of consciousness, and from the instant that the mind lays a selective hold upon the object soliciting it until it voluntarily lets go of it, there are numerous signs of the most intense phase of mental activity. The sympathetic workings of the facial muscles during such a period, the feeling of tension and uneasiness about the head, the firm set of the teeth, all these things bear witness to the forth-putting of great nervous energy. Another marked characteristic of attention is its tendency to fluctuate even when under what is seemingly the most steadfast control. Though the more noticeable and lasting fluctuations may with training be subjected to control, the insensible variations which are always to be discovered by experiment, persist in spite of the best training of the will.

The nature of attention is not fully made out. Some of the older schools of psychologists regarded it as a special faculty. This view is not tenable. Non-voluntary attention may perhaps be regarded as an absorbed form of consciousness, while voluntary attention is but the entire conscious self dominated by intelligent will. What we mean by attention is so well illustrated by experience that a formal definition scarcely seems necessary. A happy comparison which aids somewhat in understanding the working of attention is that borrowed from vision. Just as one may at any moment bring what is on the periphery of the field of vision to the point of keenest vision by a slight turn of the eyeball, so that which is at any moment on the bounds of the field of consciousness may be brought under the searchlight of the attention by a shifting of the mind in that direction.

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Consciousness, Biological Aspects of. Consciousness is at once the oldest problem of philosophy and one of the youngest problems of science. The time is not yet for giving a satisfactory definition of consciousness, and we must fain content ourselves with the decision of the metaphysician, who postulates consciousness as an ultimate datum or concept of thought, making the brief dictum *cogito, ergo sum* the pivot about which his system revolves.

Opinions concerning consciousness are many and so diverse as often to be mutually exclusive, but they may be divided into two principal classes. The first class includes all those views which make of consciousness a real phenomenon; the second, those views which interpret it as an epiphenomenon. The fundamental question is: Does or does not consciousness affect directly the course of events? — or, stated in other words, is consciousness a true cause? In short, we encounter at the outset the problem of free-will.

The opinion that consciousness is an epiphenomenon has gained renewed prominence in recent times, for it is a collateral result of the doctrine of monism. Monism itself is postulated chiefly upon the two greatest discoveries of the 19th century — the law of the conservation of energy, and the law of the evolution of species. Both laws establish a greater unity in the phenomena of the universe than mankind had previously been able to accept. With these two unities in mind, what could be nearer than the thought that the unity goes still deeper, and that the phenomena of the inanimate or physical, and of the living world are fundamentally identical? The progress of physiological science has greatly increased the impetus toward the adoption of this thought as the cardinal dogma of the new faith, because the work of physiologists has been so devoted to the physical and chemical phenomena of life, that the conviction is widespread that all vital phenomena are capable of a physical explanation. As to what is behind the physical explanation, complete agnosticism is the only possible attitude. Such in barest outline is the history of modern monism — the

doctrine that there is only one kind of power in the universe.

It is evident that monism involves the elimination of two concepts, God and consciousness. It is true that monists sometimes use these words, but they deny the concept for which the words actually stand. Now consciousness is too familiar to all men to be summarily cast aside and dismissed. Some way must be found to account for it. From the monistic standpoint there is a choice between the alternatives; consciousness is either a form of energy, like heat, etc., or merely an epiphenomenon. As there is no evidence that consciousness is a form of energy, only the second alternative is available, and it has been adopted by the monists.

It is essential to have a clear notion of what is meant by an epiphenomenon. Etymologically the word indicates something which is superimposed upon the actual phenomenon. It designates an accompanying incident of a process which is assumed to have no causal relation to the further development of the process, and corresponds to the logical term «accident» as distinguished from cause. In practice it is used chiefly in regard to the relation of the mind or consciousness to the body, and is commonly employed by those philosophers who believe that consciousness has no causal relation to any subsequent physiological process.

The epiphenomenon hypothesis of consciousness scarcely does more than explain consciousness very easily by merely assuming that it does not require to be explained at all. Is not that really the confession made by the famous assertion that the consciousness of the brain no more requires explanation than the aquosity of water?

Consciousness is better regarded as a biological phenomenon, which the biologist has to investigate in order to increase the number of verifiable data concerning it. In that way, rather than by speculative thought, is the problem of consciousness to be solved, and it is precisely because biologists are beginning to study consciousness that it is becoming, as I said in opening, the newest problem of science.

We must look to biologists for the mighty generalizations to come rather than to the philosophers because great new thoughts are generated more by the accumulation of observations than by deep meditation. The principal contribution of science to human progress is the recognition of the value of accumulating data which are found outside of ordinary human experience.

So, in regard to consciousness, for the present it is more important to seek additional positive knowledge than to hunt for ultimate interpretations. It is the department of biology to which properly belongs the problem of consciousness. The results of experimental psychology are still for the most part future. But we may obtain valuable preliminary notions concerning consciousness from our present biological knowledge.

We must begin by accepting the direct evidence of our own consciousness as furnishing the basis. We must further accept the evidence that consciousness exists in other men essentially identical with the consciousness in each of us. The anatomical, physiological, and psychological evidence of the identity of the phenomena in different human individuals is, to a scientific mind, absolutely conclusive.

The most striking distinction of the processes in living bodies, as compared with those in inanimate bodies, is that the living processes have an object — they are teleological. The distinction is so conspicuous that the biologists can very often say why a given structure exists, or why a given function is performed, but how the structure exists or how the function is performed he can tell very imperfectly, more often not at all. Consciousness is a particular example, and an excellent one of this peculiarity of biological knowledge. We do not know what it is, we do not know how it functions, but we do know why it exists. Those who are baffled by the elusiveness of consciousness when we attempt to analyze it will do well to remember that all other vital phenomena are equally and similarly elusive.

In order to determine the teleological value of consciousness, we must endeavor to make clear to ourselves what the essential function is which it performs. As I have found no description or statement of that function which satisfied me, I have ventured, perhaps rashly, to draw up the following new description:

The function of consciousness is to dislocate in time the reactions from sensations.

The description calls for a brief explanation. We receive constantly numerous sensations, and in response to these we do many things. These doings are, comprehensively speaking, our reactions to our sensations. When the response to a stimulus is obviously direct and immediate we call the response a reflex action, but a very large share of our actions are determined in a far more complicated manner by the intervention of consciousness, which may do one of two things: (1) Stop a reaction, as, for example, when something occurs, calling, as it were, for our attention, and we do not give our attention to it. This we call conscious inhibition. It plays a great role in our lives; but it does not mean necessarily that inhibited impressions may not survive in memory and at a later time determine the action taken; in such cases the potential reaction is stored up. (2) Consciousness may evoke a reaction from a remembered sensation and combine it with sensations received at other times. In other words, consciousness has a selective power, manifest both in choosing from sensations received at the same time and in combining sensations received at different times. It can make synchronous impressions dyschronous in their effects, and dyschronous impressions synchronous. But this merely paraphrases our original description. The function of consciousness is to dislocate in time the reactions from sensations.

This disarrangement and constant rearrangement of the sensations, or impressions from sensations, so that their connections in time are altered seems to me the most fundamental and essential characteristic of consciousness which we know. The characteristic we are considering is certainly important, and so far as the available evidence goes it belongs exclusively to consciousness. Without it life would have no interest, for there would be no possibility of experience, no possibility of education.

Now the more we have learned about animals, the better we appreciate the fact that in them only such structures and functions are preserved as are useful, or have a teleological value. Formerly a good many organs were

called rudimentary or vestigial, because they had no known function. But in many cases the functions have since been discovered. Such, for example, were the pineal gland, the pituitary body, the suprarenal capsules and the Wolffian body in man. It is accordingly well-nigh impossible for us to imagine that consciousness was evolved, as it has been, unless it had been bionomically useful. Let us therefore consider the value of consciousness from the standpoint of bionomics (a convenient term, recently gaining favor, for the economics of the living organism. Bionomics seems preferable to ecology, which some writers are adopting from the German).

We must begin with a consideration of the nature of sensations and the object of the reactions which they cause. In the simpler forms of nervous action a force, usually but not necessarily external to the organism, acts as a stimulus which causes an irritation; the irritation produces a reaction. Within the ordinary range of the stimuli to which an organism is subjected, the reaction is teleological, that is, it tends to the benefit of the organism. An organism might conceivably be maintained solely by this mechanism in co-operation with the physical laws which govern all matter. Life in such an organism would be a succession of teleological processes, essentially mechanical and regulated automatically by the organism. By far the majority of biologists regard plants as essentially conforming to this type of life.

A sensation involves the interpolation of consciousness between the stimulation and the reaction, and in consequence there is established the possibility of a higher order of adjustment to the external world than can be attained through the teleological reaction to a stimulus. This possibility depends upon the fact that the intervention of consciousness permits an adjustment in accordance not merely with the immediate sensation, but also, and at the same time, in accordance with earlier sensations. Thus, for example, the child sees an object, and its reaction is to take hold of the object, which is hot and hurts the child. Later the child sees the object again and its natural reaction is to take hold of it again, but the child now reacts differently because its consciousness utilizes the earlier as well as the present sensation; the previous sensation is dislocated in time and fused with the present sensation and a new reaction follows. No argument is necessary to establish the obvious conclusion that an organism which has consciousness has an immensely increased scope for its adjustments to the external conditions; in other words consciousness has a very high value for the organism.

A sensation gives information concerning the external world. Perhaps science has achieved nothing else which has done so much to clarify philosophy as the demonstration that the objective phenomena are wholly unlike the subjective sensations. Light is a series of undulations, but we do not perceive the undulation as such, but as red, yellow, and green. Objectively red, yellow, and green do not exist. Similarly with the vibrations of the air, certain of which cause the sensation of sound, which is purely subjective. But the sound gives us information concerning our surroundings, which we utilize for our teleological needs, although in nature external to us there is no sound at all. Similarly all our other senses report to us circumstances and conditions, but always the report is unlike the external reality. Our sensations are symbols merely, not images. They are, however, bionomically sufficient because they are constant. They are useful not because they copy the external reality or represent it, but because, being constant results of external causes, they enable consciousness to prophesy or foresee the results of the reactions of the organism, and to maintain and improve the continual adjustment to the external reality.

Consciousness is not only screened from the objective world from which it receives all its sensations, but also equally from immediate knowledge of the body through which it acts. As I write this sentence I utilize vaso-motor nerves, regulating the cerebral blood currents, and other nerves which make my hand muscles contract and relax, but of all this physiological work my consciousness knows nothing, though it commands the work to be done. The contents of consciousness are as unlike what is borne out from it as they are unlike what is borne in to it.

The peculiar untruthfulness to the objective which consciousness exhibits in what it gets and gives would be perplexing if we had not recognized in consciousness a device to secure better adjustment to external reality. For this service the system of symbols is successful, and we have no ground for supposing that the service would be better if consciousness possessed direct images or copies instead of symbols of the objective world.

Our sensory and motor (and other organs in efferent relations to consciousness) organs are the servants of consciousness. A large part of our anatomical characteristics exist for the purpose of increasing the resources of consciousness, so that its bionomic function may be more efficient. Our eyes, ears, taste, etc., are valuable, because they supply consciousness with data; our nerves, muscles, bones, etc., are valuable, because they enable consciousness to effect the needed reactions.

Let us now turn our attention to the problem of consciousness in animals. The comparative method has an importance in biology which it has in no other science, for life exists in many forms which we commonly call species. Species, as I once heard it stated, differ from one another with resemblance. The difference which resembles we term an homology. Our arm, the bird's wing, the lizard's front leg, are homologous. The conception of homology both of structure and of function lies at the basis of all biological science. That animals have a consciousness homologous with the human consciousness there is conclusive proof. As regards at least mammals — I think we could safely say as regards vertebrates — the proof is the whole sum of our knowledge of the structure, functions and life of these animals.

As we descend the animal scale to lower forms there is no break and therefore no point in the descent where we can say, "Here animal consciousness ends, and animals below are without it." It seems inevitable therefore to admit that consciousness extends far down through the animal kingdom, certainly at least as far down as there are animals with sense organs or even the most rudimentary nervous system.

The series of considerations which we have had before us lead directly to the conclusion that the development and improvement of consciousness has been the most important, really the dominant, factor in the evolution of the animal series. The sense organs have been multiplied and perfected in order to supply consciousness with a richer, more varied, and more trustworthy store of symbols corresponding to external conditions. The nervous system has grown vastly in complexity in order to permit a constantly increasing variety in the time dislocations of sensation. The motor and allied apparatus have been multiplied and perfected in order to supply consciousness with more possibilities of adjustment to external reality which might be advantageous.

If we thus assign to consciousness the leading role in animal evolution we must supplement our hypothesis by another, namely, that conscious actions are primary, and reflex and instinctive actions secondary; or, in other words, that, for the benefit of the organism, conscious actions have been transformed into reflexes and instincts. As we all know, new actions are performed with difficulty and slowly, but if often repeated they are soon easier and more rapid. If a given reaction to a sensation or group of sensations through consciousness is advantageous to the organism and the environment is such that the sensation is often repeated, then a habit is formed and the response becomes more rapid, and almost without participation of consciousness. The usefulness of conscious reactions is that they are determined not merely by the present sensation, but also by past sensations, but they have the defect that they are slow. We can readily understand that it would aid an organism to have the quicker reaction substituted, and we thus recognize a valid teleological reason for the replacement of conscious action by habits in the individual, by instincts in the race.

A frank unbiased study of consciousness must convince every biologist that it is one of the fundamental phenomena of animal life, at least, if not of all life.

The teleological impress is stamped on all life. Vital functions have a purpose. The purpose is always the maintenance of the individual or of the race in its environment. The entire evolution of plants and animals is essentially the evolution of the means of adjustment of the organism to external conditions, and consciousness is a conspicuous, a commanding factor of adjustment in animals. Its superiority is so great that it has been, so to speak, eagerly seized upon by natural selection and provided with constantly improved instruments to work with. A concrete illustration will render the conception clearer. In the cœlenterates, the lowest animals in which we can recognize sense organs, the structure of them is very simple, and they serve as organs of touch and of chemical sensation resembling taste. In certain jellyfishes we find added special organs of orientation and pigmented spots for the perception of light. In worms we have true eyes and vision. In vertebrates we encounter true sense of smell. Fishes cannot hear, but in the higher vertebrates, that is, from the amphibians up, there are true auditory organs. In short, both the senses once evolved are improved and also new senses are added. It is perfectly conceivable that there should be yet other senses, radically different from any we know. Another illustration, and equally forcible, of the evolution of aids to consciousness might be drawn from the comparative history of the motor systems, passing from the simple contractile thread to the striated muscle fibre, from the primitive diffuse musculature of a hydroid to the highly specialized and correlated muscles of a mammal.

In the lowest animals the range of possible adjustment is very limited, and the variety of possible actions small, and they cover also a small period of time. In animals which have acquired a higher organization the adjustments are more complex; the reactions are more varied and cover a longer period of time. The next great advance is marked by the establishment of communication between individuals of the same species. The investigation of this phenomenon is one of the most important duties of the comparative physiologist. Its bionomic value is obviously great, for it allows an individual to utilize the experience of another as well as its own. We might, indeed, compare it with the addition of a new sense, so greatly does it extend the sources of information. The communication between individuals is especially characteristic of vertebrates, and in the higher members of that sub-kingdom it plays a very great role in aiding the work of consciousness. In man, owing to articulate speech, the factor of communication has acquired a maximum importance.

It seems to me inconceivable that the evolution of animals should have taken place as it has, unless consciousness is a real factor and dominant. Accordingly I hold that it actually affects the vital processes. There is, in my opinion, no possibility of avoiding the conclusion that consciousness stands in immediate causal relations with physiological processes. To say this is to abide by the facts, as at present known to us, and with the facts our conceptions must be made to accord.

The future investigation of consciousness must separate the study of what it does from the study of what it is. Consciousness has been viewed here as a device to regulate the actions of the organisms so as to accomplish purposes which on the whole are useful to the organisms, and accordingly we have termed its function teleological. If this view is correct it accounts for the limitations of consciousness, its mechanical mode of work, its precision, and definiteness of action. The very fact that consciousness is of such high value in the bionomy of an animal renders it obvious that it must be subject to law. Accordingly it appears to us regulated as do the functions of protoplasm. Hence to certain modern thinkers it presents itself as a function of protoplasm, or, as it may be better stated, as a state or condition of protoplasm.

The internal evidence of consciousness is against the view that consciousness is a state or condition of protoplasm; it presents to us conscious actions depending upon consciousness. As before stated I believe that this evidence must be accepted. Now all the sensations of consciousness are derived from physical force, and all the acts of consciousness are manifested through physical force; hence if it has any real power consciousness must be able to change the form of energy. I propose the hypothesis:

Consciousness has the power to change the form of energy, and is neither a form of energy nor a state of protoplasm.

By this hypothesis there are two fundamentally different things in the universe, force and consciousness, and the universe consists of force and consciousness. As consciousness by our hypothesis can initiate the change of the form of energy, it may be that without consciousness the universe would come to absolute rest.

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Consciousness, Disorders of. Consciousness as evidenced in action is here under discussion. Consciousness *per se* as an entity is here regarded as incomprehensible. It is accepted solely as a mode of interpretation. The variations of normal consciousness are so manifold and extended that it is only by snatching, as it were, some fragments of peculiar character and by force of words more or less descriptive, that it is possible to circumscribe and limit the phenomena within bonds sufficiently narrow to permit of a classification. Thus any discourse on disorders of consciousness must be fragmentary at best, and when it is realized that the gamut of normal consciousness in individuals can be bound only in isolated fragments, the difficulties in the way of similar subdivision of personalities in the pathological field become apparent.

One of the first difficulties is drawing a line between normal and abnormal states of consciousness, as all states of consciousness may be said to glide one into another. In the intoxicated, disordered consciousness so alters the individual as to render him not only obnoxious to society, but a menace to himself and to society. Thus any definition of normal or abnormal should take into consideration the fact that society itself makes the definitions and that abnormal conduct is a matter really of considerable range in time and place and social customs. Distinctly anti-social conduct is branded abnormal at once.

In discussing the subject of disorders of consciousness it has been the custom in times past to describe three general types such as exalted, diminished, and perverted conscious states. This method of classification, however, is solely artificial and has no relation whatever to any pathological state which may bring about a disturbance of consciousness, for exalted states may occur in a variety of diseases as may depressed conditions also, and in fact both depressed and exalted consciousness occasionally occur in the same type of disease.

For general purposes the disorders of consciousness may be divided into four general groups. These are: (1) Disorders of sleep and their allied phenomena; (2) conscious states in the allied neuroses, hysteria, and epilepsy, including automatism, amnesia, double personality, etc.; (3) disordered conscious states due to exogenous intoxications; (4) insanities. This outline has certain justification in clinical experience at least. Under the first subdivision there may be included a large number of allied conditions, the most striking feature of which is a so-called dissociation of consciousness. By this is meant that normal waking consciousness with its accuracy of observations is in temporary abeyance and that lower cerebral centres are operative, causing the individuals to perform motor acts of which they may have only a dim conscious recollection. Somnambulism or sleep walking is one of the simplest types of this disordered conscious state. Individuals who walk in their sleep should not be considered as unconscious. They are distinctly conscious, but the consciousness is an extremely restricted one. The clinical phenomena of sleep walking are not constant. The eyes may be closed or even wide open. The pupils may be sluggish to light; they may be dilated or contracted or they may be normal. It is of interest to know that both suicide and homicide have been committed by persons said to be in the somnambulistic state.

Nightmare is another extremely interesting and at the same time suggestive modification of consciousness. Here all sorts of odds and ends are thrown together in an illogical and disordered manner. At times the resulting mixture is highly pleasing to the individual who remembers the ebb and flow of thought with pleasure. At other times the stream of consciousness is much agitated and muddy and the individual awakens in great distress under the influence of a bad dream. Such conditions are naturally temporary and may be associated with disordered digestive function. Disagreeable nightmares are also associated with grave cerebral degenerations.

In catalepsy, trance, and lethargy there is a peculiar sluggishness in motor consciousness. The will to move is modified in such a way that there is wax-like rigidity of the limbs. See CATALEPSY.

Hypnosis is an allied form of modified consciousness that is but little understood and largely written about. A very small proportion of the alleged hypnotic phenomena are true, but there seems little question that for a few people most of the time and for many people under certain conditions a certain amount of dissociation of consciousness may be brought about by appropriate physical or psychical stimuli. In this condition people are very highly suggestible and do as others indicate for them what they desire to have done. In other words, they behave largely like tractable children who have no desire or will of their own, for the most part consciously obeying what is told them to do. This phenomenon of modified consciousness is further discussed under hypnotism.

In hysteria and in epilepsy there are often very marked modifications of the conscious state. The phenomena of trance, catalepsy, hypnotism, anæsthesia, etc., are almost constant accompaniments of the hypnotic condition, and automatism and amnesia are also extremely common accompaniments of the hysterical temperament. See HYSTERIA; EPILEPSY.

The phenomena of many of the intoxications are too well known to need description in this place, but they are here spoken of because of the alliance that they show to other forms of disordered mental action. Alcohol, opium, cannabis indica bring about states of consciousness which are modifications of normal conditions, and the poisoning of the bacteria of pneumonia, typhoid, and other infectious diseases also may induce forms of delirium that are extremely suggestive in this connection.

Finally there is a large group of disordered mental states which are classed under one head

as the insanities. These are largely characterized by antisocial conduct, and the disordered states of consciousness vary very widely. Thus in some of the milder forms of paranoia or the minor obsessions perverted consciousness may be present to a very minor degree. In the death-like stages of organic or terminal dementia consciousness is practically wiped out, although the individual eats, drinks, sleeps, and grows fat. See INSANITY.

Conscription, the enlisting of men for military service by a compulsory levy, at the pleasure of the government. It is distinguished from recruiting, or voluntary enlistment. The name is derived from the Roman military constitution. Every Roman citizen was obliged to serve as a soldier from his 17th to his 45th year; the consuls announced every year by a herald or written order that a levy was to be made (*milites cogere* or *conscribere*); and all citizens capable of bearing arms assembled in the Campus Martius or near the capitol, where the consuls assisted by the legionary tribunes made the levy, choosing as many men as were needed from each tribe. The word conscription as well as the system were introduced into France by the law of 5 Sept. 1778, which declared that every Frenchman was a soldier, and bound to defend the country when in danger. Excepting in times of danger it provided that the army should be formed by voluntary enrollment or by conscription. The conscription included all Frenchmen from 20 to 25 years of age, and the number of conscripts to be called into the service each year was to be determined by the Corps Législatif. Complaints of the conscription did not begin till 1802, on the introduction of a principle of indemnity, by which a payment ranging from 50 to 1,200 francs ($10 to $240), according to the annual taxation of the parents of the conscript, secured him exemption.

During the last years of First Empire the conscription was attended with gross abuses in the matter of exemption and substitution, and it was chiefly in consequence of these that on the restoration of the Bourbons it was abolished. It was, however, re-enacted in its substantial features by the law of Marshal Gouvion de St. Cyr, and continued through the revolution of 1848 and the Second Empire. According to a new army bill passed by the national assembly in 1872, the term of service in France was 20 years, but by subsequent enactments this has been extended to 25, namely 3 in the regular army, 10 in the army reserve, 6 in the territorial army, and 6 in the territorial reserve. A youth may volunteer into the army at 18, but at 20 he is compelled to serve, with certain exceptions. The military system of Prussia was extended to the German empire by a law passed in 1887. Its terms in regard to conscription are obligatory service for all subjects, the total length of the service being 12 years, 3 in the active army, 4 in the reserve, and 5 in the landwehr. By the army bill of 1893 the three years' term was reduced to two. The Russian army has been completely remodeled in recent years. It has long been partly raised by conscription, and by a law (subsequently modified) which came into force in 1874 an annual conscription was established, to which all men who have completed their 21st year and are not physically incapacitated, are liable. The men have to serve in the active army for 5 years, after which they pass into the reserves for 18 more years, during which they are liable to active service only in time of war. In Austria military service is compulsory for all citizens, and the length of service is 12 years, 3 in the standing army, 7 in the reserve, and 2 in the landwehr. In Great Britain volunteer recruiting is commonly found sufficient to raise the contingents needed for the regular army, as well as to keep up the militia required from the several counties. In the United States, both the regular army and the State militia are regularly recruited by voluntary enlistment. During the Civil War compulsory levies were made several times; such levies were always known as drafts, though the term conscription might properly be applied to them. See DRAFT.

Conscrit de 1813, Histoire d'un (HISTORY OF A CONSCRIPT OF 1813), a famous story, by Erckmann-Chatrian, published 1868–70. The narrative turns mainly on the contrast between the perpetual mourning that is going on in families and the perpetual Te Deums for disastrous victories. This is the dominant note; and in the mouth of the humble conscript, this thesis, interpreted by scenes of daily carnage, is more eloquent and persuasive than if it borrowed arguments from history or philosophy. The style is simple, familiar; but never trivial or commonplace, and is always in harmony with the speaker. As the work was hostile to the Napoleonic legend, numerous obstacles were put in the way of its circulation at the time of publication. But notwithstanding, it was scattered in profusion throughout France by means of cheap illustrated editions.

Consecration, an act by which material things and persons are dedicated to sacred uses and sacred ministries. The word Consecration is also used in the Roman Catholic ritual and liturgy to signify the act by which the bread and wine are in the Mass changed into the body and blood of Christ. In the Roman *Pontificale* or ritual for episcopal functions there is a form for consecration of a bishop, consecration of a church, consecration of the sacred vessels used in the liturgy of the Church. In the consecration of a bishop — ordinarily performed by the metropolitan and two other bishops — the consecrating bishops impose hands on the bishop-elect and the metropolitan delivers to him the pastoral staff and the ring, emblems of his office, and anoints him with chrism, pronouncing the formula of words by which is expressed the commission of authority to rule the Church committed to his charge. The consecration of a church is a very elaborate ceremony, requiring several hours to complete it: there is chanting of the office of Matins and Lauds by the clergy; there are processions of clergy, headed by the consecrating bishop and other bishops who may be present, around the walls outside and thrice around the interior, with continuous chanting of psalms; there is anointing of the doors, of the walls, of the high altar; and a number of other rites. The consecration of the vessels destined for the service of the altar is also an episcopal function: it is a rite that has descended from high Christian antiquity: in this rite also chrism is employed.

Consent, in law, a free and deliberate act of a rational being. Any voluntary act by which the agent takes away his own power of giving a deliberate consent, such as partial intoxication, will not invalidate the consent; but it is invalidated by any undue means — intimidation, improper influence, or imposition — used to obtain it. The law does not, in general, take cognizance of the wisdom or folly of men in entering into contracts before it enforces them; but where clear proof can be brought that a person has been wilfully misled or entrapped into a contract, it will refuse to enforce it.

Consequential Damages, in law, are losses incurred in consequence of an act, but not flowing directly from it. The liability for consequential damages resulting even from an unlawful act is more limited than that for direct damages, as it is evident that the power of the law in tracing and enforcing such damages must be limited; but in some cases they can be enforced.

Conservation, the act of preserving, maintaining, supporting, or protecting. The conservation of energy is a principle based on the general one that energy communicated to a body or system of bodies is never lost; it is merely distributed, and continues to exist as potential energy, as motion or as heat. Faraday directed attention to the subject, Grove elaborately treated it, and it now stands as one of the axioms of physics. It is sometimes called correlation of forces.

Conservation of Energy. See ENERGY.

Conservation of Matter. See MATTER.

Conservative, as applied to one of the two great parties in English politics, was first used by J. W. Croker in an article in the 'Quarterly Review' for January 1830, and was by Macaulay, in the 'Edinburgh Review' for 1832, referred to as a "new cant word." Conservative accordingly began to supersede Tory about the time of the Reform Bill controversies. The plural form of the word, or its equivalent in other tongues, has been assumed as a distinctive name by certain political parties in many nations. These parties are sometimes actually, and always avowedly, opposed to changes from old and established forms and practices. In United States history these names have never been in general use, but in Van Buren's administration the name of Conservatives was applied to those Democrats that at the special session of Congress of September 1837 opposed the establishment of the sub-treasury system. In the Congress that met in December 1839 they had practically disappeared. The name was also assumed by Southern whites during the reconstruction period following the Civil War, to show their adherence to the old State governments, the abolition of which by Congress they opposed. In Virginia the name was in use until 1872. The name was also used at the North during this period. The Democrats applied it to themselves to draw moderate Republican votes. See TORY; WHIG.

Conservatives, in American history. 1. In 1837–40 the name of Conservatives was adopted by seceding Democrats, 4 in the Senate and 14 in the House, who voted with the Whigs against the sub-treasury, though voting with their party on other questions. They called themselves Conservatives, as wishing to conserve the prosperity of the State banks, which they held the sub-treasury to be a disguised attempt to ruin. They held the balance of power in the House 1837–8, and voted down in two successive sessions Silas Wright's sub-treasury bill, which had been passed by the Senate. The elections of 1838, however, returned only four of them to the House, and these ceased their active opposition — partly because the government had only escaped bankruptcy in 1838, on account of uncollectible claims against banks and individuals, by issuing fresh treasury notes in place of those canceled. The Whigs held the power, and passed the Wright bill in 1840. 2. In the Civil War the Northern Democrats, and especially the border State Democrats, often called themselves Conservatives, as wishing to preserve the old balance of State and national powers; and the name was much ridiculed by the other side. 3. During the Reconstruction period, the Southern whites to a considerable extent took the name of Conservatives as wishing to preserve their old State governments, which they held to have the same existence and sovereignty as before the War, according to the declarations of the Northern leaders and Congress themselves, in stating the purposes of the War. The name, more particularly in Virginia, lasted down to 1872.

Conser'vatory. 1. A systematic school of musical instruction. In Great Britain the term is usually applied to foreign schools of music. Conservatories were originally benevolent establishments attached to hospitals, or other charitable or religious institutions. In Naples there were formerly three conservatories for boys; in Venice four for girls; the Neapolitan group being reduced in 1818 to a single establishment under the name of the Royal College of Music. In Milan a conservatory was established in 1808. In France the muscial school established in connection with the Opera received its final organization in 1795 under the name of *Conservatoire de Musique.* Among its teachers have been Méhul, Cherubini, Grétry, Boieldieu, and others of like standing. The Conservatorium founded at Leipsic in 1842 under the auspices of Mendelssohn is perhaps the most influential in Germany, though of late years other schools have pressed closely upon it. Institutions of the same description exist in Warsaw, Prague, Munich, Berlin, and Vienna. Several conservatories have been established in the United States; prominent among them are the National Conservatory in New York and the New England Conservatory at Boston.

2. The glass house in which plants are displayed after being grown in other greenhouse structures; also, any ornamental greenhouse, especially such as are attached to private dwellings for the pleasure of the inmates. In the first sense the house is of great importance to the more pretentious private establishments, since plants brought to perfection may there be placed in an appropriate setting so long as their attractiveness lasts; they cannot be viewed to advantage upon the benches where they are grown. Conservatories are variously arranged internally, some having stationary benches, some rockeries, fountains, etc., and some permanent beds upon the ground in which plants which are

attractive for long periods are placed. Since many architects in planning conservatories as adjuncts to homes, consider architectural design more than utility and ease of management, the plans of such structures should be submitted to a competent greenhouse architect for criticism especially as to the effectiveness of ventilation, heating, and manipulation. See GREENHOUSE.

Conshohock'en, Pa., a town of Montgomery County, on the Schuylkill River and Canal, and on the Pennsylvania and the Philadelphia & R. R.R.'s. It has a number of manufacturing interests, including blast furnaces, rolling-mills, woolen and cotton-mills, and pottery works. Pop. (1900) 5,762.

Considerant, Victor-Prosper, vĕk-tôr-prôs-păr kôn-sĕ-dā-răn, French Socialist: b. Salins 12 Oct. 1808; d. 27 Dec. 1893. After being educated at the Polytechnic School of Paris, he entered the army, which, however, he soon left to promulgate the doctrines of the Socialist Fourier. On the death of his master (1837), Considérant became the head of his school, and undertook the management of the 'Phalange,' a review devoted to the spread of their opinions. Having gained the support of a young Englishman, Mr. Young, who advanced the money, Considérant established, on a large estate in the department Eure et Loire, a Socialist colony or Phalanstere; but the experiment failed, and with it the 'Phalange' fell to the ground. Thereafter he continued to promote his views in the 'Democratié Pacifique.' Among his numerous writings, the chief is the 'Destinee Sociale,' dedicated to Louis Philippe. In 1849 Considérant was accused of high treason and compelled to flee from France. Near San Antonio, Texas, he founded a socialist community, *La Rêunion,* which flourished for a time, but afterward came to nothing and he returned to France in 1869.

Consignment, a mercantile term used in two related senses, the one meaning the sending of goods to a factor or agent, for sale; the other meaning the goods sent. The one who makes the consignment is called the consignor, and the one to whom the goods are consigned is called the consignee. The consignor may be the original producer, or his agent, or a purchaser who has bought the goods outright. The consignee may agree to sell the goods on commission or to retain them for a time as called for by the agreement or contract. The one who transports the goods is also the consignee, and is usually required for a certain amount of money, to guarantee safe delivery. Consignments may be domestic or foreign, that is both parties may reside in the same country or one may reside in a foreign country.

Consistory, in ecclesiastical usage, means a court or council of ministers and Church officials or dignitaries, for transaction of business relating to the Church. In the Roman Catholic Church the Consistory by eminence is the whole college of the cardinals, which is, so to speak, the Pope's senate, assembled at stated or occasional times to deliberate questions of Church administration. It is usually presided over by the Pope in person, but often by his delegate; the stated meetings are twice a month; the sessions are secret usually, but often they are public or semi-public, Church dignitaries of rank inferior to the cardinalate being admitted. In the Church of England every bishop of a diocese has a consistorial court for determination of ecclesiastical causes arising within his jurisdiction. In Presbyterian and other Protestant communions the Consistory is an assembly or council of ministers and elders, deliberative and judicial.

Consolacion Del Sur, kōn-sō-lä-thē-ōn' dĕl soor, Cuba, the name of a district and a city in the eastern central part of Pinar del Rio province. It has railroad communication with Havana. Pop. of the district about 17,000; of the city 3,062.

Consolato Del Mare, kŏn-sō-lä'tō dĕl mä'rĕ. See COMMERCIAL LAW.

Console, kŏn'sōl, a bracket or truss, mostly with scrolls or volutes at the two ends, of unequal size and contrasted, but connected by a flowing line from the back of the upper one to the inner convolving face of the lower. They are usually decorated.

Consol'idated Fund, a fund, which now receives the produce of nearly all the taxes and other sources of revenue of Great Britain and Ireland, was formed in 1787 by the union of certain separate funds by Act 27 George III., cap. xiii. On the union of the exchequers of Great Britain and Ireland, in 1816, the fund was augmented with the separate revenue of the Irish exchequer, and the charges hitherto made upon that exchequer were thrown upon it. The fund is liable from time to time to have specific charges thrown upon it by Parliament; it is pledged for the payment of the interest of the whole of the national debt of Great Britain and Ireland, and after defraying the specific charges assigned to it, the surplus is applied indiscriminately under the direction of Parliament to the public service. The stated charges upon the consolidated fund, besides the national debt, are the civil list, pensions, annuities, salaries, courts of justice, and miscellaneous charges.

Consols, or **Consolidated Annuities,** a public stock forming the greater portion of the national debt of Great Britain. It was formed in 1751 by an act consolidating several separate stocks bearing interest at 3 per cent into one general stock. At the period when the consolidation took place, the principal of the funds united amounted to £9,137,821; but through the addition of other loans it has increased so much that now, after considerable reductions, it still amounts to more than half of the national debt. The interest of about £5,000,000 is payable in Dublin; that of the remainder in London. Their value fluctuates perpetually, but within narrow limits; they are generally not much below par.

Con'sonance, in music, is the effect of two or more sounds heard at the same time, which satisfies the ear. The effect of a consonance seems to depend on the simplicity of the ratios of vibration of the chords sounding together. All intervals are considered consonant which can be expressed by the ratios of numbers from one to six; those requiring higher numbers to express them are termed dissonant. Consonances have two forms (major and minor), as the third and sixth, are called "imperfect"; those having only one form, as the fifth and octave, are called "perfect." See CONCORD.

Con'sonant, a letter which cannot be sounded, or only imperfectly, by itself and for utterance requires a vowel to be added. Conso-

nants are either liquids or mutes. The liquid consonants, l, m, n, r, are pronounced easily and with only a slight contact of the articulating organs. The mute consonants, those formed by such a position of the vocal organs as stops the emission of sound entirely, are b, d, g hard, p, k, and t. The two sibilants, s and z, usually numbered with consonants, are a class apart, for neither for initial nor for continued utterance do they need to be combined with a vowel; hence, like the liquids and v, they are semivowels.

Consort, he, she or that which shares the same lot with another; a companion; a partner; an intimate associate; a wife or husband; applied in a modern sense chiefly to persons of royal degree or position, in countries where women are able to reign; as, a queen consort; a prince consort; that is, the wife of a reigning monarch, or spouse of a queen-regnant. It is also applied to a ship sailing in company with another.

The queen consort, the wife of the reigning king, is, in all legal proceedings, looked upon as a single, not as a married woman. She may purchase and convey lands, grant leases, and do other acts of ownership without the intervention of the king. She may also sue and be sued in her separate person, and possesses courts and officers distinct from those of the king. She pays no toll, and is free from any fine which a court could impose upon women in general; but in other respects she is on a similar footing with the other subjects of the king. In her life and person, however, she enjoys the same protection as the king, it being high treason to design the death of either. The husband of a queen-regnant is not endowed by the constitution with any distinctive rights or privileges. All his privileges and honors, therefore, must emanate from the crown, under the form of a warrant, grant, or patent, or else be conferred by act of Parliament introduced after a royal message on the subject. Up to 1857, when the title of Prince Consort was bestowed upon him by letters-patent, the late Prince Albert possessed no distinctive title and no place in court ceremonial but such as was accorded to him by courtesy.

Conspiracy, legally defined, "a combination by two or more persons, by some concerted action, to accomplish an unlawful purpose, or to accomplish a purpose not in itself unlawful, by unlawful means." The common law recognizes as an offense the agreement between the conspirators to do an unlawful act, and no overt act is necessary for the completion of the crime; but changes have been made in this holding of the common law by the laws of several of the States and by Federal legislation in the United States. Where the changes have been made it has been declared that an overt act was necessary to make the conspiracy a crime. Conspiracies are ranked as misdemeanors, except such as by acts of legislation have been declared statutory conspiracies, and punishable as such, and they are ranked as felonies. Consult Bishop, 'New Commentaries on the Criminal Law.'

Constable, kŭn'stä-bl, **Archibald,** Scottish publisher: b. Carnbee, Fifeshire, 24 Feb. 1774; d. Edinburgh 21 July 1827. He was the original publisher of the 'Edinburgh Review,' the poems of Sir Walter Scott, the 'Waverley Novels,' and other well-known works. In 1826, however, the firm was compelled to stop payment, with liabilities exceeding $1,250,000. Sir Walter Scott, who was heavily involved, practically sacrificed his life in the endeavor to meet his creditors. Constable himself did not long survive his misfortunes.

Constable, Archibald, and His Literary Correspondents, a work by Thomas Constable. (1873.) It is the story of the Edinburgh publishing house which established the 'Edinburgh Review'; initiated the publication of cheap popular volumes of literature, art, and science; and by a bold liberality in payment of authors, with remarkable sagacity in judging what would succeed with the public, virtually transformed the business of publishing. In October 1802 the first number of the 'Edinburgh Review' appeared. The generous scale of payment soon adopted,— 25 guineas a sheet,— startled the trade, and greatly contributed to make Constable the foremost among publishers of his day.

Constable, Henry, English poet: b. Newark, England, 1562; d. Liège, Belgium, 9 Oct. 1613. His chief work was his book of sonnets, 'Diana,' published in 1592, when few sonnets in the Italian form had been written. He was probably the author also of the 'Forest of Fancy' (1579), attributed to Chettle. Suspected of treason against Elizabeth, he was compelled to leave the country, and on his return in 1604 was confined in the Tower for a short time. His lyric 'Diaphenia' and his pastoral 'Venus and Adonis' take a high place in contemporary song.

Constable, John, English landscape painter: b. East Bergholt, Suffolk, 11 June 1776; d. London 30 March 1837. His father was a wealthy miller, and was at first desirous that his son should enter the Church, and then, on finding him disinclined to this career, proposed that he should follow his own business. At the latter employment he continued for several years, but his favorite pursuit was painting, and in this he used to occupy his leisure hours. After considerable objection on the part of his father, he entered as a student of the Royal Academy in 1799. For many years his progress as an artist was extremely slow, and it was not until 1814, 12 years after he had begun to send pictures to the exhibition, that he succeeded in getting any of them sold. In 1819 his 'View on the River Stour' attracted much attention, and procured him admission as an associate of the Academy. From this period his reputation widely extended itself, both over Great Britain and the Continent, and for some of his works exhibited at the Louvre he received a gold medal from the king of France. Constable's pictures are remarkable for the truth and vividness with which country scenes and natural phenomena are represented. Fuseli said of them that they made him call for his umbrella; and a French critic declared that his leaves and grass were bespangled with morning dew. Among the finest of his works are: 'A View of Salisbury Cathedral'; 'The Cornfield'; 'The Lock'; and 'The Valley Farm.' Lately several good examples of Constable's art have been added to the Louvre, and the late Henry Marquand presented two fine pictures by him to the Metropolitan Museum of Art in New York. See: Leslie, 'Memoirs of Constable' (1845); Wedmore, 'Studies in Eng-

lish Art' (1876-80); Brock-Arnold, 'Gainsborough and Constable' (1881); Chesneau, 'La Peinture Anglaise' (1882); Muther, 'History of Modern Painting' (1896).

Constable (Lat. *comes stabuli*, count of the stable = master of the horse). 1. A great noble under the later Roman empire, and so down through the Middle Ages; usually the commander-in-chief of the army; in France also of the navy, and the chief subject in the state, whence Richelieu abolished the office in 1627. Napoleon revived the title but not the authority, and it lapsed with him. In England the lord high constable and the earl marshal held the courts-martial and courts of chivalry; but Henry VIII. left the office unfilled, and it is only revived temporarily for great pageants. There were constables who were wardens of castles, and whose office is still existent, hereditary or appointive. 2. In England, a petty constable was the chief parish officer for keeping the peace, but is now mostly supplanted by the police. 3. In the United States, outside of cities and incorporated villages, the constable is still the chief conservator of the peace. The office was borrowed from England, and in colonial times was of high importance, including functions now assigned to various other officers. In New England he was appointed by the selectmen, in Virginia by the hundred, in other provinces or States chosen by the town. He not only made arrests, imprisoned, had right of search and executing processes, etc., but he was often tax collector, overseer of the roads, and even petty judge, and gave notice of town-meetings. There was no legally defined scope of his duties, each community deciding them for itself, but the place was always considered one of power and dignity. Philadelphia and New York had high constables, the latter up to about 1830, when his functions were given to the chief of police. The office of "constable of the commonwealth" has also been created in some States.

Con'stance (Ger. *Constanz*, or *Konstanz*, ancient CONSTANTIA), Germany, city and lake-port in the grand-duchy of Baden, occupying the only territory belonging to Germany on the south side of the Lake of Constance, at the place where that lake communicates with the arm known as the Untersee, "Lower Lake," and where the Rhine issues from it; 35 miles northeast of Zurich. The chief edifices are a cathedral, the Kaufhaus, in which the famous Council of Constance sat from 1414 to 1418, and which deposed three anti-popes, and condemned Huss and Jerome of Prague; an ancient palace; a grand ducal residence. The city has manufactories of cotton goods, carpets, chemicals, and sacking. Constance is said to have been founded in 378 A.D. by Constantius Chlorus as a bulwark against the Alemanni. In the Middle Ages, when it reached the height of its prosperity (at the time of the Council it was able to receive 20,000 visitors), it was frequently called Kostnitz. It was annexed to the Austrian dominions in 1549, and to Baden in 1805. Pop. 16,500.

Constance, General Council of, the 16th ecumenical council of the Church, was held at Constance in Switzerland; it was presided over by Pope John XXIII., in its opening session 5 Nov. 1414, and was dissolved in its 45th session 1418. It was called for the purpose of restoring peace to the Church, which was troubled with schisms owing to the rivalry of three claimants of the papal throne. There was Balthasar Cossa, styled John XXIII.: his title seemed to be sound in point of law, but the man was eminently unfit for the office; then there was Petrus de Luna, styled Benedict XIIII.: he was a Spaniard, but was chosen by the French cardinals: his style Benedict XIII., was formally disallowed when the Pope, Vincenzo Marco Orsini, who at first assumed the style of Benedict XIV. (1724), afterward changed that to Benedict XIII.; and there was Angelo Corario, styled Gregory XII.: both of these had been condemned as perjured men, heretics, and schismatics, by the Council of Pisa, which council "deposed" them; but they still claimed papal honors. Besides the healing of these schisms, the Council was called to take measures for repression of Wiclefism in England and analogous heresies in Bohemia and elsewhere. Also the Council was to consider the ways and means of effecting a "reformation of the Church in head and members." In the Council were some of the eminent divines of the time, among them Pierre d'Ailly and Gerson, chancellor of the University of Paris, both sturdy advocates of reform: there were also in the Council bishops representing the churches of England and Ireland. John Huss, chancellor of the University of Prague, summoned to plead in the Council to the charge of maintaining the Wiclefite heresies, attended, having come under a safe-conduct of the Emperor Sigismund. The Council condemned the doctrines of Huss and ordered him to be given up to the civil power, to be dealt with according to the laws: he perished at the stake. Memorable among the acts of this Council is its decision of a question submitted to the fathers regarding the succession to the sovereignty of the margraviate of Brandenburg. The Council recognized the superior validity of the claim of Conrad of Hohenzollern; from him is sprung the royal line of Prussia. The Council in the 12th session 29 May 1415 published a decree deposing John XXIII., who after a while formally resigned. In the 14th session Gregory XII. (Corario) gave in his resignation. Petrus de Luna (Benedict XIII.) refused to resign: but being no longer sustained by the king of Spain, he was simply ignored, and Cardinal Otto Colonna was elected Pope 11 Nov. 1417 under the style of Martin V. The schisms caused by the rival popes were ended. After a few reformatory measures, quite inadequate for the needs of the situation, were enacted, the Council was dissolved 22 April 1418.

Constance, Lake (anciently LACUS BRIGANTINUS; German *Boden See*), in central Europe, forming a common centre, in which Switzerland, and the territories of Baden, Würtemberg, Bavaria, and Austria meet. It lies between lat. 47° 28′ and 47° 50′ N.; and lon. 9° and 9° 42′ E.; length, northwest to southeast, 40 miles; greatest breadth, about 9 miles; area, 200 square miles; greatest depth, which is between Friedrichshafen and Rorschach, 964 feet; 1,283 feet above sea-level. At its northwest extremity the lake divides into two branches or arms, each about 14 miles in length; the north arm is called the Überlingen Lake, after the town of Überlingen, on its north bank; the south branch the Zellersee or Untersee. The Rhine enters the lake at Rheinek, at its southeast extremity, and leaves

it at Stein, at its northwest termination. Various other smaller rivers empty themselves into it. The lake, the waters of which are of a dark-green hue and very clear, are subject to sudden risings, the causes of which are unknown. In 1770 it rose in one hour from 20 to 24 feet above the ordinary level. It freezes in severe winters only. It is frequented by numerous aquatic birds, and contains a great variety and abundance of fish, including salmon, salmon-trout, pike, and carp. The traffic on it is considerable, although its navigation by sailing vessels is rendered dangerous by sudden and violent squalls. Steamers ply on the lake between Constance and various points on its shores. The land near is either flat or gently undulating, and fertile, and is covered with corn-fields, orchards, and gardens, interspersed with ruined castles, and other remains of the Middle Ages, and with numerous towns and villages, producing altogether a very pleasing and striking effect.

Constance Falcon, or **Phaulkon,** Greek political adventurer of the 17th century. His proper name was Constantine, and he was born in the island of Cephalonia. Having secured the favor of the king of Siam he undertook the project of introducing Christianity among the Siamese, and induced the king of Siam to send an embassy to Louis XIV. The ambassadors died on the route; but the French monarch, hearing of the scheme, sent two envoys, with some Jesuits, to Siam. French troops were also introduced into the country. These circumstances aroused the jealousy of the native princes and nobility, the result of which was a conspiracy which terminated in the dethronement of the king and the death of Constance, who was beheaded.

Constans (kŏn'stănz) **I., Flavius Julius,** Roman emperor: b. about 320 A. D.; d. in Gaul 350 A.D. He was a son of Constantine the Great, and divided the empire after the death of his father with his brothers, Constantine II. and Constantius II., receiving for his share Illyricum, Italy, and Africa. Constantine, who invaded his provinces, having been slain in the battle of Aquileia, Constans became emperor of the whole West. He was weak, profligate, and rapacious. His misrule caused an insurrection in Gaul under Magnentius; he fled to Spain, but was overtaken at the foot of the Pyrénées by the soldiers of the usurper, and slain. Constans protected the creed of Nice against the Arians and the Donatists, and closed the pagan temples.

Constans, Jean Antoine Ernest, zhŏń äń-twän ĕr-nā kôń-stäń, French politician: b. Béziers 3 May 1833. He was professor of law at Toulouse, was a republican member of the Chamber of Deputies in 1816; minister of the interior 1880–2; minister to China 1885–7, and governor-general of Indo-China 1887–8. He was elected senator in 1889, and as minister of the interior 1889–92, actively contributed to the overthrow of Boulangerism.

Constant, Jean Joseph Benjamin, zhŏn zhŏ zĕf bŏń-zhä-măń, French portrait painter: b. Paris 10 June 1845; d. there 26 May 1902. He studied in the École des Beaux Arts and under Cabanel. He has exhibited with growing distinction, at successive salons, from that of 1860, with his 'Hamlet,' his 'Samson' in 1872, his 'Scenes from Algiers' in 1873–4, his great historical painting of 'Mohammed II. in 1453' in the Exposition of 1878, and in 1885 a large Oriental subject, as melodramatic as possible, with splendid rendering of the human figure and strong effects of color. Other noted canvases by him are 'Le Roi du Désert'; 'La Tigre Favori'; and portraits of Mrs. Walters; Madame Calvé; Queen Victoria, exhibited in the Salon of 1901; Queen Alexandra; and De Blowitz. He was the fashionable artist of his time in Paris and London. His noble picture of 'Justinian' is in the Metropolitan Art Museum, New York. He was decorated with the Legion of Honor in 1878.

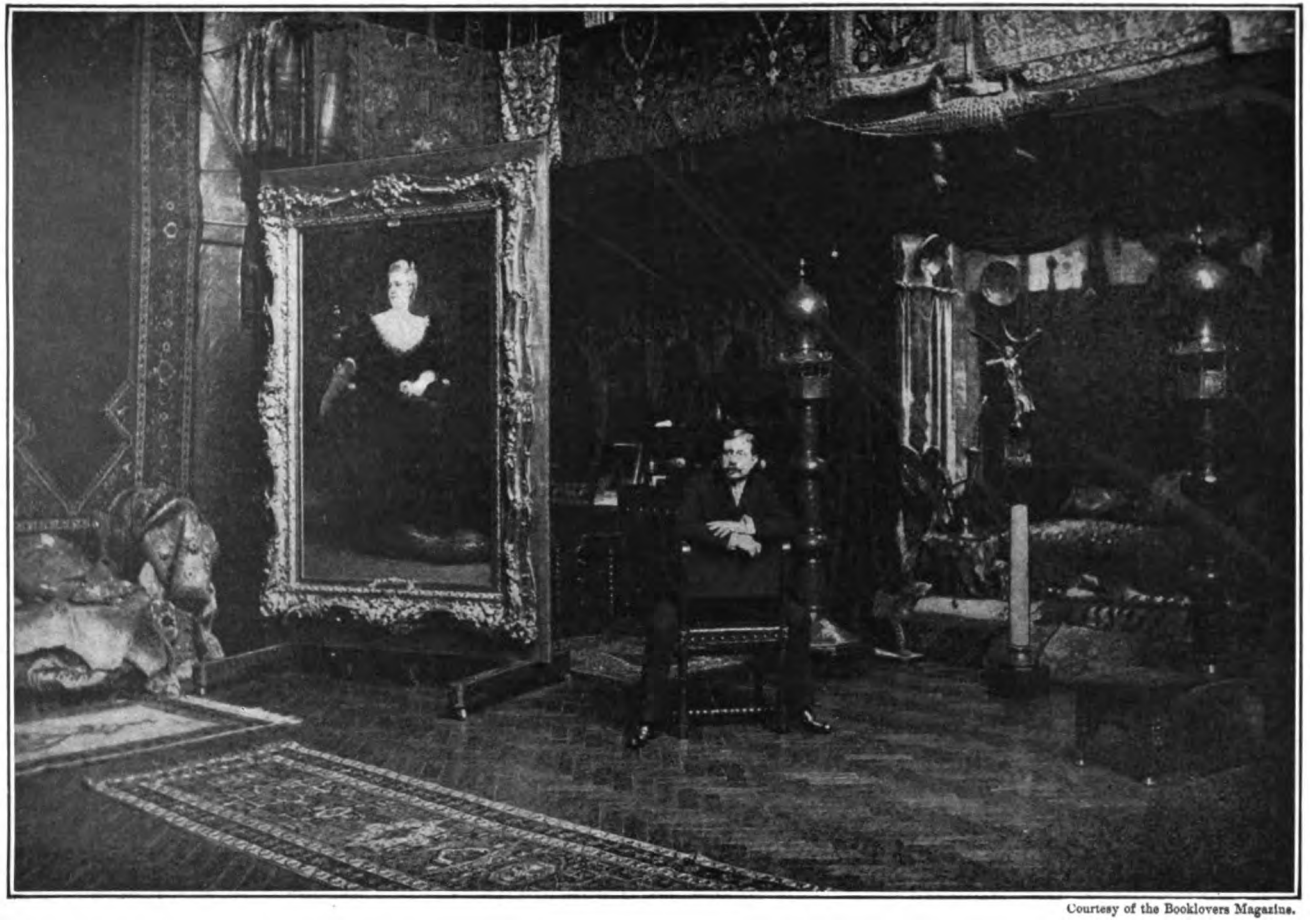
Constant de Rebecque, Henri Benjamin, ŏń-rē bŏń zhä măń kôń-stäń dė rė-bĕk, French publicist: b. Lausanne, Switzerland, 23 Oct. 1767; d. Paris 8 Dec. 1830. A member of the Revolutionary Tribunate, he was banished by Napoleon, and later by the Bourbons for accepting Napoleon. His chief works are: 'Cours de politique constitutionelle' (1818–20); 'Religion Considered in its Source, Its Forms, and Its Developments' (1823–5); 'Roman Polytheism'; and a romance, 'Adolphe' (1816).

Constan'tia, a district of Cape Colony, in South Africa; on the eastern and northeastern slopes of Table Mountain range, and distant from Cape Town seven miles. Constantia consists of only three estates, High, Great, and Little Constantia, which have long been famed for the quality of the wines produced upon them. The wines are sweet wines of delicious aroma, both red and white.

Constantin, kôń-stäń-tăń, **Abraham,** Swiss painter on porcelain: b. Geneva 1785; d. after 1851. His first work, a copy of Raphael's 'Madonna della seggiola,' was executed for the Empress Josephine. He afterward spent many years in Italy in close study of the works of Raphael, of whose style he became a successful imitator. In 1832 he was commissioned by Louis Philippe to make copies of Raphael's chief works in the Vatican, in the execution of which he carried the art of enamel painting to a perfection never before attained. The 'Transfiguration' alone occupied him a year. He has also made copies of the masterpieces of Titian, Correggio, and others, and in a few instances has attempted original compositions and portraits from life, which are highly prized. His best works are in the museum at Sèvres, and at Turin. Constantin made some valuable discoveries in the mechanical processes of his art, particularly with reference to the effect of burning upon the colors.

Constantine (kŏn'stăn-tīn) **I.,** Pope. He was elected in 708, and died in 714. There was also an anti-pope of this name, who usurped the holy office in 767.

Constantine I., Flavius Valerius Aurelius Constantinus, called the GREAT, Roman emperor: b. Rome 27 Feb. 274; d. Nicomedia 22 May 337. He was the son of the Emperor Constantine Chlorus, and after the death of his father was chosen emperor by the soldiery, in the year 306. Galerius was very unwilling to allow him the title of AUGUSTUS, and gave him that of CÆSAR only. Constantine, however, took possession of the countries which had been subject to his father, namely, Gaul, Spain, and Britain. He overcame the Franks, who had formerly



Courtesy of the Booklovers Magazine.

JEAN JOSEPH BENJAMIN-CONSTANT.

overrun the territory of Gaul, made prisoners of two of their leaders, followed them over the Rhine, surprised and defeated them. He then directed his arms against Maxentius, who had joined Maximian against him. In the campaign in Italy he saw, it is said, a flaming cross in the heavens, beneath the sun, bearing the inscription, "*In hoc signo vinces*" (Under this sign thou shalt conquer). He accordingly caused a standard to be made in this form, which was called the *labarum*. Some days after this he vanquished the army of Maxentius, under the walls of Rome, and drove it into the Tiber. He then entered the city in triumph, set at liberty all whom Maxentius had unjustly imprisoned, and pardoned all who had taken up arms against him. He was declared by the senate, chief, Augustus, and *pontifex maximus*. In the year 313, together with Licinius, he published the memorable edict of toleration in favor of the Christians. By this every one was allowed to embrace the religion most agreeable to his own mode of thinking, and all the property was restored to the Christians that had been taken from them during the persecutions. They were also made eligible to public offices. This edict marks the period of the triumph of the cross and the downfall of paganism.

Constantine had married his daughter to Licinius; but the latter, jealous of his fame, conceived a mortal hatred against him, which he displayed by persecuting the Christians. Both emperors took up arms and met in Pannonia 314 A.D. Licinius was defeated, but the conqueror granted him peace. He, however, renewed hostilities, was vanquished again, taken prisoner, and put to death at Constantine's command. Thus the latter became, in 325, the sole head of the Eastern and Western empires. His first and chief cares were the establishment of peace and order, and the propagation of his religion. Many beneficial decrees were proclaimed by him. Among these were those which abolished all the establishments of debauchery, ordered the children of the poor to be supported at his expense, gave permission to complain of his officers, and promised that the emperor would not only hear complaints, but compensate the complainants for injuries received, when they were proved to exist. He diminished the land-taxes, and caused a new valuation of estates to be taken. The state treasury had always been enriched by the property of criminals; but Constantine spared the property of their wives, and ameliorated the condition of their children. Death in prison, he said, was a cruel punishment for the innocent, and an insufficient penalty for the guilty; he therefore ordered all trials of prisoners to take place at once. He forbade the use of unwholesome dungeons and oppressive chains. He gave leave to sick persons, widows, and orphans, to appeal from the local magistrates, and refused this privilege to their adversaries. It had been customary for the heirs of a person deceased to divide his slaves among them; Constantine forbade the separation in these cases of husbands from their wives, and of parents from their children. To the Christians he gave permission not only to erect churches, but to be remunerated for the cost of them from his domains. Amidst all the cares of government and the occupations of war he found leisure to assemble the Council of Arles, to put an end to the schism of the Donatists. The ecumenical council held at Nice, in Bithynia 325 A.D. was attended by him in person.

On 26 Nov. 329 he laid the foundations of a new capital of the empire, at Byzantium, upon the Bosporus, in Thrace. The city of Byzantium had been almost entirely destroyed by Severus; it was rebuilt by Constantine, enlarged and adorned with open squares, fountains, a circus, and palaces, and called by his own name. Constantine divided the empire into four parts, governed by four prætorian prefects. Toward the close of his life he favored the Arians, to which he was induced by Eusebius of Nicomedia; and he even banished many Roman Catholic bishops. In the year 337 he fell ill in the neighborhood of Nicomedia, was baptized, and died after a reign of 31 years.

Constantine committed a great political error in dividing his empire among his three sons, Constantine, Constantius, and Constans. His zeal for Christianity appears to have been excited not less by the knowledge that the religion which was embraced by a majority of the inhabitants of the Roman empire must prevail, and that, of course, the strength of the government must be increased by protecting it, than by a wish to apply its consoling powers to the relief of a heavy conscience. He has been accused of inordinate ambition, excessive liberality, and an Oriental fondness for parade. But he was brave at the head of his army, mild and indulgent in his intercourse with his subjects, the favorite of his people, the terror of his foes. He was fond of the sciences as well as of arms, and gave them his protection. He read much, and wrote nearly all his own letters. In Eusebius we find many proofs of his theological learning. Some of the martyrologists have counted him among the saints, and fix 20 May as his festival. The Greeks and Russians observe it upon the 21st of the same month. Among all the writers who have attempted to describe the character, influence, and policy of Constantine, Gibbon, from the extent of his researches and the profoundness of his views, appears to deserve the first place, though his impartiality is more than doubtful. See Eusebius, 'Vita constantini'; Gibbon, 'Decline and Fall of the Roman Empire'; Fletcher, 'Life of Constantine the Great' (1852).

Constantine II., Flavius Claudius Constantinus, Roman emperor: b. Arles, Gaul, 7 Aug. 312; d. near Aquilea, Italy, 340. He was the eldest son of Constantine I., and received as his share of the empire on the death of his father, Gaul, Spain, and Britain. Being desirous, however, of possessing himself of the territory of his brother Constans, he invaded the latter's dominions, but was defeated and killed.

Constantine IV., Flavius Constantinus, Emperor of the East; surnamed POGONATUS, or the BEARDED; d. 685. He was son of Constans II., whom he succeeded in 668. His two brothers, Tiberius and Heraclius, shared the title of Augustus, but had little or no share in the government, and toward the close of his reign, Constantine IV., under the influence of suspicion, had them mutilated and put to death. Constantinople was unsuccessfully attacked by the Mussulmen in 672 and the six following years; and it was during these wars that the famous "Greek fire" was invented. Constantine con-

voked and took part in the sixth general council held at Constantinople, at which the doctrine of the Monothelites was condemned.

Constantine V., emperor of the East: b. Constantinople 719; d. near Selymbria, Thrace, 14 Sept. 775. He was surnamed COPRONYMUS and succeeded his father, Leo the Isaurian, in 743. He sided with the Iconoclasts, who hurled down the images of the saints, and persecuted the followers of the Roman Catholic Church. He died in an expedition against the Bulgarians.

Constantine VI., Flavius Constantinus, Emperor of the East: b. 771; d. Constantinople about 797. He was son of Leo IV., whom he succeeded in 780. Being only 10 years old when his father died, his mother Irene was his guardian and regent of the empire. On arriving at a mature age he wished to assume the government himself; but Irene, made cruel by ambition, had him imprisoned. He escaped in 790, exiled his mother, recalled her, and finally, ruined by his licentious living, and despised by his subjects, a conspiracy was formed against him, Irene taking the lead in it; and being imprisoned, his eyes were put out by her order.

Constantine VIII., emperor of the East: b. 905; d. 15 Nov. 959. He was surnamed PORPHYROGENITUS, and succeeded Leo the Wise in 905. He was destitute of energy, and devoted himself chiefly to study. He admitted colleagues to the throne so that at least five emperors were reigning together. Constantine VIII. left a treatise on state affairs, a geography of the empire, and the 'Life of the Emperor Basilius, the Macedonian.'

Constantine X., emperor of the East: d. 1028. He was the son of Romanus II., succeeded John Zemisces, and was proclaimed emperor of the East, with his brother, Basil II., who held the principal authority till 1025, when he died. Constantine X. was, after that, sole emperor.

Constantine XIII., Palæologus, emperor of the East: b. 1394; d. 29 May 1453. He was the last of the Greek emperors, and succeeded to the throne in 1448. He was killed in bravely defending Constantinople against Mahomet II., who in 1453 besieged the city with 300,000 men. The heroic valor displayed by Constantine XIII. in this unequal contest demands our admiration; but valor was of no avail, the city was taken by storm, and thus ended the Greek empire.

Constantine, Pau'lovitch, Russian grand duke: b. St. Petersburg 8 May 1779; d. Vitebsk 27 June 1831. He was the second son of the Emperor Paul of Russia. In the wars against France he distinguished himself by his personal bravery, though not by his capacity for command. He was the elder brother of the Emperor Nicholas, to whom he ceded the crown on the death of Emperor Alexander I., their brother. Constantine was afterward made viceroy of Poland, and ruled that unfortunate country with great severity.

Constantine, Nikolaevitch, Russian grand duke: b. St. Petersburg 21 Sept. 1827; d. there 24 Jan. 1892. He was the second son of the Emperor Nicholas of Russia, and brother of the Emperor Alexander II., grand duke and great admiral of Russia. In the war of 1854–6 he had the defenses of the Baltic intrusted to his care, in conjunction with Admiral Lütke; but the policy of the emperor hardly allowed the prince any display of courage or ability. He was made viceroy of Poland in 1862, but resigned the next year. He was president of the council of state 1865–81, but being suspected of sympathizing with the revolutionary party was dismissed from office.

Constantine, Flavius Julius, Roman soldier. He was raised by the army in Great Britain to the imperial dignity in 409, on which he crossed over to Gaul and conquered that country and Spain. He fixed his court at Arles, where he was besieged by Constantius, the general of the Emperor Honorius, to whom he surrendered on the promise that his life should be spared; but it was basely violated, and both Constantine and his son were put to death, 411 A.D.

Constantine, kôn-stän-tēn', Africa, a town in the French territory of Algeria, capital of the province of Constantine, on a rocky peninsula, 1,968 feet above the sea, and accessible only on one side. It is surrounded by walls, built by the Arabs chiefly with stones which the Romans had hewn and carved, and is entered by four handsome gates. The streets, though well paved, are narrow and dirty, and the houses are very indifferent. The only edifice deserving of particular notice is the palace of the bey, now the residence of the French governor. It is more remarkable for its internal decorations than for its external structure. Both within the town and in the vicinity Roman remains abound. It is the Episcopal see of a Catholic bishop. The French have here a college and the Mohammedans, a seminary. The manufactures consist chiefly of woolen and linen goods and various articles in leather; the trade is in corn, linen, and wax. It is connected by railroad with Philippville, its port of entry, 47 miles distant, and with the largest towns in the territory. Constantine was built by the emperor whose name it bears, on the site of Cirta, the capital of the Numidian kings, which had fallen into decay. In 1837, after a long siege, the French took it by assault. Pop. (1902) 50,000.

Constantine, Arch of, one of the noted triumphal arches of the world, erected by order of the Roman senate to commemorate the victory gained by Constantine over Maxentius. It is situated between the Cælian and Palatine Hills, and was built in 315. This monument of victory is well preserved, but while it tells of the power of the Emperor Constantine, it also bears witness to the incompetency of the Roman sculptors of the period in which it was built. The whole design was copied from the Arch of Trajan, even the reliefs were removed to the Arch of Constantine, and they illustrate the battles and victories of Trajan and not of Constantine. The parts copied or taken from Trajan are of superior design and workmanship, but the sculpture of the artists of the day, representing the deeds and victories of Constantine are inferior in design and crude in workmanship. Four stately columns are on each face, one high and two lower entrances. The inscriptions proclaim the great deeds of the emperor.

Constantine Tolmen, a great oblong stone, 33 feet long, 18 wide, and 14 thick, poised on the points of two upright rocks in Cornwall,

BIRDS-EYE VIEW OF CONSTANTINOPLE.

England. This mass weighs 750 tons. It is one of the natural curiosities of Cornwall.

Constantino'ple, called by the Turks *Stamboul,* by the Greeks, *Istampoli* (both derived from the Greek *eis tēn polin,* into the city), Turkey in Europe, capital of the Turkish empire, lat. 41° 0′ 18″ N.; lon. 28° 59′ 15″ E., with the Sea of Marmora and the Bosporus on the south and east, and the Golden Horn, an inlet of the latter of about six miles in length, on the north. It is surrounded by water on all sides excepting the west, and has a sea front altogether of about eight miles in extent. The city is triangular in shape, its apex projecting into the Bosporus, and its base, a lofty double wall of four miles in length, stretching across the promontory, from the Sea of Marmora to the Golden Horn. Each of the sides may be about three and three fourths miles in length, and within these limits the whole of the city proper is included. On the opposite side of the Golden Horn, and also occupying the extremity of a promontory, sometimes called the Peninsula of Pera, are situated the extensive suburbs, Galata, Pera, and Tophana. Constantinople was formerly walled on all sides; but the walls along the Golden Horn and Sea of Marmora, the north and south sides of the city respectively, are in a ruinous state, and in many places have altogether disappeared. The inland or west wall, a magnificent specimen of mural architecture, containing six gates, though also dilapidated in parts, could be easily restored. The streets are extremely narrow, dark, dirty, and ill-paved, and so crooked that hardly any two of them run for any length parallel to each other. The houses are generally low and ill-built. The windows are strictly closed with lattice-work of cane, in the centre of which the wife of the Turk, excluded from public view, endeavors to see what is passing in the street. The city is supplied with water by public fountains, which are very numerous, and some of them extremely beautiful, having pure white marble façades, elaborate arabesque ornaments, and Chinese roofs; they generally stand in the centre of an open square. On the extreme northeastern point of the promontory on which the city stands, called Point Serai, is situated the Seraglio or palace of the sultan, having the Bosporus in front and the Golden Horn on the left, and commanding a magnificent view of the opposite shore, including the beautiful town of Scutari, and its cypress-covered hills. The Seraglio, with its gardens and groves, includes a large space, and is washed by the sea for two thirds of its extent. Having been enlarged and altered at various periods, according to the taste or caprice of the princes and sultanas, it now consists of a conglomeration of buildings, clustering together without order or design. Its apartments, however, are spacious and richly furnished. At the principal entrance is a large and lofty gate, called Babi Humayon, "the high door" or "sublime porte," from which has been derived the well-known diplomatic phrase, all political business being transacted, as supposed, under this portal. Within the precincts of the palace is the celebrated divan and the harem, with the "Garden of Delight," in which are numerous gorgeous parterres and pavilions. The Adrianople and Constantinople railway here runs along the coast and has a terminus.

There are a great number of mosques in Constantinople, all of them more or less distinguished by grandeur and beauty; but the most remarkable are the royal mosques, of which there are about 15, among the finest in the world. Of these the largest and most splendid is that of Suleimania, situated on the northeast side of the city, and standing in the midst of a large square, surrounded inside by an arcade upon pillars of granite and marble. Next to it in extent, but of much older date, is the famous mosque of St. Sophia, near the east extremity of the city, the pattern of almost every mosque in the land; its walls and domes, of which last it has 20 of equal dimensions, springing from the same level, and sustained by 12 huge columns, are encrusted with mosaics, forming various figures and devices. The court or open square in which it stands is paved with marble, and shaded by fine plane-trees. This is the most ancient existing Christian church, having been only converted into a mosque in 1453. It has latterly been thoroughly restored by an English architect, by order of the sultan, and the layer of plaster removed by which the superb mosaics and frescoes that decorate its walls were covered. The mosque of Yeni Djami, known also as that of the Sultana Valide, was built by the mother of Mohammed IV., and is esteemed one of the most magnificent in the capital. It stands almost on the edge of the port, and this point, being the ferry between Galata and Stamboul, is constantly thronged with boats. Here almost every Frank first lands in the "City of the Faithful." The mosque is constructed of white marble, and has two peculiarly elegant minarets, encircled by no less than three galleries of richly perforated workmanship. The principal dome rests upon four lesser ones, which appear to lift it to the clouds. Another celebrated mosque is that of Sultan Ahmed, a little southeast from the former. From the elevated position this building occupies it is the most conspicuous object in the city when viewed from the Sea of Marmora. The minarets are of great beauty, and ascend to an immense height. All the other mosques are much less in size than those described, but very much resemble them in plan and other features. All of them are enriched by splendid columns of marble, Egyptian granite, or serpentine, and have massive and highly ornamented gateways and porches, and handsome courts and cisterns for ablution.

The bazaars of Constantinople are numerous but in no way very remarkable. Some of them are covered, others open. The covered bazaars have a somewhat mean appearance, resembling a row of booths at a fair, but the arrangement and manner of exposing the gay and glittering wares is sufficiently attractive. The principal or Great Bazaar consists of long avenues covered over with lofty arches of brick, lighted by apertures in the roof, and branching off in different directions. The ceilings of the vaults, and various parts of the walls, are ornamented with painted flowers and devices. On each side of the passage are counters and stalls, with a wide passage between them, and on each counter sits the merchant, generally smoking his pipe or chibouk, with his crossed legs drawn under him. The bazaars, both the open and covered, are severally allotted to particular trades and merchandise; they are generally so crowded,

chiefly by ladies, that it is difficult to pass through them. Constantinople has but one remarkable square, called the At-Meidan. It occupies the site of the ancient Hippodrome, "horse-course," a place at one time of great splendor, having been ornamented with marble colonnades, and surrounded by seats like an amphitheatre. The present area is an irregular quadrangle about 260 yards long by 150 wide, containing some obelisks which belonged to the ancient structure, one of which, of granite, is composed of a single piece 50 feet high. The numerous public baths in the city are mostly of marble, of plain exterior, but handsome and commodious within, with every accommodation and appliance requisite. They are divided into a number of circular rooms, lighted from above, and sufficiently spacious to admit a number of bathers at the same time. There are a vast number of coffee-houses and lodging-houses, called khans, dispersed throughout the city. The latter resemble immense stone barracks or closed squares. They are intended for the use of strangers during their temporary sojourn in the city, who may have an apartment here, with command of the key. The cemeteries of Constantinople, outside the western wall, are among its greatest ornaments. From their antiquity, and the trees planted in them, they have become vast forests, extending for miles round the city and its suburbs. Jews, Armenians, and Greeks have their own quarters in the city.

The few manufactures of Constantinople are chiefly confined to articles in morocco leather, saddlery, tobacco-pipes, fez caps, arms, perfumes, gold and silver embroideries, etc.; but its foreign commerce is considerable. The harbor, or Golden Horn, which more resembles a large river than a harbor, is deep, commodious, well sheltered, and capable of containing 1,200 large ships, which may load and unload alongside the quays. It is about six miles long, and a little more than half a mile broad at the widest part; its general breadth, however, does not much exceed a quarter of a mile. The Golden Horn is usually crowded with vessels and light boats, and presents a lively bustling scene. Among the imports are corn, iron, timber, tallow, and furs from the Black Sea and Russia; cotton stuffs and yarn, woolens, silks, watches, furniture, jewelry, coffee, sugar, pepper and spices, spirits, etc. The exports consist of silks, carpets, hides, wool, goats' hair, madder, valonia, etc. In 1897, 14,753 vessels, with a tonnage of 11,456,178, entered and cleared; 4,567 of which, with a tonnage of 6,505,925, were British.

Of the suburbs of Constantinople the largest is Galata, still the principal seat of commerce, though the city is partly displacing it. It has many very dirty streets, but much improvement has been effected in recent years. It is here that the merchants of all nations have their stores and counting-houses. Here, too, are situated the government docks, ware-houses, rope-walks, workshops, and custom-house for European goods. Pera occupies the more elevated portion of the promontory, of which Galata forms the maritime part. It is the aristocratic and finest portion of the city, and contains the ambassadorial mansions, the sultan's palaces and gardens, several fine hotels, the English Memorial Church, the artillery barracks, a public garden, the Protestant, Catholic, and Armenian cemeteries, etc. Tophana is situated a little farther up the Bosporus than Galata, of which it forms a continuation. Here is a government foundry and arsenal for cannon, artillery barracks, a fine fountain, and a spacious quay. Kassim Pasha, to the west of Galata and Pera, contains the admiralty offices, dry docks, barracks, saw-mills, machine-shops, arsenal, etc.

Constantinople occupies the site of the ancient Byzantium, and was named after Constantine the Great, who rebuilt it in 328 A.D. No city in the world has been subjected to such numerous and celebrated sieges, and no other has undergone so many vicissitudes of fortune. Yet it has only been taken twice, namely, in 1204 by the Crusaders, who retained it till 1261; and by the Turks under Mohammed II., 29 May 1453 — an event which completed the extinction of the Roman empire in the East. The inhabitants are Turks, Arabians, Greeks, Armenians, Jews, Circassians, Bulgarians, and various other nationalities. Pop. 1,125,000. Consult: Gautier; Grosvenor; Van Milligen, 'Byzantine Constantinople'; Pears, 'Fall of Constantinople'; Clement, 'City of the Sultans.' See BYZANTINE EMPIRE; BYZANTIUM.

Constantinople, General Councils of, are in number four; the First, attended by 150 eastern bishops, and held in 381 is reckoned as the second ecumenical council of the Church, the first being that of Nicæa in Bithynia, 325. Its president was at first Miletius, patriarch of Antioch, and after him Gregory of Nazianzum, then archbishop of Constantinople: the council, comprising only eastern bishops was not reputed ecumenical till after the western Church had approved its decrees by express or tacit consent. The council defined the creed of the Church as opposed to the heresy of Arius and kindred heresies growing out of it, among them the heresy of Macedonius who denied the godhead of the Holy Spirit; hence to the creed called of Nicæa this council added the clause, "and in the Holy Spirit, the Lord and life-giver who proceedeth from the Father, who with the Father and the Son is together worshipped and glorified, who spake by the prophets." Not till a later date was added "and the Son" (in Latin filioque) to declare the procession of the Spirit from the Son also. The Second Council of Constantinople — the 5th ecumenical — was held in 553, with 165 bishops, all eastern. The heresies it condemned had relation to the heresy of Nestorius, who held that there were in Christ two persons, a human and a divine. This council, at first regarded as Oriental, was later accepted as ecumenical. The Third General Council of Constantinople, held in 680, was presided over by legates of the bishop of Rome, Pope Agatho. The errors it condemned were those of the Monothelites (q.v.); it was the Sixth ecumenical council. The Fourth General Council of Constantinople (the eighth ecumenical), held in 860, was convoked for the purpose of ending the schism then separating the eastern from the western Church. This council decreed the deposition of Photius, the usurping patriarch of Constantinople, and the restoration of Ignatius the rightful patriarch; but both this decree and the measures proposed by the council for reconciling the eastern with the western churches were repudiated by the Greek Church; and the schism grew wider and has continued, with an interval of communion now and again, till the present time.

Constantinople, Strait of. See BOSPORUS.

Constantius I., Flavius Valerius, Roman emperor, surnamed CHLORUS: b. about 250; d. York, Eng., 25 July 306. He was nephew of the Emperor Claudius II., became Cæsar in 292, received Britain, Gaul, and Spain as his government, and after re-establishing Roman power in Britain and defeating the Alemanni, became one of the two Augustuses in 305. Constantine the Great, his son, was his successor.

Constantius II., Flavius Julius: b. Illyricum 317; d. 361. He was son of Constantine the Great and Fausta, was emperor of Rome from 337 to 361, reigned first in the East, and waged a protracted war against the Persians, which prevented him from participating in the struggles of his brothers Constantine II. and Constans in the West. After the fall of both he marched in 350 against Magnentius and Vetranio, who had usurped the purple. Vetranio submitted; Magnentius was finally crushed and committed suicide. Constantius now reigned over the whole empire. In 354, having returned to the East, he put to death his cousin Gallus, whom he had left there at the head of the army. He chose his brother Julian as Cæsar, and sent him to Gaul, where he successfully fought against the Alemanni and Franks. In 360 Julian was proclaimed emperor by the army at Paris. Constantius marched against him, but died on the way in Cilicia. Julian was his successor.

Constellation, The, a famous vessel which won brilliant victories in the West Indies under Commodore Truxtun (q.v.). It was built at Baltimore by David Stodert, and launched 7 Sept. 1797, as one of six frigates ordered by the national government for service against the Barbary pirates; was of 1,265 tons, and cost $314,212. The outrages of the French on our West Indian commerce having brought on war in 1798, the Constellation was sent under Truxtun to cruise off Porto Rico; and on 9 Feb. 1799 he overhauled a French warship, L'Insurgente, with which, at 3.15 P.M., he joined battle at pistol-shot. The Constellation, nominally of 36 guns, had an armament of 48; the Insurgente, of the same size, had 40, but of heavier calibre, firing 792 pounds of metal to the American's 848. The American had 309 men, the Frenchman 409. Truxtun was the better sailor, and his guns were far better served; he managed to pass back and forth repeatedly athwart the other, and rake her from end to end, cutting her maintopmast near the outset and largely disabling her movements; and when the Insurgente struck after an hour and 14 minutes, she had lost 29 killed, 22 badly and 19 slightly wounded, while the American loss was two killed and three wounded. The London merchants presented Truxtun with a handsome piece of plate for this service. On 1 Feb. 1800 he sighted another, the Vengeance, of 52 guns and 330 men, against his now 50 guns and 310 men, about 15 miles west of Basse Terre; she endeavored to escape, and it was not till 8 P.M. of Sunday, the 2d, that he came within range, when the Vengeance opened fire. Truxtun wished to close, and forbade his men to fire till they were within pistol-shot, though the French broadsides were deadly; but the Vengeance sheered off and fired almost entirely at the rigging, cutting the shrouds, stays, and spars into shreds, and at last leaving the mainmast so unsupported that it came down with the topmen and a midshipman. Meantime Truxton had fired his broadsides with fearful slaughter; and by midnight entirely silenced the French guns; but the above mishap about this time forced him to spend an hour in repairs, and the French vessel escaped. The American loss was 14 killed and 11 mortally wounded, and 14 others wounded; the French, 50 killed and 110 wounded, the Frenchman's hull being struck with 186 round shot. Congress presented Truxtun with a gold medal for this action. During the entire War of 1812 the Constellation was blockaded at Norfolk. In 1815 she was part of Decatur's fleet in the Mediterranean, and was one of the squadron which captured the Moroccan vessel Mashouda after a savage conflict on 26 August. Consult: Maclay, 'History of the American Navy,' Vol I. (1900).

Constella'tions (Lat. *con,* "together," + *stella,* "star"). From the earliest times men have formed certain groups of bright stars into constellations. Thus the names of the 12 zodiacal constellations are prehistoric. The same is true of many of those clustering about the north pole of the heavens. Quite a number bear the names of members of the Argonautic expedition, or of persons who were in some way connected with it, which determines the age of their formation approximately. The earliest description of the constellations of which we have any record is by Eudoxus, who lived about 360 B.C. This work is lost, but a poetic paraphrase of it by Aratus, who lived about 100 years later, is still extant. This work mentions 45 constellations. The earliest star catalogue which has survived to modern times is the 'Syntaxis'; that is, 'Compendium.' This is usually known as the 'Almagest,' which means "The Greatest," of Ptolemy. His observations were made between 121 and 151 A.D. The catalogue contains 1,028 stars divided among 48 constellations. This completes the ancient classification, and no permanent additions were made to it until 1602, when one constellation was added by Tycho Brahé. The next year appeared Bayer's 'Uranometria,' a series of star-maps containing 1,709 stars and 12 new southern constellations. These maps were decorated by a series of drawings made by Dürer, whose outlines have until recently served to ornament the constellations as represented on certain maps and stellar globes. These were the first star-maps published, although stellar globes were introduced in the middle of the previous century by Mercator.

Before Bayer's time it was customary to describe the position of a star by its location in the animal or figure represented by the constellation. Thus Aldebran was the bright star in the eye of the bull. From this it would appear that the ancients had manuscript maps with figures drawn upon them, but none of these maps have come down to our time. Bayer introduced the important innovation of lettering the various stars with the letters of the Greek and Roman alphabets, a separate set of letters being used for each constellation, thereby greatly simplifying the designation of any particular star. Strangely enough he did not letter his 12 new southern constellations, so that these stars still had to be designated by the

cumbrous methods of the ancients. In Flamsteed's catalogue, issued early in the 18th century, the stars are numbered in the order of their right ascension, and both letters and numbers are still in general use. From the earliest times some of the brightest stars have received special names, such as Sirius, Arcturus, etc. Although these are still in common use, there is a tendency among astronomers to substitute Bayer's nomenclature in their place.

Following Bayer a number of new constellations were introduced by various astronomers, notably Hevelius, Lacaille, and Royer. Many constellations were proposed which have failed to meet with universal acceptance, and the number which is now generally adopted by astronomers is 89. There is no definite agreement as to their exact outlines. Indeed, such an agreement would be impossible unless the boundaries followed definite circles of the celestial sphere. All stars brighter than the 9.5 magnitude are now designated by their numbers in certain large modern catalogues. Fainter stars are located by their right ascension and declination at certain dates. These quantities correspond to terrestrial longitude and latitude.

The shapes of the constellations are entirely matters of accident, and in only a few instances are the brighter stars contained in them arranged in such a manner as to bear any resemblance to the object for which the constellation is named. The exceptions to this rule are the Scorpion, the Southern Cross, the Northern and Southern Crowns, and the Southern Triangle. On the other hand, certain characteristic forms are obvious in the heavens which bear no relation to the name of the constellation in which they occur. Plena, the Great Dipper in Ursa Major, known in England as Charles' Wain (or Wagon), the Y in Boötes, the Sickle in Leo, and the cross in Cygnus, are well-known examples. Good modern star-atlases have been published by Schurig and by Upton.

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Constipa'tion, a condition in which the normal number of evacuations from the intestinal canal does not take place, or one in which the fæces are extremely hard and painful in passing. Constipation affects all ages, being prevalent in childhood, youth, adult life, and old age. It can for the most part be regulated by proper hygienic living, but by reason of extreme carelessness in this regard is frightfully prevalent.

The symptoms of constipation vary considerably. In infants there is always pain; the child cries, especially on attempts to defecate; there is usually much colic; there may be fever. In adult life the symptoms are fairly well marked. There is the time element, which is known; there is pain on passage, due to hardness of the fæces; and there may be feelings of bloating, coated tongue, headache, or backache, all of which are characteristic of this condition. In fact the symptoms which are described very widely in patent-medicine circulars as due to disease of the kidney, brain, lost manhood, and vague menstrual irregularities are nothing more or less than symptoms of ordinary constipation, and the patent-medicine business succeeds largely because it ascribes to this extremely common malady names of very much more dangerous illnesses. Practically most patent medicines are hardly more than cathartics

The causes of constipation are in the main two,— lack of water in the intestines, and lack of muscular power of the unstriped muscle of the intestinal walls. Lack of water may result from insufficient drinking of water. It may also result from increased elimination of water, as in excessive sweating. It may also be the result of diminished secretions of the normal juices of the intestines,— the gastric juice, the bile from the liver, and the pancreatic and intestinal juices.

These are all essential in adding fluid to the intestinal canal. Insufficient muscular power in the intestines may be due to a number of causes. Lack of tone of the body in general, resulting from insufficient exercise and insufficient food, is one of the most important. Bad dressing is a second cause for this loss of muscular tone. It may be a symptom of a nervous disorder such as is very frequently found in paraplegia (q.v.), in locomotor ataxia and other grave spinal disorders, in which case the motor paralysis is more or less permanent. Lack of muscular power may also be the result of taking fluid diet; thus the intestine has no irritants and the muscular power is not invoked. A frequent cause of constipation is tea-drinking.

The treatment of constipation is self-evident if one takes into consideration the two underlying causes and remedies them. The drinking of water, out-door exercise, sunlight, the eating of food that has plenty of residue, such as bread, spinach, lettuce, cabbage, celery, etc. These are very helpful. The first absolute necessity, however, in the treatment of constipation, is to establish a habit of regular daily movement. In order to do this it is essential that a time should be taken which is ordinarily not interfered with, and the individual should consider a certain 15 minutes of the day to be sacredly devoted to this duty. So far as drugs are concerned in the treatment of constipation, they are best left alone; but if it becomes absolutely necessary that a drug should be used, it is a cardinal principle to remember that alternation of drugs is advisable. The same drug used day in, day out, and week after week, tends to diminish the power of the intestine and habituate it to a given drug. This results in some frightful cases of constipation. In a few cases of constipation in which the cause is due to some obstruction, as some solid body situated near the intestinal canal and pressing upon it, surgical treatment is imperative. See CATHARTIC.

Constit'uent Assembly, a name given to the first convention of the delegates of the French nation (1787–91) to distinguish it from the legislative assembly of 1791. It drew up and obtained the acceptance of the first of the famous revolutionary constitutions. The Constituent Assembly of 1848 had a similar aim.

The opening of the States-General of 1789 was set for 4 May, the deputies being presented to the king on that day, and religious services held. On 5 May the formal opening took place in a magnificent hall; the king and royal family being present. According to the decision of the king's council the claim of the Third Estate to be equal in numbers to the two others was granted, and from the first these representatives of the people took a threatening attitude. The

representatives from the rural districts and small towns constituted the Third Estate; they were more in number than the other members of the assembly. (See FRANCE.) On 17 June, on a motion of the Abbè Sièyes, the majority voted in favor of constituting the body a "National Assembly."

Three days later, 20 June 1789, the deputies under the lead of Bailly gathered on a tennis ground near their usual place of meeting and took an oath not to permit the dissolution of the assembly until a new constitution had been given to France. On 11 July, Lafayette presented the celebrated Declaration of Rights, which after discussion was ordered placed at the head of the constitutional code.

From time to time the assembly voted addresses to the king and Louis had several times appeared before them and expressed his views. Early in October he signed the Declaration and the Constitution.

Constitution, the fundamental law of a state, whether it be a written instrument of a certain date, as that of the United States of America, or an aggregate of laws and usages which have been formed in the course of ages, like the English Constitution.

I. Constitutions, according to their origin or their fundamental principle, may be divided into three classes: (1) Those established by the sovereign power; (2) those formed by contracts between nations and certain individuals whom they accept as sovereigns on condition of their complying with the terms of the contract; (3) those formed by a compact between different sovereign powers.

1. The first class may be again divided into: (*a*) constitutions established by a free sovereign people for their own regulation, of which sort is the Constitution of the United States; and (*b*) such as have been, in some instances, granted by the plenary power of absolute monarchs to their subjects, and which in theory are the voluntary gift of the beneficence of the ruler. These are called by the French *constitutions octroyées,* from *octroyer,* to grant.

2. The second great class of constitutions mentioned above includes such as have been formed by a contract between the future ruler and the people. These are mutually binding on each party as long as the other fulfils his duty. Such, in a great degree, is the British Constitution.

3. Some constitutions are compacts between several sovereign powers. Such was the constitution of the German empire and that of the United Provinces of Holland, and such is also the Swiss Confederation. The Constitution of the United States, though the different States call themselves sovereign, proceeded, in point of fact, from the people of the United States collectively, as is apparent from the very beginning of the instrument: "We, the people of the United States," and not "We, the States." Moreover, the Congress, established by this Constitution, has rights and powers far exceeding those which other confederate but entirely distinct governments are wont to allow each other. The Constitution, in short, unites all the States into one nation, the government being called by all parties the national government. Governments entirely and virtually distinct from each other never would, however closely confederated, allow a government, particularly a national government, to be established over themselves. The Constitution of the United States is more than a mere compact between independent powers, yet less than the simple constitution of an undivided nation: it ought rather to be considered as forming one whole with the different Constitutions of the States which have given up to the general government most of the rights of sovereignty, as that of making war and peace, coining, etc.

II. In regard to political principles, constitutions are: (1) Democratic, when the fundamental law guarantees to every citizen equal rights, protection, and participation, direct or indirect, in the government, such as the Constitution of the United States and those of some cantons of Switzerland; (2) aristocratic, when the constitution establishes privileged classes, as the nobility and clergy, and intrusts the government entirely to them, or allows them a very disproportionate share in it; such a constitution as that of Venice, and such as, at one time, those of some Swiss cantons, for instance, Bern; (3) of a mixed character, to this latter division belonging some monarchical constitutions, which recognize the existence of a king whose power is modified by other branches of government of a more or less popular cast. The British Constitution belongs to this last division.

III. The forms of government, established by the various constitutions, afford a ground of division important in some respects; and, lastly,

IV. The principle on which a constitution establishes the representation, or the way in which the people participate in the government, furnishes an important means of classification: (1) Some allow the people to partake in the government without representation, as was the case in many of the small states of ancient Greece, and also in the ancient Roman republic, and is still the case in several of the small Swiss cantons, in which the whole people assemble and legislate; it being obvious that such a constitution can operate only where the number of citizens is very small, and even then will be almost always objectionable; (2) some are of a representative character; that is, all the citizens do not take an immediate part in the government, but act by their representatives; constitutions of this sort, either establishing a general and equal representation, as those of the United States; or connecting the right of representation with particular estates and corporations. The term representative constitution is frequently applied exclusively to the former by way of eminence.

V. Representative constitutions may be divided into: (1) Such as are founded on the union of the feudal estates, the clergy, nobility, citizens, and peasantry; the two latter of which derive their right of representation from the charters of the ancient corporations; (2) such as establish the right of a general representation, like the American Constitution, and such as partake of both characters, like the British Constitution. Those of the first class either originated in the feudal times, or have been since copied from such as did. The feudal states were conglomerates of many heterogeneous bodies; and it was reserved for later ages to unfold the true principles of government — to separate the essential from the unessential and injurious — to give stability, distinctness, and extent to

principles before unsettled, indefinite, and limited in their operation. See articles on the different countries of the world for information respecting their various constitutions.

Constitution, Framing of the. The Articles of Confederation (see CONFEDERATION, ARTICLES OF) were an organized national suicide, carefully barricaded against help. The scheme was unworkable except by general, constant, and hearty unanimity; yet it was made unchangeable except by unanimous consent. The impotence of the scheme had been foreseen before it went into operation at all. Hamilton in 1780, while Maryland was still blocking its adoption, had privately analyzed its evils and suggested a convention of the States to frame a better one. This plan was publicly put forth in a very influential pamphlet of Pelatiah Webster in 1781; and recommended in a resolution of the New York legislature in 1782, seconded by that of Massachusetts in 1785. But the change finally had to be accomplished under a sort of false pretense, justified by the right of the nation to live and of the people to consent. The last straw had been the failure of the Confederate Congress in obtaining permission to lay duties for 25 years, to produce a revenue independent of futile appeals to the States; all consented, but New York did so only on condition of herself levying and collecting the duties, and appointing and dismissing the officers. As this left the funds in her hands as before, it killed the whole intent of the plan; and showed anew that one large State could paralyze national action. The friends of efficient government then made use of a convention already called, the Annapolis Convention (q.v.), which they dominated; it had no authority but to regulate trade, but reported that nothing could be done under such a government, and recommended calling a fresh convention to amend it — the changes of course to be consented to by all the States. Congress issued the call for 14 May at Philadelphia; but a quorum (seven States, a majority) was not secured until the 25th. George Washington was appointed president; by 2 June four more States had come in, and on 23 July the New Hampshire delegation arrived. All were thus finally represented but Rhode Island, which was unalterably opposed to the scheme, and was the last to ratify the Constitution.

Three prime obstacles lay in the path of the convention: the small States' fear of the large, the one-crop States' fear of the national taxing power (and general tenacity of hold on the port dues by those which had ports), and the slave-trading States' determination not to have the business summarily stopped. The first, if not compromised, would have prevented any union at all, as the three "large States," Massachusetts, Pennsylvania, and Virginia — New York then counting as a "small State" — were scattered through the line; commercial interests quite possibly might have created three confederacies, the New England, Middle, and Southern; the slavery question would have created two, from New York to Delaware and from Maryland south. The first was assuaged by equal representation in the Senate; the second by the prohibition of taxing exports, with some other safeguards; the third by permitting the slave-trade for 20 years. These were three primary concessions which secured the votes of enough States to overlook the irregularity of the convention's title to create a new government, and join the Union under it; and without them there would have been no Union then, and most probably none now.

The first was by far the most difficult of all. The second and third could be and were cured by one or two single provisions, not difficult to draft nor very difficult to agree on; the first involved the very basic structure of the government, and cost a long struggle, great ingenuity, and much doubt about ratification. The situation was this: The convention assumed as a basis of debate that the 11 States represented had the following populations: Virginia, 420,000 (including three fifths of the slaves, as with all the five Southern States); Massachusetts, 360,000; Pennsylvania, 360,000; New York, 238,000; Maryland, 218,000; Connecticut, 202,000; North Carolina, 200,000; South Carolina, 150,000; New Jersey, 138,000; Georgia, 90,000; Delaware, 37,000. New Hampshire with 102,000 came late, and Rhode Island with 58,000 held aloof altogether. The three largest States were regularly reinforced by the three southernmost, who were next to or mixed with huge and powerful Indian confederacies against which they would like to turn the entire national force, and therefore favored a strong government; this gave a pretty constant large State vote of six for a "national" system, where the weight should be in proportion to size, and a small State vote of five for a federative one, like the Confederation, where each State had one vote. This further involved that the latter should be a one-chamber system, since two houses each representing sovereign States equally would be an absurd duplication. These two irreconcilable propositions were embodied in what were called the "Virginia" and the "Jersey" plans.

The former, presented by Edmund Randolph 29 May, was intended to obliterate the States as bodies from the government almost entirely. It was in substance, that the Congress should have two branches, membership in both proportioned to population, but the lower ones chosen directly by the people, the upper by the lower out of nominations by the State legislatures, the executive by both houses jointly; that Congress should have a veto on the State laws, and the President with part of the judiciary a veto on those of Congress; that Congress might coerce delinquent States, and should legislate on all matters where State action would cause discord in the Union (that is, commerce and taxation); that new States might be admitted; that all the obligations of the Confederation should be assumed, that members of State governments should take oath to support the national government, and that the new Constitution should be ratified by popular conventions instead of the State legislatures. A plan of Pinckney of South Carolina was in the same line. The committee of the whole, after debate and amendment, reported the amended bill favorably 13 June. The amendments had cut out the power of coercing the States, taken the veto from the judiciary and restricted it to the executive; made the executive's term seven years and not renewable, the senators' seven, and the representatives' three; had the State legislatures choose the senators; and styled the new system a "national" government. Two days later, William Paterson of New Jersey presented the "Jersey plan,"

whose distinctive differences were, that Congress should have but one chamber with each State voting equally, and should gain its revenue from requisitions as then, only having the power of coercing delinquent States. Coercion implied gaining a majority vote in an equal body to make war on one of the members, which would never have been granted. The other articles — that Congress should have the power of taxation and regulation of commerce, and of coercing refractory individuals as well as States, also of deciding disputes as to territory, etc. — were no stronger than the weakest link; Congress was given some powers extra to those of the Confederation, but was given no whit more power to enforce them. What the Confederation had lacked was not privileges, but force. Paterson's plan otherwise was much like Randolph's. The convention in committee of the whole adhered to the latter.

Hamilton attempted to forward a plan by which the Senate was to be chosen for life by electors chosen by popular vote, the executive for life by electors chosen by electors chosen by popular vote, and the State governors be appointed by the national government, with an absolute veto on the acts of the legislature. It found no supporters.

The first problem was to settle the basis of power between the States. Under Randolph's plan, the Senate would have had 28 members, of which the three "large States" would have had 13; and the House 65, of which they would have had 26 — two fifths of the latter and about half the former. Obviously they would be able, by a bargain with one or two of the smallest States, to choose the President and dictate the entire operations of the government. On the other hand, Paterson's plan was practically the Confederation plus more wind and paper decrees. The deadlock was absolute. John Dickinson of Philadelphia suggested consolidating the two plans, which was like consolidating a democracy and an autocracy. But on 21 June, William Samuel Johnson of Connecticut proposed the "Connecticut plan," the one finally adopted, making the States equal in the Senate and proportional in the House. His colleague, Ellsworth, supported him; but the vote on it showed a tie, five large to five small States, and Georgia's delegation divided. The question was referred to a committee of one from each State, which reported a compromise to win over the large States by restricting the power of originating money bills to the House, which they would control, and secure the slave States by counting in three fifths of the slaves as a basis of representation. With the addition of the power to the Senate to propose amendments to money bills, the compromise passed after a hot debate. The two New York delegates left the convention in wrath.

Another point which had to be compromised was the power of Congress over commerce. As matters stood, not only could each State lay any duties it pleased, so long as it did not violate treaties already made or take national property, and therefore fill the Union with prohibitive barriers, but a State like New York could ruin its neighbor, New Jersey, and deal a crushing blow at western Connecticut, whose port it was. Further, several States were not agriculturally diversified, but had one great crop — tobacco, or rice, or naval stores — a severe tax on which would bankrupt the entire State. The first of these difficulties was met at the outset by the conditional power given to Congress to regulate commerce between the States; the second was acknowledged by the insertion of the prohibition to tax exports, as said. A "committee of detail" reported a draft Constitution 6 August. It had 23 articles (finally boiled down to seven); the President was to have one term of seven years, and be chosen by Congress; there was no Vice-President, and the Senate chose a president for itself. This was debated till 12 September, and amended to its present form. The slave-trading States were given their solatium in the shape of permission to continue the trade for 20 years, and the entire slave group were placated by the fugitive-slave provision; the Vice-President and the electoral system was added, and a restriction of Congressional control of commerce to a two-thirds vote stricken out. On 12 September a committee of five was appointed to revise its form, and the actual work was mainly done by Gouverneur Morris (q.v.). The next day it was reported back, after a few changes — the chief requiring only a two-thirds instead of a three-fourths vote to pass a bill over a President's veto — and accepted. A new convention to consider amendments proposed by the States was voted down; they must take or leave it as it stood. Of the 55 delegates present, only 39 signed. On 17 September the convention adjourned. The Constitution and the resolutions of the convention were transmitted to Congress, which on 28 September ordered them sent to the State legislatures for action. (For the amendments, and the consequent difficulties about ratification, see CONSTITUTIONAL AMENDMENTS, HISTORY OF, below.) Only three States — New Jersey, Delaware, and Georgia — ratified it unanimously; Connecticut, Pennsylvania, Maryland, and South Carolina, by heavy majorities; Massachusetts, New Hampshire, New York (see FEDERALIST, THE), and Virginia by light ones, after a bitter and protracted struggle; North Carolina refused to ratify without many amendments and a bill of rights, and Rhode Island refused altogether till it was carried without her and she would have been shut out. There was great dissatisfaction, and only the commercial classes were heartily in its favor: John Adams said afterward that the Constitution was "extorted from the grinding necessity of a reluctant people."

Constitution, Immutability of The. The Constitution of the United States is the product of a few great minds assembled in a brief convention. A great statesman (Gladstone) has termed it "the most wonderful work ever struck off at a given time by the brain and purpose of man." This characterization has been accepted by all thinking men. There have been, indeed, cavils at some provisions, and speculative suggestions of alterations and improvements by individual minds; but the universal wonder is that the framers of the Constitution did so well; and that wonder was never so great as now at the close of a stormy century, littered with the wrecks of governments and nations and dynasties and constitutions.

The "given time"! The work was great, the difficulties many — most men then deemed them insuperable — and the work and its difficulties have had commentators and historians for

70 years or more; but will there be a single reader of this article who has noted how short a time it took to frame the Constitution? Has there been a single commentator or historian who has adequately shown how exceedingly brief the "given time" was? Less than a hundred working days measured it.

Moreover, the framers had had no means of previous personal communication by telegraph and almost none by mail; there were no stenographers or typewriters; there was, indeed, no clerical assistance; for the proceedings of the convention were secret and the clerical work was done by great men. When we see recent conventions with modern facilities for rapid work spending months in putting a few patches on existing State constitutions, we can best appreciate the ability of the men who in 85 working days forged the great compact of the people of the United States with themselves — a compact which has lasted more than a century substantially unchanged, which survived the storm of the greatest civil war of the modern world, which has expanded with an unforeseen and unprecedented expansion of inhabited territory from a narrow strip upon the Atlantic seaboard to the shores of the Pacific, and which, notwithstanding changed conditions of life and thought, has grown steadily in the power of moral obligation and become more and more truly the "supreme law" of nearly 100,000,000 people.

As the time was brief, so were the framers few. The convention was composed of 55 members; the Constitution was signed by 39, including Washington; 51 members took part in the debates (according to the most complete report we have of them, the Journal of Madison), again including Washington. It is generally assumed that he took no part in the debates; but Prof. Fiske has said in words which cannot be too often brought before the American citizen:

> It was suggested that palliatives and half measures would be far more likely to find favor with the people than any thorough-going reform, when Washington suddenly interposed with a brief but immortal speech, which ought to be blazoned in letters of gold and posted on the wall of every American assembly that shall meet to nominate a candidate or declare a policy or pass a law, so long as the weakness of human nature shall endure. Rising from his President's chair, his tall figure drawn up to its full height, he exclaimed in tones unwontedly solemn with suppressed emotion: "It is too probable that no plan we propose will be adopted. Perhaps another dreadful conflict is to be sustained. If, to please the people, we offer what we ourselves disapprove, how can we afterward defend our work? Let us raise a standard to which the wise and the honest can repair; the event is in the hand of God."

Some of the 55 took no real part in framing the Constitution, and some were obstructionists. Their objections may have exercised a wholesome influence on the convention, but added much to the cares and perplexities of the greater men who assumed the responsibility and did the work. But whether we take the 39 members who signed the Constitution, or the 51 who took part in the debates, or the 55 who composed the convention, the number seems perilously small to be intrusted with the titanic task of founding for all time a great and growing and intensely active nation. Edmund Randolph, speaking of the time when the Articles of Confederation were framed, apologetically called it "the then infancy of the science of constitutions and of confederacies." He might have said the same of the moment at which he was addressing the convention. Very little did the world then know of the science of constitutions or confederacies! He well summed up the new and added difficulties which confronted the convention, and which it must meet and overcome:

> The inefficiency of requisitions was unknown [to the framers of the Confederation] — no commercial discord had arisen among any States — no rebellion had appeared, as in Massachusetts — foreign debts had not become urgent — the havoc of paper money had not been foreseen — treaties had not been violated; and perhaps nothing better could be obtained, from the jealousy of the States with regard to their sovereignty.

There were other difficulties which Randolph, like a tactful statesman, left unnoticed. At one end of the line of financial troubles Rhode Island stood intent on her great scheme of making fiat paper money the equivalent of gold and silver by imprisoning the citizen who charged more for a commodity in the one kind of money than in the other. At the other end of the line stood New York, with the greatest custom-house of the country, her chief source of revenue, which she would be called upon to surrender to the new Federal government as a part of the price she must pay for coming within the sovereignty of the Constitution. Virginia owned a vast territory which she must cede that it might become the public lands of the United States. Even in the greatness and authority of the men who composed the convention there were dangers and impediments. Three of the greatest proposed things which would have defeated the great work: Franklin, the wisest member of the convention, proposed that the legislative power be vested in a single house, which would have been substantially the House of Representatives; Hamilton, the brilliant genius of the convention, advocated a government of which the President and the senators should hold office during good behavior, that is, for life; Madison, the most sagacious statesman in the convention, would have cast the responsibility of legislation on the judiciary by lodging a veto power in the supreme court. Any one of these provisions would have wrecked the Constitution before it was adopted; and any one of them, if it had been adopted, would have given us a government essentially different from that which we possess.

There is still another extraordinary fact connected with the framing of the Constitution which has received little if any attention, and substantially no comment. In the order of philosophical research the first subject of investigation would be the means or process by which the framers worked. A true philosopher, contemplating the clearness and conciseness of the Constitution, the masterly handling of the chief elements of the future government, the wonderful adaptation of insufficient means to a glorious end, would instantly exclaim, "Such a work is not born of the human mind completed! What was the secret process by which these great inventors attained their grand result"? And the philosopher would find, as he suspected, that even as the Constitution stands alone in the records of constructive statesmanship, so do the means and methods by which the convention did its work. It speaks badly for the century that none of the lesser conventions which have assembled frequently to experiment with

State constitutions has done its work in the same way. In a word, there is nothing which equals the Constitution; there is nothing which approaches the patient, painstaking workmanship of the great convention.

At the beginning, propositions for consideration and discussion were tentatively placed before the convention in an *abstract* form. These propositions were embodied in 15 resolutions, which were immediately referred to the Committee of the Whole. They were taken up one by one, and considered and discussed and amended or rejected or adopted or postponed for later consideration. The abstract of a part of a single day's proceedings will give a clear idea of the way in which the convention worked:

Tuesday, June 5. Mr. Randolph's *ninth* proposition — *The national judiciary to be chosen by the national legislature* — Disagreed to — *To hold office during good behavior and to receive a fixed compensation* — Agreed to — *To have jurisdiction over offenses at sea, captures, cases of foreigners and citizens of different States, of national revenue, impeachment of national officers, and questions of national peace and harmony* — Postponed.

At the end of two weeks of such consideration and discussion (13 June), the Committee of the Whole reported the conclusions which had so far been reached in the form of 19 resolutions. But everything was still abstract and tentative. No line of the Constitution had yet been written; no provision had yet been agreed upon. The 19 resolutions in like manner were taken up, one by one, and in like manner considered and discussed and amended or rejected or adopted or postponed. Other propositions coming from other sources were also considered; and so the work went on until 26 July, when the conclusions of the convention were referred to the Committee of Detail, and the work of reducing the abstract to the concrete began. The convention then adjourned to 6 August, to enable the committee to "prepare and report the Constitution."

On 6 August the Committee of Detail reported and furnished every member with a printed copy of the proposed Constitution. Again the work of consideration began, and went on as before, section by section, line by line. Vexed questions were referred to special committees,— composed of one member from each state,— amendments were offered, changes were made, the Committee on Detail incorporated additional matters in their draught, until, on 8 September, the work of construction stopped. But not even then did the labors of the convention cease. On that day a committee was appointed, "by ballot, to revise the style of, and arrange, the articles which had been agreed to." This committee was afterward known as the Committee of Style. It reported on 12 September, and the work of revision again went on until Saturday, the 15th. On Monday, the 17th, the end was reached, and the members of the convention signed the Constitution. Well might Franklin exclaim in his farewell words to the convention: "It astonishes me, sir, to find the system approaching so near to perfection as it does!" He had been overruled more than once in the convention; provisions which he had proposed had been rejected; provisions which he had opposed had been retained; but he was a great man and saw that a great work had been accomplished.

This article should treat of the Constitutional changes of the century. But the extraordinary fact is that from the framers' point of view there has been, with one trivial exception, absolutely no change in the Constitution of the United States. "Are there not 15 amendments," it will be asked, and "do not the presidential electors vote for a President and Vice-President in a different way, and is there not an unwritten change in the Constitution by virtue of which the selection of Presidents has passed directly to the people, acting through their political national conventions?" All these questions may be answered generally in the affirmative; and yet the fact remains that from the framers' point of view there has been, with one trivial exception, absolutely no change in the Constitution of the United States.

The work of the great convention was the making of a government; and the government which the framers made has remained absolutely unchanged. Madison, who was a wary as well as sagacious statesman, carried the first ten amendments through the first Congress at the first session to assuage public excitement and strengthen the new government and close the mouths of those who railed against it. He introduced into the tenth amendment a rule of construction which would not have been adopted by the convention, a clause which politically has made much mischief during these one hundred years, but which under the necessities of judicial construction has amounted to nothing, namely, that powers not delegated or prohibited by the Constitution "are reserved to the States respectively or to the people." The other provisions of the ten amendments are little more than quotations from the Bill of Rights. The constitution contained but few such declarations: that the writ of habeas corpus shall not be suspended; that no bill of attainder or *ex post facto* law shall be passed; that the trial of all crimes shall be by jury; that such trials shall be in the State where the crime was committed; that no attainder of treason shall work corruption of blood or forfeiture except during the life of the person attainted. The ten amendments declare that Congress shall make no law respecting an establishment of religion or prohibiting the free exercise thereof, or abridge the freedom of speech, or the right of the people peacefully to assemble and petition the government for a redress of grievances, etc. (Article 1). They provide that no person shall be compelled to be a witness against himself, nor be deprived of life, liberty, or property without due process of law; nor shall private property be taken for public use without just compensation, etc. (Article 5). These are great principles and noble sentiments, but their efficacy depends upon the rectitude of the government and the vigor and integrity of the people. No Congress would ever have dared to "make a law respecting an establishment of religion," though there had been no Constitutional prohibition; and many an unfortunate citizen has lived and died with his claim for property taken for public use still unpaid, notwithstanding the Constitutional guaranty of "just compensation." In a word, the ten amendments served their temporary purpose; they have doubtless warned off Congress occasionally when in the heedlessness of the short session or in the heat of political excitement a legislative wrong might otherwise have been

done; they have in a few instances secured the individual citizen, judicially, in his natural right to life, liberty, or property; they continue to be a standing moral restraint upon the legislative and executive branches of the government; and they form a noble decalogue of great principles to be kept before the eyes of all American citizens; but, nevertheless, the judicial records of the century show that the government which the framers of the Constitution established would have moved on just as it has done, if these ten amendments had never been proposed. The conscience and intelligence of the country have been the real safeguards of the citizen against injustice and oppression.

The Eleventh Amendment was caused by the extreme ground taken by the early supreme court in Chisholm *v.* Georgia (2 Dall., R. 419), and the incipient rebellion of that State. Its purpose was to overrule that decision and to exempt a State from suit by a citizen. If Marshall had been upon the bench the decision would never have been made; and, singularly, it was overruled by the same court a hundred years afterward (Hans *v.* Louisiana, 134 U. S. R. 1). The Thirteenth, Fourteenth, and Fifteenth Amendments grew out of the Civil War. They abolished slavery; they impose restraints upon State governments; they confer on some persons constitutional rights; they guarantee certain rights, privileges, and immunities to citizens and persons; and they contain some provisions relating to representation in Congress. Much litigation has been caused by them; some statutes have been held constitutional and some unconstitutional; a larger proportion of representation has fallen to the Southern States; the guaranty given to all citizens of the right to vote without regard to "race, color, or previous condition of servitude" is not absolutely effective, and the government of the United States moves on precisely as it did before.

It has been said herein that from the point of view of the framers of the Constitution their work has been changed in only one trifling particular. That change relates to the election of President, and was effected by the Twelfth Amendment. Under the Constitution as it originally stood each elector voted for two persons for President. He who should have the greatest number of votes would become President; he who might come next would be Vice-President. Under this provision, Mr. Lincoln, in 1861, would have become President, and Mr. Seward Vice-President. That is to say, the Republican electors, following the direction of their party, as expressed by the national convention, would have cast all their votes for Mr. Lincoln, and all but one for Mr. Seward. The purpose of the framers was a wise one: to secure for the country the two strongest statesmen of the party constituting for the time being the majority of the people, to fill the offices of President and Vice-President. No better plan could have been devised for obtaining a strong executive. We see a weak and modified application of the principle in national conventions when the defeated "wing of the party" is placated by being allowed to designate the candidate for Vice-President. But in 1801 there had been a tie, whereby the electors had failed to elect, and the election had gone into the House. If it had not been for that mishap, the Twelfth Amendment would not now exist; and if the original system had survived until the time of rapid communication by railroad and telegraph and better party organization, it is safe to say that it would now be in unquestioned operation. Political conventions would long ago have adopted its leading principle, and the struggle would have been as to which of the two strongest candidates should be first or second upon the ticket. The system would have given greater dignity to the office of Vice-President, and would have brought the possible importance of that office always before the eyes of the citizen. But whether we think well or ill of the original method, one thing is certain, that the only change made by the Twelfth Amendment is a trivial one of administrative detail. After all the changes this country has passed through in the last hundred years — changes in civilization, of territory, of population, of ideas, education, and public convictions, and individual life — changes such as the world has never witnessed in one country or in one century, the only change made in the Constitution has been the paltry one of having the electoral vote cast in one form instead of in another.

The unwritten amendment of the Constitution, as it has been called, also relates to the selection of the President. It is said by some of the commentators, and indeed it is now generally believed, that the electoral colleges were intended to be "deliberative bodies." In one sense this is true — in the legal sense. The electors are not ministerial or administrative officers; they do not perform a specific work in a way determined by higher official authority; in legal contemplation the responsibility of their action rests upon themselves. But the framers of the Constitution never supposed that the electors would disregard the political pledges upon which they were chosen, or that the American people, either directly or through their State legislatures, would blindly choose electors to evolve a President out of their inner consciousness. On the contrary, they contemplated the successful candidates receiving the votes of "a majority of the whole number of electors," and they required the electors to vote "in their respective States," and to vote on the same day. If they had framed a provision requiring all of the electors to convene at the seat of the government in one body, and there in their own way and time proceed to choose a President, there would be good reason for saying that actual deliberation was intended; but they did not give to the electors one single power or attribute by virtue of which they could deliberate.

That very thing was attempted and the attempt failed. The question before the convention was, in effect: "Where shall the deliberative power to choose the President be vested when the formal casting and counting of the electoral vote fails to elect?" The answering propositions were, "In the Senate," or "In the House of Representatives." Then Spaight, of North Carolina, said that "he would prefer their [the electors] meeting altogether [all together] and *deciding finally*"; and he moved "*that the electors meet at the seat of the general government*"; and all of the States except North Carolina voted against it. The evidence is therefore both negative and positive — the convention did not invest the electors with the

necessary powers and means for deliberation, and positively refused to do so; and refusal is conclusive of non-intent.

The idea that it was ever intended that the electors should nominate the candidate for whom they themselves should vote is a myth which has been unthinkingly reiterated by most eminent writers, but which does not rest upon a single fact. Nothing perplexed the convention more than the subject of the executive. Plan after plan was weighed and found wanting. The electoral system was late in coming to the front, and was the solvent of many difficulties. Hamilton early foresaw the inevtable, and proposed that "the selection be made by electors chosen by the people." Madison, later, said that the option before the convention "lay between an appointment by electors chosen by the people and an immediate appointment by the people"; and he at the same time said that "the electors would be chosen *for the occasion*, would meet *at once*, and proceed *immediately* to an appointment." It was as well understood then as it is now that they would but register the decree of the political power which appointed them. The internal evidence of intent is even more conclusive. He who supposes that the framers intended *that thirteen different bodies should convene in thirteen different places at one time for one object and for one day, and that object the selection of the executive of a nation*, confesses a most superficial knowledge of the greatest constructive statesmen of their century and of the great work which they deliberately planned and built.

And what better could the framers of the Constitution have done? Wilson, who proposed "an election by the people," was "almost unwilling to declare the mode which he wished to take place, being apprehensive that it might appear chimerical." Gerry, "who liked the principle," "thought the community not yet ripe"; he "was for waiting till the people should feel more the necessity of it." Gouverneur Morris admitted "that difficulties attended this mode," but thought that they would be "found superable." Madison liked an election by the people best, but acknowledged "the disadvantage this would throw on the smaller States." Ellsworth declared "the objection drawn from the different sizes of the States unanswerable."

It has been a fashion of late to speak of the electoral system as curious machinery which may give rise to serious complications; but viewed amid the difficulties and conditions and limitations of 1787, there is no stroke of practical statesmanship in the Constitution more wise and ingenious. The choosing of candidates soon drifted into Congress; with the coming of the steamboat and the railroad it passed from the congressional caucus to national conventions; and yet, notwithstanding these radical changes of usage, the expansion of territory, the multiplication of States, and the unscrupulousness of political partisanship, there have been no more mishaps than are incident to any system of human device.

To foretell the future of the Constitution is to foretell the future of the American people. They will change before it is changed. As with Washington and Lincoln, the more we know of them the better they appear; so of the Constitution, the more we contemplate its trials the better it appears adapted to our national needs. With the growth of knowledge there has been a growth of reverence. The people will experiment with State constitutions and tear them up and experiment again, but when it comes to the Constitution — the great Constitution — there is a sturdy sentiment of "hands off," and that sentiment is incomparably stronger now than it was at the beginning of the century. Judicial construction has moved backward rather than forward, and where Marshall left it it stands, substantially, to-day.

The amendatory provision of the Constitution is an unbarred door which may be opened at any time. It was wise and prudent of the framers to leave it thus unlocked. But he who tries to swing open that door will find two things of which he did not reckon: first, a *vis inertia* in the ignorance and indifference of congressmen — in their doubts whether the amendments will be popular — in their absorption in lesser things; and, second, that there is always some one on the other side pressing back the door.

At this time there is an amendment pending to have senators elected directly by the people. It is a popular amendment, and yet is absolutely needless. The men who framed the Constitution constructed it of general principles, and left it flexible for administrative details. Long ago, Abraham Lincoln and Stephen A. Douglas were senatorial candidates, and were as directly candidates before the people of Illinois as Mr. Gladstone and Lord Beaconsfield ever were before the people of England; and the legislature of Illinois carried into effect the public will. During the past year the people of North Carolina have nominated a candidate for senator by what is termed a "direct primary," and the legislature of North Carolina will give effect to their will. When the people of the United States find that it is easier to instruct the delegates they send to State conventions to proceed and nominate a candidate for United States senator than to obtain an amendment to the Constitution, the election of senators by the people will in practical effect take place.

CHARLES C. NOTT,
Chief Justice Court of Claims.

Constitution of the United States, the governing instrument of the United States of America, adopted in 1787, when it took the place of the Articles of Confederation. (For details of its adoption see CONSTITUTION, FRAMING OF THE.) Political discussion of the time played a much greater part in the compromises of this instrument than its provisions in turn exerted on political history in the following period, which to a surprising degree may be attached to only two clauses of the instrument and to these two simply because of their vagueness, and their mutually contradictory nature. Section 8 (18) in defining the powers of Congress adds the blanket provision of power, "To make all laws which shall be necessary and proper for carrying into execution the foregoing powers, and all other powers vested by this Constitution in the government of the United States, or in any department or officer thereof." The second historic clause occurs in the Amendments, where Article X reads: "The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people." The

former is the famous elastic clause. In this accommodating provision interpreted radically, or conservatively, in the light of the Tenth Amendment all shades of political theory find proof-texts for their peculiar doctrines. So immediately upon the formation of the new government two political parties arose, the Democratic-Republican party, strict constructionists of the elastic clause, who limited the powers of Congress to the minimum and exalted State rights to the maximum, and the Federalist party in favor of a highly centralized government doing everything possible for and in the States. Around this fundamental difference may be grouped the great political questions up to and culminating in the Civil War, and to a less degree recent political discussions are based upon the same variance in interpretation of the Constitution, although neither party now holds to the strict construction theory as it was set forth by the early opponents of the Federalists. This change has been brought about very largely by practical experience of affairs, it being well known that the foremost strict constructionists who have come to the presidential chair were forced by the exigencies of administration to a broader exposition of the clause. This was notably the case in the administrations of Jefferson and of his immediate lieutenants and successors.

The text of the Constitution follows:

CONSTITUTION OF THE UNITED STATES

WE the people of the United States, in order to form a more perfect union, establish justice, insure domestic tranquillity, provide for the common defense, promote the general welfare, and secure the blessings of liberty to ourselves and our posterity, do ordain and establish this Constitution for the United States of America.

ARTICLE I

SECTION 1. All legislative powers herein granted shall be vested in a Congress of the United States, which shall consist of a Senate and House of Representatives.

SECTION 2. 1 The House of Representatives shall be composed of members chosen every second year by the people of the several States, and the electors in each State shall have the qualifications requisite for electors of the most numerous branch of the State legislature.

2 No person shall be a representative who shall not have attained to the age of twenty-five years, and been seven years a citizen of the United States, and who shall not, when elected, be an inhabitant of that State in which he shall be chosen.

3 Representatives and direct taxes shall be apportioned among the several States which may be included within this Union, according to their respective numbers, which shall be determined by adding to the whole number of free persons, including those bound to service for a term of years, and, excluding Indians not taxed, three fifths of all other persons. The actual enumeration shall be made within three years after the first meeting of the Congress of the United States, and within every subsequent term of ten years, in such manner as they shall by law direct. The number of representatives shall not exceed one for every thirty thousand, but each State shall have at least one representative; and until such enumeration shall be made, the State of New Hampshire shall be entitled to choose three, Massachusetts eight, Rhode Island and Providence Plantations one, Connecticut five, New York six, New Jersey four, Pennsylvania eight, Delaware one, Maryland six, Virginia ten, North Carolina five, South Carolina five, and Georgia three.

4 When vacancies happen in the representation from any State, the executive authority thereof shall issue writs of election to fill such vacancies.

5 The House of Representatives shall choose their speaker and other officers, and shall have the sole power of impeachment.

SECTION 3. 1 The Senate of the United States shall be composed of two senators from each State, chosen by the legislature thereof for six years; and each senator shall have one vote.

2 Immediately after they shall be assembled in consequence of the first election, they shall be divided as equally as may be into three classes. The seats of the senators of the first class shall be vacated at the expiration of the second year, of the second class at the expiration of the fourth year, and of the third class at the expiration of the sixth year, so that one third may be chosen every second year; and if vacancies happen by resignation, or otherwise, during the recess of the legislature of any State, the executive thereof may make temporary appointments until the next meeting of the legislature, which shall then fill such vacancies.

3 No person shall be a senator who shall not have attained to the age of thirty years, and been nine years a citizen of the United States, and who shall not, when elected, be an inhabitant of that State for which he shall be chosen.

4 The Vice President of the United States shall be President of the Senate, but shall have no vote, unless they be equally divided.

5 The Senate shall choose their other officers, and also a president *pro tempore*, in the absence of the Vice President, or when he shall exercise the office of President of the United States.

6 The Senate shall have the sole power to try all impeachments. When sitting for that purpose, they shall be on oath or affirmation. When the President of the United States is tried, the chief justice shall preside: and no person shall be convicted without the concurrence of two thirds of the members present.

7 Judgment in cases of impeachment shall not extend further than to removal from office, and disqualification to hold and enjoy any office of honor, trust or profit under the United States: but the party convicted shall nevertheless be liable and subject to indictment, trial, judgment and punishment, according to law.

SECTION 4. 1 The times, places, and manner of holding elections for senators and representatives, shall be prescribed in each State by the legislature thereof; but the Congress may at any time by law make or alter such regulations, except as to the places of choosing senators.

2 The Congress shall assemble at least once in every year, and such meeting shall be on the first Monday in December, unless they shall by law appoint a different day.

SECTION 5. 1 Each House shall be the judge of the elections, returns and qualifications of its own members, and a majority of each shall constitute a quorum to do business; but a smaller number may adjourn from day to day, and may be authorized to compel the attendance of absent members, in such manner, and under such penalties as each House may provide.

2 Each House may determine the rules of its proceedings, punish its members for disorderly behavior, and, with the concurrence of two thirds, expel a member.

3 Each House shall keep a journal of its proceedings, and from time to time publish the same, excepting such parts as may in their judgment require secrecy; and the yeas and nays of the members of either House on any question shall, at the desire of one fifth of those present, be entered on the journal.

4 Neither House, during the session of Congress, shall, without the consent of the other, adjourn for more than three days, nor to any other place than that in which the two Houses shall be sitting.

SECTION 6. 1 The senators and representatives shall receive a compensation for their services, to be ascertained by law, and paid out of the Treasury of the United States. They shall in all cases, except treason, felony and breach of the peace, be privileged from arrest during their attendance at the session of their respective Houses, and in going to and returning from the same; and for any speech or debate in either House, they shall not be questioned in any other place.

2 No senator or representative shall, during the time for which he was elected, be appointed to any civil office under the authority of the United States, which shall have been created, or the emoluments whereof shall have been increased during such time; and no person holding any office under the United States shall be a member of either House during his continuance in office.

SECTION 7. 1 All bills for raising revenue shall originate in the House of Representatives; but the Senate may propose or concur with amendments as on other bills.

2 Every bill which shall have passed the House of Representatives and the Senate, shall, before it become a law, be presented to the President of the United States; if he approve he shall sign it, but if not he shall return it, with his objections to that House in which it shall have originated, who shall

enter the objections at large on their journal, and proceed to reconsider it. If after such reconsideration two thirds of that House shall agree to pass the bill, it shall be sent, together with the objections, to the other House, by which it shall likewise be reconsidered, and if approved by two thirds of that House, it shall become a law. But in all such cases the votes of both Houses shall be determined by yeas and nays, and the names of the persons voting for and against the bill shall be entered on the journal of each House respectively. If any bill shall not be returned by the President within ten days (Sundays excepted) after it shall have been presented to him, the same shall be a law, in like manner as if he had signed it, unless the Congress by their adjournment prevent its return, in which case it shall not be a law.

3 Every order, resolution, or vote to which the concurrence of the Senate and House of Representatives may be necessary (except on a question of adjournment) shall be presented to the President of the United States; and before the same shall take effect, shall be approved by him, or being disapproved by him, shall be repassed by two thirds of the Senate and House of Representatives, according to the rules and limitations prescribed in the case of a bill.

SECTION 8. 1 The Congress shall have power to lay and collect taxes, duties, imposts and excises, to pay the debts and provide for the common defense and general welfare of the United States; but all duties, imposts and excises shall be uniform throughout the United States;

2 To borrow money on the credit of the United States;

3 To regulate commerce with foreign nations, and among the several States, and with the Indian tribes;

4 To establish an uniform rule of naturalization, and uniform laws on the subject of bankruptcies throughout the United States;

5 To coin money, regulate the value thereof, and of foreign coin, and fix the standard of weights and measures;

6 To provide for the punishment of counterfeiting the securities and current coin of the United States;

7 To establish post offices and post roads;

8 To promote the progress of science and useful arts by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries;

9 To constitute tribunals inferior to the Supreme Court;

10 To define and punish piracies and felonies committed on the high seas, and offenses against the law of nations;

11 To declare war, grant letters of marque and reprisal, and make rules concerning captures on land and water;

12 To raise and support armies, but no appropriation of money to that use shall be for a longer term than two years;

13 To provide and maintain a navy;

14 To make rules for the government and regulation of the land and naval forces;

15 To provide for calling forth the militia to execute the laws of the Union, suppress insurrections and repel invasions;

16 To provide for organizing, arming, and disciplining the militia, and for governing such part of them as may be employed in the service of the United States, reserving to the States respectively the appointment of the officers, and the authority of training the militia according to the discipline prescribed by Congress;

17 To exercise exclusive legislation in all cases whatsoever, over such district (not exceeding ten miles square) as may, by cession of particular States and the acceptance of Congress, become the seat of the government of the United States, and to exercise like authority over all places purchased by the consent of the legislature of the State in which the same shall be, for the erection of forts, magazines, arsenals, dockyards, and other needful buildings; and

18 To make all laws which shall be necessary and proper for carrying into execution the foregoing powers, and all other powers vested by this Constitution in the government of the United States, or in any department or officer thereof.

SECTION 9. 1 The migration or importation of such persons as any of the States now existing shall think proper to admit, shall not be prohibited by the Congress prior to the year one thousand eight hundred and eight, but a tax or duty may be imposed on such importation, not exceeding ten dollars for each person.

2 The privilege of the writ of *habeas corpus* shall not be suspended, unless when in cases of rebellion or invasion the public safety may require it.

3 No bill of attainder or *ex post facto* law shall be passed.

4 No capitation, or other direct, tax shall be laid, unless in proportion to the census or enumeration hereinbefore directed to be taken.

5 No tax or duty shall be laid on articles exported from any State.

6 No preference shall be given by any regulation of commerce or revenue to the ports of one State over those of another: nor shall vessels bound to, or from, one State be obliged to enter, clear, or pay duties in another.

7 No money shall be drawn from the treasury, but in consequence of appropriations made by law; and a regular statement and account of the receipts and expenditures of all public money shall be published from time to time.

8 No title of nobility shall be granted by the United States: and no person holding any office of profit or trust under them, shall, without the consent of the Congress, accept of any present, emolument, office, or title, of any kind whatever, from any king, prince, or foreign State.

SECTION 10. 1 No State shall enter into any treaty, alliance, or confederation; grant letters of marque and reprisal; coin money; emit bills of credit; make anything but gold and silver coin a tender in payment of debts; pass any bill of attainder, *ex post facto* law, or law impairing the obligation of contracts, or grant any title of nobility.

2 No State shall, without the consent of the Congress, lay any imposts or duties on imports or exports, except what may be absolutely necessary for executing its inspection laws: and the net produce of all duties and imposts laid by any State on imports or exports, shall be for the use of the treasury of the United States; and all such laws shall be subject to the revision and control of the Congress.

3 No State shall, without the consent of Congress, lay any duty of tonnage, keep troops, or ships of war in time of peace, enter into any agreement or compact with another State, or with a foreign power, or engage in war, unless actually invaded, or in such imminent danger as will not admit of delay.

ARTICLE II

SECTION 1. 1 The executive power shall be vested in a President of the United States of America. He shall hold his office during the term of four years, and, together with the Vice President, chosen for the same term, be elected, as follows

2 Each State shall appoint, in such manner as the legislature thereof may direct, a number of electors, equal to the whole number of senators and representatives to which the State may be entitled in the Congress: but no senator or representative, or person holding an office of trust or profit under the United States, shall be appointed an elector.

The electors shall meet in their respective States, and vote by ballot for two persons, of whom one at least shall not be an inhabitant of the same State with themselves. And they shall make a list of all the persons voted for, and of the number of votes for each; which list they shall sign and certify, and transmit sealed to the seat of the government of the United States, directed to the president of the Senate. The president of the Senate shall, in the presence of the Senate and House of Representatives, open all the certificates, and the votes shall then be counted. The person having the greatest number of votes shall be the President, if such number be a majority of the whole number of electors appointed; and if there be more than one who have such majority, and have an equal number of votes, then the House of Representatives shall immediately choose by ballot one of them for President; and if no person have a majority, then from the five highest on the list the said house shall in like manner choose the President. But in choosing the President, the votes shall be taken by States, the representation from each State having one vote; a quorum for this purpose shall consist of a member or members from two thirds of the States, and a majority of all the States shall be necessary to a choice. In every case, after the choice of the President, the person having the greatest number of votes of the electors shall be the Vice President. But if there should remain two or more who have equal votes, the Senate shall choose from them by ballot the Vice President.

3 The Congress may determine the time of choosing the electors, and the day on which they shall give their votes; which day shall be the same throughout the United States.

4 No person except a natural born citizen, or a citizen of the United States, at the time of the adoption of this Constitution, shall be eligible to the office of President; neither shall any person be eligible to that office who shall not have attained to the age of thirty-five years, and been fourteen years a resident within the United States.

5 In case of the removal of the President from office, or of his death, resignation, or inability to discharge the powers and duties of the said office, the same shall devolve on the Vice President, and the Congress may by law provide for the case of removal, death, resignation, or inability, both of the President and Vice President, declaring what officer shall then act as President, and such officer shall act accordingly, until the disability be removed, or a President shall be elected.

6 The President shall, at stated times, receive for his services a compensation, which shall neither be increased nor diminished during the period for which he shall have been elected, and he shall not receive within that period any other emolument from the United States, or any of them.

7 Before he enter on the execution of his office, he shall take the following oath or affirmation: — "I do solemnly swear (or affirm) that I will faithfully execute the office of President of the United States, and will to the best of my ability, preserve, protect and defend the Constitution of the United States."

SECTION 2. 1 The President shall be commander in chief of the army and navy of the United States, and of the militia of the several States, when called into the actual service of the United States; he may require the opinion, in writing, of the principal officer in each of the executive departments, upon any subject relating to the duties of their respective offices, and he shall have power to grant reprieves and pardons for offenses against the United States, except in cases of impeachment.

2 He shall have power, by and with the advice and consent of the Senate, to make treaties, provided two thirds of the senators present concur; and he shall nominate, and by and with the advice and consent of the Senate, shall appoint ambassadors, other public ministers and consuls, judges of the Supreme Court, and all other officers of the United States, whose appointments are not herein otherwise provided for, and which shall be established by law: but the Congress may by law vest the appointment of such inferior officers, as they think proper, in the President alone, in the courts of law, or in the heads of departments.

3 The President shall have power to fill up all vacancies that may happen during the recess of the Senate, by granting commissions which shall expire at the end of their next session.

SECTION 3. He shall from time to time give to the Congress information of the state of the Union, and recommmend to their consideration such measures as he shall judge necessary and expedient; he may, on extraordinary occasions, convene both Houses, or either of them, and in case of disagreement between them with respect to the time of adjournment, he may adjourn them to such time as he shall think proper; he shall receive ambassadors and other public ministers; he shall take care that the laws be faithfully executed, and shall commission all the officers of the United States.

SECTION 4. The President, Vice President, and all civil officers of the United States, shall be removed from office on impeachment for, and conviction of, treason, bribery, or other high crimes and misdemeanors.

ARTICLE III

SECTION 1. The judicial power of the United States shall be vested in one Supreme Court, and in such inferior courts as the Congress may from time to time ordain and establish. The judges, both of the Supreme and inferior courts, shall hold their offices during good behavior, and shall, at stated times, receive for their services, a compensation which shall not be diminished during their continuance in office.

SECTION 2. 1 The Judicial power shall extend to all cases, in law and equity, arising under this Constitution, the laws of the United States, and treaties made, or which shall be made, under their authority; — to all cases affecting ambassadors, other public ministers and consuls; — to all cases of admiralty and maritime jurisdiction; — to controversies to which the United States shall be a party; — to controversies between two or more States; — between a State and citizens of another State; — between citizens of different States,— between citizens of the same State claiming lands under grants of different States, and between a State, or the citizens thereof, and foreign States, citizens or subjects.

2 In all cases affecting ambassadors, other public ministers and consuls, and those in which a State shall be party, the Supreme Court shall have original jurisdiction. In all the other cases before mentioned, the Supreme Court shall have appellate jurisdiction, both as to law and fact, with such exceptions, and under such regulations as the Congress shall make.

3 The trial of all crimes, except in cases of impeachment, shall be by jury; and such trial shall be held in the State where the said crimes shall have been committed; but when not committed within any State, the trial shall be at such place or places as the Congress may by law have directed.

SECTION 3. 1 Treason against the United States, shall consist only in levying war against them, or in adhering to their enemies, giving them aid and comfort. No person shall be convicted of treason unless on the testimony of two witnesses to the same overt act, or on confession in open court.

2 The Congress shall have power to declare the punishment of treason, but no attainder of treason shall work corruption of blood, or forfeiture except during the life of the person attainted.

ARTICLE IV

SECTION 1. Full faith and credit shall be given in each State to the public acts, records, and judicial proceedings of every other State. And the Congress may by general laws prescribe the manner in which such acts, records and proceedings shall be proved, and the effect thereof.

SECTION 2. 1 The citizens of each State shall be entitled to all privileges and immunities of citizens in the several States.

2 A person charged in any State with treason, felony, or other crime, who shall flee from justice, and be found in another State, shall on demand of the executive authority of the State from which he fled, be delivered up to be removed to the State having jurisdiction of the crime.

3 No person held to service or labor in one State, under the laws thereof, escaping into another, shall, in consequence of any law or regulation therein, be discharged from such service or labor, but shall be delivered up on claim of the party to whom such service or labor may be due.

SECTION 3. 1 New States may be admitted by the Congress into this Union; but no new States shall be formed or erected within the jurisdiction of any other State; nor any State be formed by the junction of two or more States, or parts of States, without the consent of the legislatures of the States concerned as well as of the Congress.

2 The Congress shall have power to dispose of and make all needful rules and regulations respecting the territory or other property belonging to the United States; and nothing in this Constitution shall be so construed as to prejudice any claims of the United States, or of any particular State.

SECTION 4. The United States shall guarantee to every State in this Union a republican form of government, and shall protect each of them against invasion; and on application of the legislature, or of the executive (when the legislature cannot be convened) against domestic violence.

ARTICLE V

The Congress, whenever two thirds of both Houses shall deem it necessary, shall propose amendments to this Constitution, or, on the application of the legislatures of two thirds of the several States, shall call a convention for proposing amendments, which, in either case, shall be valid to all intents and purposes, as part of this Constitution, when ratified by the legislatures of three fourths of the several States, or by conventions in three fourths thereof, as the one or the other mode of ratification may be proposed by the Congress; Provided that no amendment which may be made prior to the year one thousand eight hundred and eight shall in any manner affect the first and fourth clauses in the ninth section of the first article; and that no State, without its consent, shall be deprived of its equal suffrage in the Senate.

ARTICLE VI

1 All debts contracted and engagements entered into, before the adoption of this Constitution, shall be as valid against the United States under this Constitution, as under the Confederation.

2 This Constitution, and the laws of the United States which shall be made in pursuance thereof; and all treaties made, or which shall be made, under the authority of the United States, shall be the supreme law of the land; and the judges in every State shall be bound thereby, anything in the Constitution or laws of any State to the contrary nothwithstanding.

3 The senators and representatives before mentioned, and the members of the several State legislatures, and all executive and judicial officers, both of the United States, and of the several States, shall be bound by oath or affirmation to support this Constitution; but no religious test shall ever be required as

a qualification to any office or public trust under the United States.

ARTICLE VII

The ratification of the conventions of nine States shall be sufficient for the establishment of this Constitution between the States so ratifying the same.

Done in Convention by the unanimous consent of the States present the seventeenth day of September in in the year of our Lord one thousand seven hundred and eighty-seven, and of the independence of the United States of America the twelfth. In witness whereof we have hereunto subscribed our names,

Go: WASHINGTON —
Presidt. and Deputy from Virginia

New Hampshire

John Langdon
Nicholas Gilman

Massachusetts

Nathaniel Gorham
Rufus King

Connecticut

Wm. Saml. Johnson
Roger Sherman

New York

Alexander Hamilton

New Jersey

Wil: Livingston
David Brearley
Wm. Paterson
Jona: Dayton

Pennsylvania

B. Franklin
Thomas Mifflin
Robt. Morris
Geo. Clymer
Thos. Fitzsimons
Jared Ingersoll
James Wilson
Gouv Morris

Delaware

Geo: Read
Gunning Bedford Jun
John Dickinson
Richard Bassett
Jaco: Broom

Maryland

James McHenry
Dan of St. Thos. Jenifer
Danl. Carroll

Virginia

John Blair —
James Madison Jr.

North Carolina

Wm. Blount
Richd. Dobbs Spaight
Hu Williamson

South Carolina

J. Rutledge,
Charles Cotesworth Pinckney
Charles Pinckney
Pierce Butler

Georgia

William Few
Abr Baldwin

Attest WILLIAM JACKSON Secretary.

Articles in addition to, and amendment of, the Constitution of the United States of America, proposed by Congress, and ratified by the legislatures of the several States pursuant to the fifth article of the original Constitution.

Amendments

ARTICLE I

Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press; or the right of the people peaceably to assemble, and to petition the government for a redress of grievances.

ARTICLE II

A well regulated militia, being necessary to the security of a free State, the right of the people to keep and bear arms, shall not be infringed.

ARTICLE III

No soldier shall, in time of peace be quartered in any house, without the consent of the owner, nor in time of war, but in a manner to be prescribed by law.

ARTICLE IV

The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no warrants shall issue, but upon probable cause, supported by oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.

ARTICLE V

No person shall be held to answer for a capital, or otherwise infamous crime, unless on a presentment or indictment of a grand jury, except in cases arising in the land or naval forces, or in the militia, when in actual service in time of war or public danger; nor shall any person be subject for the same offense to be twice put in jeopardy of life or limb; nor shall be compelled in any criminal case to be a witness against himself, nor be deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use without just compensation.

ARTICLE VI

In all criminal prosecutions, the accused shall enjoy the right to a speedy and public trial, by an impartial jury of the State and district wherein the crime shall have been committed, which district shall have been previously ascertained by law, and to be informed of the nature and cause of the accusation; to be confronted with the witnesses against him; to have compulsory process for obtaining witnesses in his favor, and to have the assistance of counsel for his defense.

ARTICLE VII

In suits at common law, where the value in controversy shall exceed twenty dollars, the right of trial by jury shall be preserved, and no fact tried by a jury shall be otherwise reëxamined in any court of the United States, than according to the rules of the common law.

ARTICLE VIII

Excessive bail shall not be required, nor excessive fines imposed, nor cruel and unusual punishments inflicted.

ARTICLE IX

The enumeration in the Constitution of certain rights shall not be construed to deny or disparage others retained by the people.

ARTICLE X

The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people.

ARTICLE XI

The judicial power of the United States shall not be construed to extend to any suit in law or equity, commenced or prosecuted against one of the United States by citizens of another State, or by citizens or subjects of any foreign State.

ARTICLE XII

The electors shall meet in their respective States, and vote by ballot for President and Vice President, one of whom, at least, shall not be an inhabitant of the same State with themselves; they shall name in their ballots the person voted for as President, and in distinct ballots the person voted for as Vice President, and they shall make distinct lists of all persons voted for as President and for all persons voted for as Vice President, and of the number of votes for each, which lists they shall sign and certify, and transmit sealed to the seat of government of the United States, directed to the president of the Senate;— The president of the Senate shall, in presence of the Senate and House of Representatives, open all the certificates and the votes shall then be counted; — The person having the greatest number of votes for President shall be the President, if such number be a majority of the whole number of electors appointed; and if no person have such majority, then from the persons having the highest numbers not exceeding three on the list of those voted for as President, the House of Representatives shall choose immediately, by ballot, the President. But in choosing the President, the votes shall be taken by States, the representation from each State having one vote; a quorum for this purpose shall consist of a member or members from two thirds of the States, and a majority of all the States shall be necessary to a choice. And if the House of Representatives shall not choose a President whenever the right of choice shall devolve upon them, before the fourth day of March next following, then the Vice President shall act as President, as in the case of the death or other constitutional disability of the President. The person having the greatest number of votes as Vice President shall be the Vice President, if such number be a majority of the whole number of electors appointed, and if no person have a majority, then from the two highest numbers on the list, the Senate shall choose the Vice President; a quorum for the purpose shall consist of two thirds of the whole number of senators, and a majority of the whole number shall be necessary to a choice. But no person constitutionally ineligible to the office of President shall be eligible to that of Vice President of the United States.

ARTICLE XIII

SECTION 1. Neither slavery nor involuntary servitude, except as a punishment for crime whereof the party shall have been duly convicted, shall exist within the United States, or any place subject to their jurisdiction.

SECTION 2. Congress shall have power to enforce this article by appropriate legislation.

ARTICLE XIV

SECTION 1. All persons born or naturalized in the United States, and subject to the jurisdiction thereof, are citizens of the United States and of the State wherein they reside. No State shall make or enforce any law which shall abridge the privileges or immunities of citizens of the United States; nor shall any State deprive any person of life, liberty, or property, without due process of law; nor deny to any person within its jurisdiction the equal protection of the laws.

SECTION 2. Representatives shall be apportioned among the several States according to their respective numbers, counting the whole number of persons in each State, excluding Indians not taxed. But when the right to vote at any election for the choice of electors for President and Vice President of the United States, representatives in Congress, the executive and judicial officers of a State, or the members of the legislature thereof, is denied to any of the male inhabitants of such State, being twenty-one years of age, and citizens of the United States, or in any way abridged, except for participation in rebellion, or other crime, the basis of representation therein shall be reduced in the proportion which the number of such male citizens shall bear to the whole number of male citizens twenty-one years of age in such State.

SECTION 3. No person shall be a senator or representative in Congress or elector of President and Vice President, or hold any office, civil or military, under the United States, or under any State, who, having previously taken an oath, as a member of Congress, or as an officer of the United States, or as a member of any State legislature, or as an executive or judicial officer of any State, to support the Constitution of the United States, shall have engaged in insurrection or rebellion against the same, or given aid or comfort to the enemies thereof. But Congress may by a vote of two thirds of each House, remove such disability.

SECTION 4. The validity of the public debt of the United States, authorized by law, including debts incurred for payment of pensions and bounties for services in suppressing insurrection or rebellion, shall not be questioned. But neither the United States nor any State shall assume or pay any debt or obligation incurred in aid of insurrection or rebellion against the United States, or any claim for the loss or emancipation of any slave; but all such debts, obligations and claims shall be held illegal and void.

SECTION 5. The Congress shall have power to enforce, by appropriate legislation, the provisions of this article.

ARTICLE XV

SECTION 1. The right of citizens of the United States to vote shall not be denied or abridged by the United States or by any State on account of race, color, or previous condition of servitude.

SECTION 2. The Congress shall have power to enforce this article by appropriate legislation.

Constitutional Amendments, History of. As shown in a preceding article (see CONSTITUTION, FRAMING OF THE), very few of the States liked the Constitution as a form of government at all, and fewer still were satisfied with it as an instrument. North Carolina had refused to ratify without amendments and a "bill of rights" affixed — a declaration of the fundamental rights of human beings to which immense importance was attached by the mass at that time; Massachusetts and New Hampshire ratified with an appended urgent recommendation of certain amendments; New York first ratified subject to the right to secede if her amendments were not accepted within six years, and finally changed "on condition" to "in full confidence." The mass of amendments proposed in the first Congress was enormous; 103 from the States themselves, and 42 from minorities in other States, besides long bills of rights from New York and Virginia. Some of them were duplicates, but the total was very great; the House rejected them all and agreed on 17 articles in their place. The Senate cut them down to 12 and both Houses passed them; the first two failed of ratification by the States, the remaining 10 were accepted and went into force 15 Dec. 1791.

The text of the Amendments is to be found with the body of the Constitution.

The First Amendment (Article I.) was violated by the government within a few years in the Sedition Act (see ALIEN AND SEDITION ACTS), and had no effect in accomplishing its defeat, which was effected by a party revolution. Nor has it prevented "gag laws," or exclusion from the mails of whatever has been thought obnoxious. Public opinion in these respects has been found more efficient than the Constitution.

General warrants were a principal grievance of the British customs laws, a fact which explains Article IV.

"Life *or limb*" in Article V. is a curious anachronism; modern laws do not prescribe the rack as a punishment. Probably the drafters of this provision used a current phrase without stopping to analyze its meaning.

The provision of Article VI. against changing the venue was doubtless suggested by the attempts to take Americans to England for trial.

The intrepid jumble of possible and impossible dangers of Articles VII.–X., inclusive, reminiscences of 17th-century persecutions and 18th-century customs laws, of the times of King John and those of George III., of grievances unthinkable except under foreign rule and of others likely enough under their own, of local provisions and world-wide provisions, is amusingly characteristic of the period and the people; perhaps rather, any period and any people. The Amendments inspired the champions of a strong government with great weariness and disgust; but they are not all anachronisms or idle precautions. The Tenth especially (added by Massachusetts) has in practice restrained the action of the government greatly, especially in guiding the constructions of the supreme court; and certain provisions of the Fifth, Sixth, and Seventh have been great public safeguards, by no means out of date even yet.

See CHISHOLM V. GEORGIA, for the circumstances under which the Eleventh Amendment, put in force 8 Jan. 1798, was passed. Maryland had been sued by a private citizen, and submitted; Georgia was sued, refused to plead, and threatened with death any one who served a writ in the suit; and she and Virginia pressed through an amendment forbidding such suits by individuals against States, but not *vice versa*.

The gist of Article XII. is the naming of the candidates for President and Vice-President separately; the lack of which provision brought about a discreditable intrigue, and results political and personal by no means forgotten. (See ELECTORAL SYSTEM; JEFFERSON-BURR IMBROGLIO.) Before this, the highest candidate was President and the next highest Vice-President; but now came an election which showed not merely the possibility of a tie, but the certainty of one, between the two candidates of the same party from mere party loyalty. Yet plain as this seems, the Amendment failed in the first Congress where it was introduced,

passed the House 12 Dec. 1803, only by the Speaker's casting vote, was ratified by the bare three fourths of the States necessary, and declared in force 25 Sept. 1804. New Hampshire, Massachusetts, Connecticut, and Delaware (Federalist States) rejected it.

The emancipation proclamation had freed only the slaves within the States technically in revolt. In those where the Union forces alone had prevented it, as Maryland, or a powerful minority of Union men plus resolute Union commanders, as Missouri, and generally in the Border States, the slaves were still private property, nearly 1,000,000 in number. Movements to compensate the owners were abortive, partly because the owners would not listen to such proposals; and the Thirteenth Amendment was introduced for entire emancipation without payment. Its phraseology is essentially that of the Ordinance of 1787 (q.v.), repeated in the Missouri Compromise and the Wilmot Proviso (qq.v.). It passed the Senate 8 April 1864, 38 to 6, and the House 15 June 95 to 66, but the latter was not the needed two thirds. In the next session the House passed it, and it was ratified by 31 States, and proclaimed in force 18 Dec. 1865.

The Fourteenth Amendment, in part a rephrasing of the Fifth, arose out of the first Civil Rights Bill (q.v.), which was pronounced nonenforceable as contrary to the decision of the supreme court in the Dred Scott Case (q.v.), that negroes were not citizens. As this decision was law until distinctly reversed, the Amendment was drawn, the first clause clearing away that decision. The other sections were: (1) A bribe to the South to give the negro the vote; (2) to give the negroes a clear field by debarring the Confederate leaders from it; (3) obvious. It passed both houses in June 1866, by overwhelming votes, but a long struggle ensued over ratification. The old Confederate States rejected it, to which Congress retorted by the Reconstruction Act of 2 March 1867, constituting provisional governments in those States till they had ratified the Amendment, and they did so. Maryland, Delaware, and Kentucky also rejected it; and New Jersey and Ohio were captured by the Democrats and rescinded their ratifications, though it was doubtful whether this could be done. But finally 33 States ratified without them, and the Amendment was declared in force 28 July 1868.

The Fifteenth Amendment was practically a substitute for the second section of the Fourteenth, which was found valueless. In one respect it was weaker than the other, which prescribed a penalty for the offense, while this prescribed none; but its specification of the negroes as the class not to be excluded, and their race or color or former slavery as not legal grounds for disfranchisement, gave it apparently a clearer legal footing. In fact, however, it has been found as little worth as the other. It passed both Houses in February 1869, by immense majorities, was ratified by 30 out of 37 States, and declared in force 30 March 1870. New York fell into the hands of the Democrats and rescinded its vote; a notice was filed in the State Department, which reported that the State "claimed" to have rescinded its ratification, but paid no further attention to it. It is more than doubtful if such action of a State has the least validity.

Constitutions, State, First Formation of. The colonies at the Revolution were living under a great variety of governmental instruments, and some of them under none. For example, New Hampshire and Delaware were not separate colonies by any formal grant or charter; the former existed only by the royal will, and was a semi-appendage of Massachusetts, the two often having the same governor; the latter was in theory only three counties of Pennsylvania, and had always the same governor. Pennsylvania and Delaware had proprietary governments; New Jersey a crown government, but the old proprietary instrument of government, "the Concessions"; Massachusetts, New York, Virginia, the Carolinas, and Georgia, crown governments and royal charters; Connecticut and Rhode Island pure self-governing charters. All of course had the rights of English freemen, and popular assemblies. When the Revolution broke out, these instruments, except in the last two cases, and measurably in Massachusetts, would no longer serve for the new needs as members of an independent republic, and must have great modification or entire reconstruction. New Hampshire, living on sufferance with no government at all, was naturally the first to act, adopting a constitution 5 Jan. 1776; South Carolina followed 26 March; Virginia 29 June; New Jersey 2 July; Delaware 21 September, seizing the opportunity for independence; Pennsylvania 28 September; Maryland 11 November; North Carolina 18 December; Georgia 5 Feb. 1777; New York 20 April. Some of these constitutions were adopted by the provincial congresses, the rest by conventions called by the congresses. None of them were submitted to popular ratification: the adopting bodies themselves had no basis but popular desire and consent, and the people asked nothing better than to have them assume the power. But in the other New England colonies there was no such haste, for their bodies of law were satisfactory enough. Even the Massachusetts General Court did not replace the royal charter by a constitution till 28 Feb. 1778, and when it was submitted to popular vote it was rejected; another, drawn up by John Adams, was adopted by a convention 2 March 1780, and ratified. The two colonies already under pure democratic charters took no steps to alter them: no alteration was needed. In fact, Connecticut remained under the charter of 23 April 1662, which by statute of 1776 was enacted to be the Constitution of the State, until 1818, when a strong democratic movement took the reins of power from the hands of the local aristocracies which mainly exercised it; while Rhode Island remained under the charter of 14 March 1643, renewed 1663, until 1842, two thirds of a century after the Revolution, when the great disfranchised mass revolted against the former oligarchy (see DORR REBELLION), and forced it to include them.

Constitution, The, or **Old Ironsides** (from the slightness of the injury her hull received in the fight with the Guerrière), one of the most famous vessels of the American navy, now fixed in Boston harbor. She was a 44-gun frigate of 1,576 tons; one of the six war vessels ordered by Congress early in 1794, on account of the Algerian piracies (see BARBARY POWERS, U. S. WARS AND TREATIES WITH THE). These were

built not on contract, but by the day, under the eyes of practised commanders, and embodied the latest experience of all nations; and were the supreme types of their class on the globe. The Constitution was built at Boston by George Cloghorne and Mr. Hartley, at a cost of $302,719, and was launched 20 Sept. 1797. An English officer in 1815 said she was one of the finest frigates, if not the very finest, he ever set foot on. She took part in the war of 1800 with the French in the West Indies, as Commodore Talbot's flag-ship; her first lieutenant was Isaac Hull, by whose seamanship she beat an English frigate several miles in a day's race, and who in a boat from her captured a French privateer at Hayti. In 1803 she went to the Mediterranean as Preble's flag-ship, and took part in the operations against the pirates,—notably the recapture of the Philadelphia (see DECATUR, STEPHEN), and the bombardment of Tripoli August–September 1804. It was while sailing to relieve her that the Chesapeake (q.v.) was so bloodily raided by the Leopard. In 1811, when on an errand to England under Hull, then captain, two English frigates undertook to repeat the Leopard's performance with her; but Hull outsailed the one and closed with the other, daunting the latter into drawing off, to the great disappointment of the Constitution's crew.

When the War of 1812 broke out Hull started to join the New York squadron with her, 12 July; was cut off by a British squadron, including the Guerrière, but in a wonderful chase of three nights and two days outmanœuvred and escaped it. The Navy Department was exceedingly afraid of an encounter between British ships and its own, was barely shamed out of keeping the latter all in port to prevent their capture, and had instructed Hull not to risk an engagement with a superior force; it had resolved to supersede him by Bainbridge, and had sent him word to remain in Boston till further orders; but he had foreboded some mischief and, 2 August, to avoid receiving undesirable orders, slipped out of Boston with his ship. A high authority says that had his ship been captured or unsuccessful, he would have been hanged or shot for disobedience of orders. Sailing for the Bay of Fundy and the Gulf of St. Lawrence in hope of prizes, but disappointed, he stood south for Bermuda; but on the 19th, about 100 miles east of Boston came (without recognizing her) upon the Guerrière. Its captain, Dacres, had met Hull before and bet a hat with him as to the results of a mutual fight, and had left the squadron precisely in order to capture in single combat the vessel which had eluded the whole body. The Constitution had 55 guns firing 700 pounds of metal, the Guerrière 49 guns firing 597; the crews were respectively 468 and 263. The frequent statement that the Guerrière was a rotten and worn-out ship is, however, a fiction. After manœuvering for position, about 5.45 P.M. the Constitution steered straight for the enemy, but reserved her fire; the Guerrière kept up a hot fire, wounding several men; at 40 yards Hull let fly his whole broadside, with the accuracy of American naval gunnery and with fearful destruction. By 6.10 the Guerrière's main yard was shot away and the rigging, sails, and hull badly damaged; just then the mizzenmast was shot through and fell dragging in the sea, acting as a rudder and making the helm useless. The Constitution came about and raked her hampered foe with two terrible broadsides, and the two shortly met. Both wished to board, but the rolling prevented it; the rigging, however, was filled with sharpshooters who swept the decks, badly wounding several officers of both, including Dacres, and killing one of the Constitution's. At 6.22 the Guerrière's foremast came down and carried the mainmast with it, with all the yards and rigging; and the dismasted wreck rolled in the trough of the sea perfectly helpless. Hull took possession, refusing to accept Dacres' sword, but asking for the hat. The Guerrière had lost 15 killed and 63 wounded; the Constitution, seven killed and seven wounded. The Guerrière was sinking and could not be towed into port; she was therefore blown up. Hull sailed into Boston with his prisoners, to such an ovation as few men have ever earned in so short a time. In less than 25 minutes of actual fighting he had lifted the despised American navy and nation to an equality with the proudest of the world; and drew from Great Britain such an explosion of rage and humiliation as it has never known before or since.

Hull generously gave up the command, to give a chance to other officers, they being more plentiful than frigates; and the Constitution was made Bainbridge's flag-ship for a cruise against English commerce in the East Indies. On 29 Dec. 1812 it encountered the Java, Capt. Lambert, off the coast of Brazil, and at 2.10 P.M. joined action. The Constitution had 54 guns, with 787 pounds of metal; the Java 47, with 568 pounds. The crews were 480 and 426. One of the fiercest of naval battles ensued for nearly two hours, in which the Constitution's wheel was shot away at the outset, making its navigation difficult, and the English vessel was the better sailer anyway. But the American gunnery was incomparably more intelligent, and improved every opportunity for raking broadsides, while the British did not. As soon as the Constitution came to close quarters, she inflicted ruinous damage and frightful slaughter. The Java's jib-boom and bowsprit were soon shot away, and the running rigging made useless; at 3.05 P.M. the foremast was carried away, shattering the forecastle and main deck, and making several guns inaccessible; soon afterward the maintopmast fell, and in a short time the gaff and spanker boom. Bainbridge had been twice badly wounded, and now Lambert was fatally shot. At 3.30 the Java's fire slackened, and the Constitution poured in broadsides almost unanswered; at 3.55 the former's mizzenmast went; at 4.05 the fire had wholly ceased, half the guns were useless, and the mainmast was tottering and had to be cut away. This closed the action, and the Java struck. She had lost 60 killed and 101 wounded, against the Constitution's 9 killed and 25 wounded. The Java was so utter a ruin that she could only be got into the nearest port (Bahia), and was blown up. The Constitution was taken into Boston for repairs; but before they were completed, Boston was closely blockaded, and she did not escape till New Year's Day 1814, under Capt. Charles Stewart.

In a cruise to the West Indies, Capt. Stewart captured four prizes, with 24 guns and 76 men; one of them was the 14-gun schooner Picton. Again blockaded by a powerful British squad-

ron, she did not escape till 17 Dec. 1814. The news that the Constitution was loose again spread consternation among the British merchant service, and vigilance among the naval. Standing toward the Madeiras, on 20 Feb. 1815 Capt. Stewart, about 150 miles northeast of Madeira, encountered two ship-rigged war vessels: the frigate Cyane, 34 guns with 451 pounds to the broadside; and the sloop-of-war Levant, 21 guns with 303 pounds, aggregating 55 guns with 754 pounds. The Constitution had 51 guns with 644 pounds. The two, however, had but 313 crew against the Constitution's 456. The engagement began at 6.05 P.M. For skill and beauty the manœuvres by which Stewart rapidly passed back and forward around and between the ships, raking both with terrific broadsides again and again, and slipping away from them when they had secured raking positions, are unsurpassed in naval history. At 6.50 P.M. the Cyane struck; the Levant temporarily escaped, but was overhauled by the Constitution, and at 10 P.M. surrendered also. The two ships had lost 35 killed and 42 wounded; the Constitution, 4 killed and 10 wounded. Cut off by a powerful British squadron at a neutral port whose neutrality the English treated with utter contempt, the Constitution and Cyane succeeded by fine seamanship in escaping, but the Levant was recaptured. In 1830 she was reported unseaworthy, and condemned to be broken up, but Oliver Wendell Holmes published in the Boston *Advertiser* his thrilling poem 'Old Ironsides,' and the public clamor excited by it saved the noble vessel, which was rebuilt and again put in service in 1833. In 1855 she was laid up at the Portsmouth Navy Yard, but used sometimes as a training-ship; in 1877 was again partially rebuilt, and took her last trip across the Atlantic the next year. In 1897 she was roofed in at the Boston Navy Yard, and has since been used as a barrack ship, etc.

Consult: Hollis, 'The Frigate Constitution' (1900); Maclay, 'History of the United States Navy,' Vol. I. (2d ed. 1898); Henry Adams, 'History of the United States,' Vol. VI., VII., IX. (1900–1); Roosevelt, 'Naval War of 1812' (1882).

Constitutional Law. See LAW, CONSTITUTIONAL.

Constitutional Union Party, in United States history, popularly known in its own time as the Bell-Everett party, from the names of its presidential candidates; the name assumed by the remnant of the Southern Whigs in 1860. The Whig party (q.v.), as incongruous a body as ever acted together in politics, had cohered only by ignoring the slavery issue as long as possible. So soon as this became the controlling issue by reason of the Fugitive Slave Law of 1850, it split hopelessly into the Northern and Southern branches. The election of 1852, in which it carried but two Northern and two Border States, and less than one third of the national House, many of those bolting Southerners, was accepted by the whole country as marking its end; but it was not till the crowning blow of the Kansas-Nebraska Bill (q.v.) that the Northern section openly founded the Republican party. The Southern Whigs were divided; part of them joined the Democrats; the remainder would not join the Republicans in opposing slavery, nor yet the Southern Democrats in making it the one touchstone, much less in setting it above the Union. After attempting to draw a herring across the trail by the anti-foreign agitation (see AMERICAN PARTY), in 1860 they doubled back desperately to the old policy of excluding slavery from the platform; but this time appealing to the love of the Union as the bond of unity, and calling on all who loved it to refrain alike from attacking or upholding it, and simply to preserve the *status quo* of the compromise of 1850. But that compromise had in fact been repealed by its friends, not by its enemies; the Kansas-Nebraska Bill had made a clean slate. On 9 May 1860 this element held a convention at Baltimore; adopted a platform deprecating "geographical and sectional parties," and making it an obligation of both "patriotism and duty" to hold as a sole political principle "the Constitution of the country, the Union of the States, and the enforcement of the laws" (that is, the Fugitive Slave Law); and nominated for President John Bell of Kentucky, and for Vice-President Edward Everett of Massachusetts. The party had only a small scattering vote in the North, where the Republican party satisfied the opponents of slavery aggressions, and the sudden rise of that party into enormous proportions frightened the Conservatives into acting with the Democrats. But in the South it was the only refuge left for the Union men and moderates, who would not vote for Breckinridge and the secession Democrats; and it carried the three Border States (q.v.), Kentucky, Tennessee, and Virginia; almost carried Maryland, was but lightly defeated in Arkansas and Delaware; and also came well toward equality in North Carolina, in Florida, and in Louisiana. Indeed, it is surprising how light the majority for the Breckinridge ticket was in general through the South, except in Mississippi and Texas. The party gained 39 electoral votes, and 589,581 popular votes. The loyal element in the War was composed largely of this body of voters. It was represented by the West Virginians, who tore away their entire section from the Old Dominion, by the East Tennesseeans, who made it possible to retain that State, by the Kentucky "neutrals," and by others. But the leaders, so far as they retained political vitality, became Democrats on the Reconstruction issue.

Constitution of Matter. See GASES, KINETIC THEORY OF; MATTER; MOLECULAR THEORY.

Consubstantial, kŏn-sŭb-stăn'shal, having the same substance or essence co-essential. When the Arian controversy ran high in the Church, and with the view of settling it, Constantine was induced to summon the general council of Nice in 325, the council pronounced in favor of the Athanasian view that the Second Person of the Trinity is *homoousios* with the Father. To this the corresponding Latin term was consubstantialis. The Greek and Roman Catholic Churches, as well as those of England and Scotland, with the leading Continental Protestant Churches, still adopt this view; thus the second of the Thirty-nine Articles commences, "The Son, which is the Word of the Father, begotten from everlasting of the Father, the very and eternal God and *of one substance with the Father.*" Similarly the Westminster Confession of Faith — the standard

of the proper Presbyterian Churches — teaches that "In the unity of the Godhead there be three persons of one substance." (Ch. ii., § 3.)

Consubstan'tiation, the doctrine that in the Holy Eucharist the real body and blood of Christ are present and are of the same substance with the bread and wine. The doctrine of Transubstantiation is that when the words of consecration are pronounced by the priest, the bread and wine are substantially changed, into the body and blood of Christ, and consequently cease to exist as bread and wine. The doctrine of Consubstantiation, on the contrary, is that after consecration they continue to exist in their original form, but substantially conjoined with the body and blood of Christ.

This doctrine, generally ascribed to John of Paris, as its earliest advocate, has had few, if any, confessors. The term "Consubstantiation" is often incorrectly used to designate Luther's doctrine of the sacramental conjunction with the bread and wine, which is a very different thing from that of the substantial conjunction. Luther taught that the bread and wine are present in the natural, but the body and blood in a supernatural manner. The presence is not "consubstantial"; for while the elements are masticated, swallowed, digested, etc., the body of Christ, according to Luther's teaching, is present only when the element is received by the communicant, as the words of distribution are repeated, and no longer. The presence of the elements is comprehensible, visible, tangible; that of the body and blood incomprehensible, invisible, mysterious, and inexplicable. The belief that the body and blood of Christ can be received in the same way as the bread and wine, the Lutheran Church designates as "Capernaitic-error," as the people of Capernaum, in John vi. 52, seemed to have had such an impression. Consubstantiation is sometimes called Impanation.

Consuelo, kôn-sü-ā-lō, a novel by Amandine Lucile Aurore Dudevant (George Sand), published in 1842. This and its sequel, 'The Countess of Rudolstadt,' issued the following year, form a continuous romantic narrative, of which the first book is the more famous. While not the most characteristic novel, perhaps, of the great French authoress, 'Consuelo' is the best known to general readers. It abounds in picturesque and dramatic scenes and incidents, in glowing romance, in the poetry of music, and the musical life.

Consul, the title given to the two chief magistrates of the ancient Roman republic, and to the three supreme magistrates of the first French republic during the last five years of its existence. In present usage the term indicates an official who resides in a foreign seaport or other commercial centre as the representative of his home government, and who is charged with the protection of his fellow-countrymen and the safeguarding of their interests.

The office of consul was created in Rome about 508 B.C., after the expulsion of the kings. The election to the consulship was annual, and only patricians were eligible until the Licinian laws opened the office to the plebeians.

In the history of France the title of consul appears after the fall of the Directory, when three consuls were appointed. The constitution of 13 Dec. 1799 gave to the first of these magistrates the real power, the others having only an advisory voice in the government. Napoleon Bonaparte became first consul. In 1802 he was confirmed in the consulship for life, and in 1804 he abolished it by the establishment of the empire. The office of consul in the present signification of the term had its origin in the extensive trade relations of the Italian cities of the 12th century.

In 1780 the first United States consul was commissioned. The consular system was established by acts of Congress in 1790 and 1792. The consular posts of the United States are arranged by statute in three classes: (1) Those in which the incumbents receive a fixed salary and are not allowed to transact business; (2) those to which a fixed salary is attached, and business transactions permitted; (3) those in which the incumbents are compensated by fees collected in their offices, and are allowed to transact business. There were in existence, 25 Oct. 1902, 315 consular posts. Among the responsibilities developing upon United States consuls are the regulation of shipping, the issuing of passports, and of certificates of births, deaths, and marriages, the caring for disabled seamen, and the insuring of justice to native-born or naturalized American citizens. Consuls also send reports to the home government concerning foreign trade conditions. In countries where the government is unstable or despotic, American consuls are vested with exceptional powers. They may exercise judicial functions over lawbreakers of their own nationality, such as fining, committing to prison, etc. Special powers and duties of consuls are determined by treaty. Before entering upon his duties a consul must receive an exequatur from the government to which he is accredited. No radical change has been made in the consular service of the United States since its establishment. President Cleveland by executive order in 1895 applied civil service principles to consular posts of a certain class. Of late there has been considerable agitation in favor of reorganizing the system.

Bibliography.— Schuyler, 'American Diplomacy and the Furtherance of Commerce'; Straus, 'Reform in the Consular Service'; Warden, 'Origin, Nature, and Progress of Consular Establishments.'

Consular Service of the United States. The first consul of the United States was appointed 9 Dec. 1780, although the commissioners of the United States in Europe had exercised consular functions in addition to their diplomatic duties prior to that time. Five years afterward Congress declared by a joint resolution that it was expedient that the United States should appoint consuls abroad, and expressly authorized American ministers in Europe to exercise the powers of consuls general in the countries to which they were accredited. The Constitution, adopted in 1787, conferred upon the President the power to nominate, and by and with the advice and consent of the Senate, to appoint consuls. While President Washington in pursuance of the authority given him by the Constitution, appointed a number of consuls and vice consuls, no detailed law regarding consuls was passed until 14 April 1792. That law, which was to carry into effect our consular treaty with France, did not create or even regulate a consular system, but merely recognized its exist-

ence by imposing upon consuls certain specified duties. The act of 1 May 1810 appropriated salaries for the consuls at Algiers, Tangier, Tunis, and Tripoli, which for nearly 30 years were the only consular salaries provided by law. For the most part, the United States, like most other nations, started by appointing unpaid consuls from among American merchants residing abroad, or, if they were sent from America, by permitting them to enter into business as a means of insuring support. Consuls were also allowed to retain as compensation the fees collected for official services performed.

This so-called system was found to work badly for the interests of the government as well as the individual citizen, and as early as 1816, the secretary of state, to whose discretion the administration of the service was left, proposed to Congress to pay fixed salaries to the consuls at more important places, at least. Efforts in this direction were continued from time to time with the object of so providing for the compensation of consuls that they could devote their entire time to their official duties, but nothing was accomplished until 1856, when Congress passed the law in pursuance of which the reorganization of the consular service upon substantially its present basis was effected. The aim of this act was to reduce the service to a regular system somewhat in line with the British consular service by providing for fixed salaries for the principal consuls, prohibiting those consuls from engaging in business, and requiring them to remit to the secretary of the treasury all fees collected by them for performing official services. Since that time, many laws have been passed affecting the consular service, but the greater number of them have been directed to details and have not materially changed the system organized under the act of 1856. During recent years, various attempts have been made to reorganize the consular service by providing fixed salaries for all officers, requiring all fees to be turned into the treasury, and prescribing qualifications for admission to and promotion in the service. All these attempts have so far been unsuccessful. An important step in this direction, however, was taken by President Cleveland in 1895, when he issued an order which is still in effect, requiring the examination, by a board of three persons to be designated by the secretary of state, of applicants for appointment to places in the consular service the salaries of which are more than $1,000 and do not exceed $2,500 a year. The examination is not competitive. Applicants holding, or having held positions under the Department of State of a nature to qualify them for the performance of consular duties are not required to be examined.

Consular officers of the United States are divided into two classes, principal and subordinate. Principal officers are consuls general, consuls, and commercial agents. Subordinate officers are vice consuls general, deputy consuls general, vice consuls, deputy consuls, vice commercial agents, deputy commercial agents, consular agents, and consular clerks. There are also interpreters, marshals of consular courts, and office clerks. Consuls general perform the same duties as consuls, and in addition have general supervision over consuls within the limits of their jurisdiction. Like consuls they are appointed by the President and confirmed by the Senate. Commercial agents have, under the laws of the United States, the same powers and duties as consuls. The title of the office as representing a distinct grade in the consular service is peculiar to the service of the United States, and usage has established the appointment directly by the President, without confirmation by the Senate. It is usual to ask formal recognition and an exequatur for a commercial agent from the government to which he is accredited as in the case of consuls general and consuls. Vice consular officers fill the places and exercise the functions of consuls general, consuls, and commercial agents when those officers are temporarily absent or relieved from duty. They have no powers when the principal officers are present at their posts. Deputy consular officers are subordinate to, and exercise their powers and perform their duties under, the direction of principal officers. Unlike vice consular officers, they perform their functions when their principals are at their posts as well as when they are absent, but they are not authorized to assume responsible charge of the consular office. Consular agents are subordinate to principal consular officers, exercising their powers and performing their duties at ports or places different from those at which their principals are located. Their functions are not in all respects as extensive as those of principal officers, and they are not authorized to correspond with the Department of State. Vice and deputy consular officers and consular agents do not receive commissions, but are given certificates of appointment signed by the secretary of state. There are 13 consular clerks provided for by law. They are appointed by the President, after examination, and can only be removed for cause, stated in writing, which must be submitted to Congress. They are assigned from time to time to consulates with such duties as the secretary of state may direct. Consular officers qualify by taking a prescribed oath, and all except consular agents and consular clerks are required to file a bond to the United States for the faithful performance of their duties. The salaries of consuls general, consuls, and commercial agents range from $5,000 to $1,000 a year. Consuls receiving salaries of $1,000 a year are permitted to engage in business. There are also a number of unsalaried consuls and commercial agents who are permitted to retain as compensation not more than $2,500 a year from the official fees collected by them and to engage in business. Vice and deputy consular officers receive no fixed salaries. Consular agents receive as compensation one half of the official fees collected by them. Consular clerks receive salaries of $1,000 for the first five years' service, after which their salaries are $1,200 a year. All fees for unofficial and notarial work are retained as personal compensation by the officers collecting them. The statement given shows the number of consular officers on 30 November 1903.

The duties of consuls of the United States are varied, and include the shipment, discharge, and relief of seamen of American vessels, adjustment of differences between masters and crews; reclamation of deserters; protection of citizens of the United States; settlement of estates of citizens who may die intestate in foreign countries; issuance of bills of health certifying to the sanitary condition of the cargo,

passengers, and crew of vessels clearing from foreign ports for ports in the United States; issuing and viséing of passports; superintending the disinfection of merchandise exported to the United States from a district in which infectious diseases exist; execution of landing certificates; and certification of invoices of merchandise valued at more than $100 exported to the United States. The latter duty is highly important for the protection of the customs revenue, and makes it necessary for consular officers to examine carefully each invoice before certifying that the prices stated therein are correct. In case the merchandise is found to be undervalued, notice of the fact is sent to the collector of customs at the port in the United States to which the merchandise is destined.

	Salaried	Compensated by Fees	No Compensation	Total
Consuls General	48	.....	.....	48
Consuls	219	34	.....	253
Commercial Agents	9	20	.....	29
*Vice and Deputy Consuls General	.....	.....	30	30
Vice Consuls General	.....	.....	19	19
Deputy Consuls General	.....	.....	13	13
*Vice and Deputy Consuls	.....	.....	132	132
Vice Consuls	.....	.....	105	105
Deputy Consuls	.....	.....	25	25
*Vice and Deputy Commercial Agents	.....	.....	10	10
Vice Commercial Agents	.....	.....	12	12
Deputy Commercial Agents	.....	.....	.....	.....
Consular Agents	.....	385	.....	385
Consular Clerks	13	.....	.....	13
Marshals	10	.....	.....	10
Interpreters	16	.....	.....	16
Total	315	439	346	1,100

*The two offices are usually combined, when practicable.

Consular officers are not permitted to solemnize marriages, but they may, when requested, be official witnesses of the ceremony of marriage where one of the parties is a citizen of the United States. In such cases they give each of the parties a certificate of the marriage, and forward a certificate thereof to the Department of State. Under section 4082 of the Revised Statutes marriages in the presence of a consular officer of the United States in a foreign country, between persons who would be authorized to marry if residing in the District of Columbia, are declared to be valid and to have the same effect as if solemnized in the United States, but the operation of this statute outside of the District of Columbia and the Territories is doubtful.

The exemptions and privileges of consular officers depend largely upon the treaties existing between the United States and the countries to which they are accredited. In the absence of treaties, consuls after receiving their exequaturs are regarded both as officers of the State which appoints and the State which receives them under the special protection of international law. They may claim inviolability of the official property and archives; exemption from military service and service on juries, and the right to place the arms of their government over their doors.

By virtue of treaties and Title XLVII. of the Revised Statutes, consular officers in China, Siam, Turkey, Morocco, Maskat, Persia, Zanzibar, and Tripoli, are invested with judicial powers. In China, Turkey, and Siam, consuls are empowered to arraign and try all citizens of the United States charged with offenses against law, committed in that country, and to sentence offenders. They also have jurisdiction in civil cases between American citizens. In the trial of cases between citizens of the United States and subjects of China or Siam, the consuls of the United States act in conjunction with the Chinese or Siamese officials. In case of disputes between Turkish subjects and citizens of the United States in Turkey, provision is made for the presence of the dragoman of an American consulate at the hearing. The treaties with Persia, Maskat, Morocco, Zanzibar, and Tripoli give consular officers jurisdiction over cases the parties to which are American citizens, and provide for the assistance of consuls in the trial by the foreign tribunal of cases in which one party is a citizen of the United States and the other a subject of the foreign power.

The duties of consular officers with respect to the development of our foreign trade are of comparatively recent origin, but, owing to increased competition among commercial nations, have become of special importance within the past few years. Every consular officer is now expected to have accurate knowledge of the conditions of trade and commerce of the place where he is located, and he is required to keep the Department of State fully informed regarding all matters of interest touching the industries, trade, commerce, and navigation of the country of his official residence. He must be alert and report promptly new markets for American products or manufactures, the construction of public works, changes in transportation rates and facilities, the opening up of new trade routes, changes in economic conditions within his district, improvements of old and development of new industries including inventions or discoveries, development, or decline of commercial and manufacturing centres, projects for great manufacturing or other industrial enterprises, river, and harbor improvements, hygienic, and quarantine measures, fluctuations in rates of wages, changes in tariff legislation, the enactment of patent, trade mark and copyright laws, and legislation preventing the adulteration of food, and all other information of value to the commercial and industrial interests of the United States. The information reported that may be of current interest is printed in a publication known as 'Advance Sheets of Consular Reports,' which has been issued daily since 1 Jan. 1898. The reports are collected at the end of every month and printed in a periodical monthly, 'Consular Reports,' established in 1880. More comprehensive reports are prepared annually under special instructions of the Department of State with the object of presenting a statement of the trade, not only of the United States with the rest of the world, but of the various countries with each other, and these reports are published under the title of 'Commercial Relations.' From time to time, at the suggestion of individuals or firms seeking information as to conditions in foreign countries, special reports are obtained from consuls and are printed in separate form.

The cost of the consular service for the fiscal year ending 30 June 1902, including salaries, allowances, and other expenses, was $1,194,447.53, while the fees collected by consular officers during the year and turned into the treasury amounted to $1,097,475.03, making the actual cost to the government of the entire service for the year, $96,972.50.

The volume known as 'Consular Regulations,' the latest edition of which was published in 1896, contains all the laws, treaties, and regulations which govern consular officers in the performance of their duties.

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Consumers' League, an organization intended "to promote better conditions among the workers" by encouraging the purchase of goods made and sold under proper conditions. The work of the organization is based upon the principle that the purchase of an article tends to create a demand for that article, and that in the stress of modern competition manufacturers and merchants are unable to improve the condition of their employees, while there is a constant demand for cheap goods, "regardless of how cheapness is brought about." The first consumers' league in the United States was organized in New York in 1898; its object was to investigate retail stores and to encourage the patronizing of those conforming to their standard of conditions. They have now a "white list" of over 40 stores in New York, where the league certifies that conditions of employment are satisfactory. The standard for a "fair house" demands: (1) Equal wages for women and men for equal work, wages to be paid by the week; (2) hours from 8 A.M. to 6 P.M., with three quarters of an hour for lunch, overtime to be paid for, and a half-holiday in the summer; (3) retiring and lunch rooms to be separated and regulated according to the sanitary laws; (4) recognition of fidelity and length of service and general considerate treatment; (5) no children under 14 to be employed.

The National Consumers' League was organized in 1898 for the purpose of regulating conditions of manufacture rather than sale. The national organization is a federation of State leagues; the governing body is a council consisting of representatives from the State leagues. The council annually elects a president, two vice-presidents, two secretaries, and a treasurer; and these, with two representatives from each State league, constitute the executive committee of the council. Any person living where there is no local or State league may join the national society by paying a yearly fee. The work of the league has so far been limited to one industry, the manufacture of women's and children's white underwear. The main lines of its work are: enlisting the aid and interest of authorities in the enforcing of labor laws and furthering of necessary legislation; investigating conditions of labor and awarding the use of the league's label to manufacturers conforming to their standard; educating public opinion by lectures, correspondence, and literature. The standard for establishments entitled to the label demands: (1) That all State factory laws be complied with; (2) that the label be used only on goods made on the premises; (3) that no children under 16 be employed; (4) that no person work over 60 hours a week. The national organization embraces 35 leagues in 13 States, and 38 establishments in 11 States are entitled to the use of the label.

Bibliography.— Brooks, 'The Consumers' League'; Brooks, 'Label of the Consumers' League' (in the American Economic Association's Publications, 3d series, Vol. I., 250–8); Kelley, 'Aims of the Consumers' League' (in the 'American Journal of Sociology,' Vol. V., 289); Lowell, 'Consumers' League'; McVey, 'Work and Problems of the Consumers' League' (in the 'American Journal of Sociology,' Vol. VI. 764); and the reports of the National Consumers' League.

Consumption, in political economy, all use or expenditure of the products of industry or of things having an exchangeable value; a term to a large degree interchangeable with "demand." It is usually characterized as productive or unproductive, according as it does or does not conduce to the efficiency of a producer and to further production. Thus wealth in the form of machinery is consumed productively by wear and tear in the possession of production; and, similarly, wealth expended in improving land is productively consumed; but the wealth expended in the maintenance of an operatic artiste is, from the ordinary point of view, unproductively consumed. The classification, however, is not of a very definite kind, the distinction lying for the most part in the degree of directness and obviousness with which the act of consumption is related to production. Hence, in the case of the operatic artiste, it is sometimes urged that the recreative benefit conferred upon the community tends indirectly to increase efficiency in production, and that from this point of view the artiste consumes productively. So the expenditure of wealth in war, or in preparations for war, usually classed as unproductive, may be really productive consumption, as tending to the assurance of the producer in the stability of the commercial conditions.

The perfect characterization of an act of consumption as productive or unproductive involves the consideration of elements of a frequently incommensurable kind, and the rough practical economic test has to be employed with some amount of reservation. Consumption is the end of all production; and as the demand of the consumer determines the employment of the various coefficients of production, land, labor, and capital, it is urged by many later economists that the scientific treatment of economics should proceed from consumption to production, instead of from production to consumption in accordance with the method of the older economics. Too much stress may be laid upon this method, but the consideration of economic problems from the standpoint of the consumer is of advantage,

as giving the social need rather than the producer's profit the prior claim upon the attention. The modern treatment of consumption, however, not only makes it the starting-point in a discussion of economy, but, especially with German authors, attempts to show the relation of the phenomena of consumption with those of production, exchange, and distribution. More particularly there has been a growing tendency to study the question in the concrete, examining the schedules of household expenses, notably those of the laboring classes. What is styled the «new» economy, the ultra-modern system of economic teaching as set forth by the Austrian school and by the American economists, Patten and Clark, is in great part due to the new prominence given to consumption in economic discussion.

Consumption (Lat. «using up,» «destruction»), in medicine, or Phthisis (from Gr. *phthio*, to consume), a disease known by emaciation, debility, cough, hectic fever, and purulent expectoration. The causes which predispose to this disease are very numerous. The following are, however, the most general: hereditary disposition; certain diseases, such as syphilis, scrofula, the typhoid and scarlet fever, and measles; employments exposing particular artificers to dust, or to the fumes of metals or minerals under a confined and unwholesome air; conditions which lower the general nutrition of the body, such as mental depression, overwork or study without proper exercise, exhausting discharges from the bowel, excess in drinking, and in the case of women frequent miscarriage, too frequent confinements, or unduly prolonged suckling. To these must be added climatic influences. A cold, damp climate is provocative of the disease. Moisture of atmosphere and dampness of soil are specially conducive to its attack. A moist, warm atmosphere is also hurtful. Purity of atmosphere is also of the highest importance. It has been clearly shown that the prevalence of lung affections in large cities is directly associated with overcrowding and the diminution of air space and bad ventilation.

Consumption attacks in an infinite variety of ways. But its leading symptoms are cough, sooner or later with expectoration, breathlessness, and progressive emaciation. Such an association of symptoms demands careful investigation as to its cause. The disease has two main types, the acute form, rapid and brief in its course, and the chronic, or more slowly progressive form. To the former the phrase galloping consumption is often applied, to the latter the term decline is not inappropriate.

In the acute form the patient is suddenly attacked with chills, high fever, quickened pulse, and breathing, and much prostration. Symptoms definitely pointing to the lungs may at first be wanting; and the physician may be in doubt as to the true nature of the attack, typhoid fever often beginning in a similar way. Very careful examination may fail to reveal the mischief already begun in the lungs. But soon cough and spit occur, and signs of changes going on in the lungs are discovered. The attack may never lose its acute form, high fever continuing, cough and spit becoming harassing, loss of flesh and strength and increasing difficulty of breathing ending in death by exhaustion in a comparatively brief period. Or the acute attack may abate, improvement set in, and the case become a chronic one, indicated by a persistence of the cough and spit, difficulty or shortness of breath, and sometimes pain over some part of the chest. Sometimes an acute case begins with a hemorrhage.

The chronic type often begins with cough, dry and hacking, specially on lying down at night or in the morning. The breathing is easily flurried, and great languor, with indolence, dejection of spirits, and loss of appetite prevail. In this state the patient frequently continues a considerable length of time, during which he is, however, more readily affected than usual by slight colds; and upon one or other of these occasions the cough becomes more troublesome and severe, and it is at length attended with an expectoration. By degrees the matter which is expectorated becomes more viscid and opaque, being on many occasions streaked with blood. In some cases a more severe degree of hæmoptysis attends, and the patient spits up a considerable quantity of florid, frothy blood. The breathing at length becomes more difficult, and the emaciation and weakness go on increasing. With these there may be pain in some part of the thorax, which, however, is usually felt at first under the sternum, particularly on coughing.

When the disease has advanced considerably its marked symptoms are the persistent cough, with copious expectoration, yellow, and sometimes streaked with blood, severe night sweats, great emaciation, hectic fever, a clubbed appearance of the finger ends, loss of color, the more marked from the bright hectic flush on the cheek, rapid breathing, and pulse. The characters of hectic fever are of the remittent type, that is, the fever at some time of the day rises till it attains a height, then it gradually falls. In consumption the rise begins after noon, and increases till evening, about 8 P.M., when it may reach 104° or thereby. It then gradually falls till 4 or 5 A.M. It is when it is about at its height that the bright pink flush appears on the cheek, contrasting with the general paleness of the skin.

In the last stage of the disease the emaciation is so great that the patient has the appearance of a skeleton; and severe diarrhœa is common. To the end of the disease the senses and intelligence may remain unimpaired. Persons laboring under its most advanced stage often flatter themselves with the thought of a speedy recovery, and form distant projects under that vain hope.

The changes that occur in the lungs are, first, a consolidation, and then a breaking down. The consolidation is due to the formation of tubercles, small gray nodules, consisting of masses of round cells. The irritation caused by the tubercles results in the deposit of inflammatory material, and thus the part of the lung attacked loses its spongy cellular texture, and becomes firm and solid. Later the tubercles soften and break down into matter, carrying with them in their destructive change the substance of the lung in which they have become incorporated. This forms the matter of the expectoration, and with the breaking down and expulsion of the matter cavities or vomicæ are left in the lung. It is surprising how much destruction may thus be wrought in both lungs and yet life be maintained. The upper parts or apices of

the lungs, specially the left, are most frequently the parts attacked.

Consumption, Prevention of. The sole direct cause of tuberculosis of the lungs, commonly called consumption, is the entrance and growth in the lung substance of a particular vegetable micro-organism which is found among the disease-producing bacteria and is named the bacillus tuberculosis. This germ may enter the system in three ways:

1. By inhalation; that is, being breathed into the lungs. This is by far the most frequent way.

2. By ingestion; that is, eaten in tuberculous food, especially milk and beef, or in contaminated articles of diet.

3. By inoculation; that is, through scratches and wounds in the skin.

The indirect causes of consumption are very numerous, for anything that interferes with the normal development or normal vigor of the body renders it more susceptible to the disease.

To prevent consumption it is necessary (*a*) to establish and maintain the body in such health that it will be invulnerable to attack by the bacillus tuberculosis; or (*b*) to hinder the entrance of the germ.

Rarely are infants born with consumption. Many children, however, have an inherited predisposition; but if brought up under favorable circumstances and with proper oversight they may entirely escape the disease. In the young any pathological condition of the air-passages that impedes free breathing, such as adenoids or enlarged tonsils, should be remedied, and every obstruction to natural, healthy growth should be removed.

Any influence that lowers the vitality is a predisposing cause: for example, the acute infectious diseases, especially measles, whooping-cough and epidemic influenza; and diseases of the respiratory system, such as pleurisy, pneumonia, and bronchitis. Exhausting maladies, typhoid fever and the like, are ofttimes followed by tuberculosis of the lungs. Hence, after any of these, full restoration to health should be sought. Likewise in chronic inflammations of the heart, liver, or kidneys and in similar debilitating diseases, consumption frequently supervenes, and in all such disorders endeavor should be made to preserve the general health.

Those who live in wet and ill-drained districts, or in unsanitary surroundings, breathe an impure atmosphere, neglect personal cleanliness, have insufficient food or food of poor quality and badly cooked, suffer from exposure or indulge in excesses, are prone to acquire consumption. So also are those who work in ill-kept and imperfectly ventilated factories, shops, and stores, or whose work is injurious, in a dusty atmosphere, as in coal-mining; amid irritating vapors, as in match-making; in hurtful attitudes, as in shoe-cobbling; or at work that puts special stress upon the lungs, as in glass-blowing. Therefore all measures that better the hygienic state of the people and improve their mode of living are aids in preventing consumption.

Residence in an invigorating climate and in a wholesome environment; plenty of fresh air, indoors and outdoors, both day and night, with a maximum of sunshine; an abundance of nutritious food, and a well-ordered, temperate life, will do much to upbuild the human organism and fortify it against the invasion of the bacillus tuberculosis.

The bacillus is easily demonstrated under the microscope. Examined at different stages of their life history, these bacilli are found to exist in two forms: In the first, or active state, they appear as rod-shaped bodies; these rods increase in size and reproduce themselves, their multiplication being remarkably profuse under advantageous conditions. In the second, if unfavorably situated, they tend to dry up and form small rounded bodies called spores. Bacilli themselves are killed by comparatively simple means, whereas spores are much more tenacious of life.

From the lungs of a consumptive bacilli and spores may be cast off in very large numbers, amounting in some cases to 2,000,000,000 or 3,000,000,000 in 24 hours. The vast majority of such germs perish,— most quickly if exposed to sunshine; but it is possible for some immediately to enter the bodies of men or animals and produce centres of disease; or spores may float about for days and even for weeks in the dust of streets or rooms, ready to blossom forth in a congenial "soil" such as animal tissues.

The spread of consumption is almost exclusively due to communication of the disease from person to person through inhalation of the tubercle bacilli, and the problem of prevention is mainly that of destroying the bacilli wherever they are present, and of limiting their numbers in the air. For this reason a person who is consumptive should observe a few reasonable measures of precaution, both for his own sake and for the sake of others. If his occupation is such that he handles foodstuffs, or if he handles certain articles of use and wear, as a cigar-maker or clothing-maker, he should change his work. He should exercise great care as to cleanliness. His body- and bed-clothing, and particularly his handkerchiefs, should be washed apart and purified by boiling. He should use separate dishes and table furnishings. He should have his own bed, and preferably his own room. Rugs, not carpets, should be on the floor, and dust should be taken up with a moist mop. Above all else he should not expectorate carelessly. In the house he may use a mug or spittoon containing a little water, and at other times a pocket spittoon. In any event all expectorated matter should be boiled or burned, and the vessel carefully disinfected. Provision should be made not only for a cough accompanied by expectoration, but also for the so-called dry cough, and a handkerchief, paper napkin, or moistened cloth should be held before the face, else particles of germ-laden moisture will be sprayed on clothing, bedding, or floor. "The consumptive is himself almost harmless, and only becomes harmful through bad habits."

It is also important to avoid infected or contaminated food and drink. Tuberculosis attacks some animals, chiefly bovines. The milk from tuberculous cows, especially those with diseased udders, should not be used. Beef from infected cattle is undesirable, although cooking may render such meat innocuous. In some states dairy herds are regularly inspected,

and to suspected animals a test is administered. Those found diseased are killed, and the owner is compensated. This should be the universal practice. Finally, since consumption is most prevalent in centres of population, the rule should be adopted in cities and towns that all cases be reported by physicians to the health department, and all sufferers be instructed in methods that prevent spread of the disease.

ADDISON W. BAIRD, M.D.

Con'tact, in astronomy, a word used in describing eclipses of the sun and moon, and also the transits of the inferior planets. In a solar eclipse contact takes place at the instant when the limbs of the sun and moon just touch each other either exteriorly or interiorly; in a lunar eclipse, when the shadow of the earth just touches the limb of the moon; and in the case of a transit of Venus or Mercury, when the limb of the planet just touches the sun's limb either exteriorly or interiorly. The instant of interior contact and of exterior contact are distinguished by these names.

Con'tact Action. A mixture of hydrogen and oxygen gases can be kept for any length of time without change, but if a piece of spongy platinum be introduced into the mixture in a very short time the gases combine with explosion. The platinum, which is found unchanged, is said to have acted by its presence or by contact, and the cause was ascribed to a peculiar force called by Berzelius "catalytic," the whole phenomenon being denoted by the term catalysis. There are many other examples of bodies inducing combination or decomposition without themselves apparently altering, but extended study of the whole subject renders it probable that in some cases the neutrality is only in appearance, the catalytic body really undergoing successive combination and decomposition, while in others, as in that given above, a modification of the physical circumstances is produced sufficient to determine the chemical change. There is no necessity, therefore, for assuming the existence of a peculiar force, though in individual instances it may not be at once obvious to what cause the effect is to be ascribed.

Contagion (Latin, *contagio*, from *contingo*, to meet or touch). The word Contagion in its strictest and narrowest sense, imports the communication of disease through the medium of touch, as in ringworm or syphilis. It is also applied to the action of those very minute particles which proceed from persons laboring under certain diseases, and which communicate these diseases without contact. Such minute particles are now usually regarded as distinct organisms or germs, probably of the nature of plants. The diseases so familiar in malarial districts, intermittent and remittent fevers, have been generally regarded as similarly communicated (but see MALARIA). The contagious virus of the plague, smallpox, measles, scarlet fever, and certain other diseases operates to a much more limited distance through the medium of the atmosphere than the miasmata of malarious districts. Breathing the air immediately surrounding a diseased person is said to be necessary for the communication of plague; and approach within two or three yards of him for that of typhus. The Walcheren miasmata are said to have extended their influence to vessels riding at anchor fully a quarter of a mile from shore. When disease is communicated through the atmosphere, infection is the most proper word to employ, though the terms infection and contagion are not employed with any great precision.

The character and nature of all these poisonous effluvia are little understood. They undoubtedly consist, however, in every individual case, of a specific virus; in some cases this is demonstrated to be a minute organism, and, most probably, there is always an organism which is capable of propagating itself where it finds a proper nidus. (See GERM THEORY.) Antiseptics are substances which arrest the growth of the germs of the disease. A good example of an antiseptic is carbolic acid in weak solutions. The purpose of a disinfectant is to destroy the matter of contagion. The disinfectants commonly used are carbolic acid, chloride of lime, Condy's fluid (a solution in water of permanganate of potash), sulphurous acid, obtained from burning sulphur, Burnet's fluid (a solution of chloride of zinc), sulphate of copper (blue vitriol) dissolved in water, and sulphate of iron (copperas), sulphuric acid (oil of vitriol), and hydrochloric acid (spirit of salt).

The diseases arising from miasmata are of a different class from those arising otherwise, since they are not communicated by one person to another. The disease communicated by diseased persons is usually so communicated by the product of the disease itself; for instance, by the matter of the smallpox; and therefore many of these diseases are infectious (or contagious) only when they have already produced such matter, but not in their earlier periods. In some of them actual contact with the diseased person is necessary for infection, as is the case with the itch, syphilis, hydrophobia, ringworm, etc.; in other diseases even the air seems to convey the infection, as in scarlet fever, measles, etc. The infectious matter of smallpox and scarlet fever may remain attached to clothing for a long time.

A real infection requires always a certain susceptibility of the healthy individual; and many infectious maladies destroy forever this susceptibility of the same contagion in the individual, and accordingly, attack a person only once, as the smallpox, measles, etc. Other contagious diseases do not produce this effect, and may therefore repeatedly attack the same person, as typhus, itch, syphilis, and others. Sometimes one contagious disease destroys the susceptibility for another, as the cowpox for the smallpox. In general, those parts of the body which are covered with the most delicate skin are most susceptible of contagion; and still more so are wounded parts deprived of the epidermis. Against those contagious diseases which are infectious through the medium of the air, precautions may be taken by keeping at the greatest possible distance from the sick, by cleanliness and fearlessness; but most completely by the vigilance of the health officers, by fumigations, according to the prescriptions of Guyton-Morveau, etc. Greater security against such contagious diseases as are infectious only in case of contact, can be obtained by means of cleanliness and caution in the use of tobacco pipes, wind-instruments, beds, clothing, and vessels for eating and drinking. No general preservative against contagious diseases is known,

though many are offered for sale by quacks. The examination of the persons intended for nurses and tenders of infants is very necessary, as thousands of children may be infected by contact with them, and the cause of the disorder remain unknown. See EPIDEMIC; MALARIA; etc.

Contarini, kŏn-tä-rē'nē, the name of a noble family of Venice. The most important members were DOMENICO, dō-mā'nē-kō, doge of Venice from 1043 to 1071 or 1073. He rebuilt Grado, and reduced the city of Zara, which had revolted. JACOPO, yä'kō-pō, doge from 1075 to 1080. Under his reign the Venetians forced the city of Ancona to acknowledge their sovereignty over the Adriatic Sea. ANDREA, än-drā'ä, doge from 1367 to 1382. The Genoese, under Pietro Doria, had conquered Chiozza in 1379, and threatened even Venice. Andrea Contarini reconquered Chiozza, captured the Genoese fleet, and delivered the republic from its enemies (1380). FRANCESCO, frän-chĕs'kō, doge from 1623 to 1625. Under him Venice, in alliance with Louis XIII. of France, the Duke of Savoy, and the Protestant cantons of Switzerland, reconquered the Pays de Vaud in 1624, which the Austrians had taken possession of. CARLO, doge from 1655 to 1656. Under his reign Lazaro Mocenigo, admiral of the republic, in June 1655, gained a brilliant victory over the Turks in the Dardanelles. DOMENICO, doge from 1659 to 1674. During his government Venice resisted for five years the attacks of the Turks on the island of Candia; but on 26 Sept. 1667, after a siege and defense of unexampled obstinacy, Francesco Morosini surrendered the island. AMBROGIO, äm-brō'jō, from 1473 to 1477, was ambassador of the republic at the court of the king of Persia, Usun Kassan. The interesting description of his residence at this court first appeared at Venice in 1487, in Italian. GASPARO, negotiated a permanent peace between the republic and Charles V. in 1529. Pope Paul III. conferred on him the cardinal's hat in 1535. In 1541 he was papal legate at the Diet of Ratisbon, where he distinguished himself by his moderation. After his return he was sent as legate to Bologna, where he died in 1542. GIOVANNI, jō-vän'nē: b. Venice 1549; d. 1605; was one of the most distinguished painters of his age. He worked in the style of Titian, and was particularly skilful in painting ceilings; for example, his 'Resurrection' in the church of St. Francesco di Paolo, in Venice. VINCENZO, vēn-chĕn'zō: b. Venice 1577; d. 1617; a scholar whose reputation was in early life so great that the magistrates of Padua established a new chair of Latin and Greek eloquence only to retain the learned youth of 26 years of age in their city. He lectured there until 1614.

Conte, Nicolas Jacques, nĭk-ō-lä zhäk kôńt, French inventor: b. Saint Cenery, near Seez, 4 Aug. 1755; d. Paris 6 Dec. 1805. After several successful experiments in the use of the balloon for military purposes he was made director of the French aërostatic institute, and chief of the aërostatic corps of the army. He also invented a substance for the manufacture of lead pencils, now universally used. He accompanied the French army at the time of Napoleon's expedition to Egypt, and erected works in Cairo for the manufacture of arms, ammunition, and other necessaries for the army.

Contemporane'ity. Formerly strata found partly with identical, partly with allied fossils, were held to be exactly contemporary, though widely separated on the earth's surface; now the same facts are used to establish the contrary conclusion. If each species came into existence at a certain spot on the earth's surface, from which it gradually spread in various directions, it cannot have reached a remote region till some considerable time after its birth. Two strata, then, widely separated in the world, containing some species common to both, are contemporaneous in this sense, that they were formed while that species lived; but the stratum near its birthplace is older than the one to which it spread after it had already multiplied greatly and rooted itself successively in all the intervening regions, wherever a place appropriate for its habitation could be found.

Contempt, a wilful disregard or disobedience of a public authority. The Constitution of the United States provides that each House of Congress may determine the rules of its proceedings, punish its members for disorderly behavior, and, with the concurrence of two thirds expel a member. The same provision is substantially contained in the constitutions of the several States. The power of making rules carries with it that of enforcing them, and the power to attach persons who violate them, and to punish them for contempts. Courts of justice have an inherent power to punish all persons for contempt of their rules and orders, for disobedience of their process, and for disturbing them in their proceedings.

Content' and **Non'content,** words by which assent and dissent are expressed in the British House of Lords. Aye and No are used in the House of Commons, Aye and Nay generally in American deliberative bodies.

Conti, kôń-tē, the name of a distinguished French family, a branch of the Bourbon house of Condé, deriving its title from the small town of Conti near Amiens, in Department Somme. It sprang from Armand de Bourbon, Prince of Conti, brother of the great Condé (b. 1629; d. 1666). He took an active part in the troubles of the Fronde both for and against the court, and married the niece of Mazarin. His son, François Louis (b. 1664; d. 1709) was brought up under the eyes of the great Condé, served with distinction under the Duke of Luxembourg, and was elected king of Poland by a number of the magnates, but declined the honor. The last of the house of Conti was Louis François Joseph, b. 1734; d. 1814.

Conti, Antonio Schinella, än-tō'nē-ō skē nĕl'lä kŏn'tē, Italian mathematician: b. Padua 1677; d. there 1749. He gave up the clerical profession, because he disliked to hear confessions. He visited Paris, and in 1715 London, where he was elected a member of the Royal Society on the proposal of Newton. Here he became involved in the controversy between Newton and Leibnitz, and by attempting to avoid displeasing either of them dissatisfied both. He lived mostly in Venice, entirely devoted to his literary occupations, which included poetry.

Con'tinent. A definition of continent based on the origin and development of land masses is not possible in the present state of our know-

ledge, and about all that can be done is to define a continent as a very large body of land. North America, South America, Europe, Asia, and Australia are such land areas, but since Europe and Asia form a single land mass, many physical geographers speak of the two as one continent — Eurasia. There is also probably a land area of continental size in the Antarctic regions.

Origin of Continents.—The solid earth, the lithosphere, is largely covered by water, the hydrosphere; the proportion of land to water on the surface of the globe being about 1 to 2.63, making the land surface about 27.5 per cent of the total. The extreme height of the land above sea-level is about five miles (Mt. Everest 29,000 feet), and the extreme depth of the ocean somewhat more; the extreme relief of the lithosphere is therefore over 10 miles. According to Lapparent the mean elevation of the continents is as follows: Europe 958 feet; Australia 1,118 feet; South America 1,702 feet; North America 1,953 feet; Africa 2,007 feet; Asia 2,883 feet. The mean height of all land is estimated at a little over 2,000 feet, and the mean depth of the ocean at 12,000 to 15,000 feet. Therefore if the solid earth, the lithosphere, were free from inequalities, the hydrosphere would cover it, perhaps to a depth of over two miles. Inequalities of surface have, however, existed since the earliest geological time of which we have knowledge. The oldest rock formations show traces of sedimentary origin, and therefore represent in part the waste of land areas from the action of streams and the waves of the ocean. So far as North America is concerned the position of the continent had been determined in Archæan time. What determined the position of this and other continents is, however, still an unsolved problem, though there are several theories, each with some show of reasonableness.

The generally accepted theory is that when the crust of the molten earth had solidified and cooled enough to allow the condensation of aqueous vapor, it cooled and contracted unequally, some parts cooling and contracting toward the centre more rapidly than others. Thus were formed areas of depression and elevation, the seas filling the former, and the higher parts of the latter projecting above the water as land. The water would hasten cooling under the depressions, and thus the general tendency would be to increase the area and elevation of the land and increase the depth, but decrease the area of the sea.

Distribution and Form of Continents.—The distribution and form of continents show some curious features, and on these features theories of the origin of continents have been based. North and South America, for instance, are roughly triangular in shape, with the apex of the triangle at the south. Eurasia and Africa together form another roughly triangular land area tapering to the south, the Cape of Good Hope being the apex of the triangle. Owing to the lands tapering to the south, the northern hemisphere contains more land than the southern, and it is possible to divide the globe, by taking a north pole in the English channel, into two hemispheres, one nearly all land, and the other nearly all water.

Continents consist typically of a great interior basin bordered by mountain ranges, this form being shown by the continents of somewhat regular outline, the irregular Eurasian continent being an exception. In each continent the greatest mountain system faces the greatest ocean. In North and South America these mountains are on the west, facing the Pacific, with the smaller Appalachian Mountains, the Venezuelan Mountains, and Brazilian highlands facing the Atlantic. In Africa the greatest range is on the east, facing the Indian Ocean, in Australia the greatest range faces the Pacific, and in Asia the Himalayas face the Indian Ocean. Omitting the mountains of Eurasia, the mountain chains of the world have a northwest-southeast or northeast-southwest direction, and on this account the continents taper toward the south.

From the base of the mountains to the sea is a gentle slope or plain, and this plain extends frequently some distance beyond the shore, forming a continental platform or shelf. The outer edge of this platform is usually at a depth of about 100 fathoms (600 feet) when the bottom slopes rather sharply — forming the continental slope — to the depths of the ocean. Off the coast of New Jersey the 100-fathom line is 110 miles from shore, while on the coast of California it is only about 10 miles from shore. Great Britain stands on such a shelf and is really part of the continent of Europe. In the same way the East India islands to Celebes are part of Asia. New Zealand may be considered part of Australia.

Permanency of Continents.— It is one of the commonplaces of geology that the lands are continually changing; by weathering, by rivers, and by the waves of the ocean the rocks are worn away and spread out as sediments on the sea floor. In some parts of the world the land is apparently rising, in others sinking. The northern coast of Norway is rising five feet in 100 years, the coast of New Jersey and parts of the New England coast are sinking. At Boston the rate is about one foot in 100 years, and on the New Jersey coast two feet. Yet geologists, while admitting the instability of the lands, differ as to the permanency of continents. Lyell believed that neither continents nor oceans — so far as any particular part of the earth is concerned — are permanent. His views have been opposed by later geologists, who have thought that while continents may change form, certain parts of the earth have always been covered by oceans, while others have not; the Atlantic and Pacific, for instance, were always oceans, while the continents, even if at times partly covered with water, have always been uplifts in the sea floor.

Two objections to this view may be cited. In the first place, chalk beds, which are believed to be deep-sea deposits corresponding to the globigerine ooze that covers much of the ocean floor, are found in the interior of continents; in the second place, the study of fossils has shown that at times in past ages continents now separated by oceans had essentially the same fauna and flora. The evidence of deep-sea deposits shows that in Cretaceous time a deep sea covered much of Mexico and parts of Texas, New Mexico, Arkansas, and Kansas, while another, or perhaps the same wide, deep sea covered southern Europe and northern Africa and extended across Asia to the Pacific. In Cretaceous time, therefore, the continental land masses did not have their present form

and arrangement, and theories as to the origin of continents based upon present land forms are at best of doubtful value. The evidence of fossils indicates that in Permian time the Antarctic land mass was of far greater extent than now, and joined South Africa, Patagonia, and Australia. Again in Cretaceous time the evidence indicates that Brazil, south central Africa, Madagascar, and India were connected by land masses, so that the Atlantic and Indian oceans had not at all their present shape. There is some reason for believing that no longer ago than the beginning of the Glacial Period the Arctic lands were of far greater extent than now, Asia, North America, and Europe being connected. Thus, while it is fair to assume that the position of the continents was determined ages ago, there is nothing permanent about their forms or the present distribution of land and water on the earth.

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See also GEOGRAPHY; GEOLOGY.

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Continental Congress. See CONGRESS, CONTINENTAL.

Continental Money. The colonies at the time of the Revolution believed undoubtingly in paper money as real wealth. The foremost native leaders, like Franklin, declared that since money has value only from opinion, an opinion that paper is good has the same effect as one that gold is good; and later a member of the Continental Congress asked why the people should be taxed, when a cartload of money could be got at the printing-office. Few deeds of the British government excited more indignation than its prohibition of colonial paper issues in 1763; and when it was repealed in 1773 full advantage was taken of it. The colonies issued notes for military and other expenses of the coming conflict; and when the Revolution broke out, the New York Provincial Congress advised the Continental Congress to do likewise. That body was not only like-minded, but had no other means of raising money, lacking power to tax. On 23 June 1775 it issued bills for $2,000,000, on 17 July for $1,000,000, and on 29 November for $3,000,000. During 1776 it issued $19,000,000 more. The "opinion" that the redeemability of these bills was dubious had begun to show itself almost at once; and by the middle of 1776 the premium on specie was fully 135. This varied in different spots, according to patriotic feeling, and at different times, according to the fortunes of the cause; but even in Massachusetts it was strongly felt. As always, the depreciation was at first denied, and the rise in prices and reluctance to take the paper ascribed all through to everything but over-issue and bad security — mainly to speculation and want of patriotism. The usual laws were passed to force it on all who had goods to give in exchange, objectors being proclaimed "enemies of their country," which meant always plunder and frequently tar and feathers. Raising prices from a previous basis, or demanding payment in kind instead of money, constituted enmity to the country. Washington was given power by Congress to arrest all who "maligned the public credit"; local magistrates and local mobs took in hand all who refused to yield up goods for money which would buy much less goods; and at the beginning of 1777 Congress seconded their efforts with legislation. It resolved that the bills ought to be equal to Spanish dollars; that whoever asked, offered, or received more for goods in them than in any other kind of money, ought to be deemed an enemy and forefeit the goods; that the States were recommended to pass laws to that effect, and make the bills legal tender, extinguishing the debt if refused; and that debts payable in sterling money should be discharged in continental bills at 4s, 6d. to the dollar. The States were not loath to comply. Price conventions were held in some of them in 1777–8, which regulated the price of goods and labor, with severe penalties for violation, ordinances against forestallers and engrossers (that is, all who had goods and would not give them up for paper), etc. All these measures had the inevitable effect of increasing scarcity by making it not worth while for merchants to lay in stocks, and increasing depreciation by making prices include insurance for plunder, violence, and further depreciation.

In the middle of 1777 Congress tried the more sensible plan of stopping the issue of bills and trying to float a loan at interest; but it was unsuccessful and the notes were resumed. By the middle of 1778 the total had risen to over $60,000,000, and the depreciation was demoralizing the military service: the soldiers' pay was next to nothing, enlistments were almost impossible to get, and many of the officers resigned their commissions. The actual depreciation had become fully eight to one (though Congress in March established it at only 1¼), and was entirely impossible to calculate from week to week. In that year $63,000,000 was issued, making a gross total of $101,000,000, probably $90,000,000 out. Some of it was constantly coming back into the hands of government as payment of its requisitions on the colonies, and a little of it had been redeemed in interest-bearing loan certificates, but these acted as a preferred currency, and still further pulled down the continental bills, as did the excessive issues of State paper. By this time the British justly concluded that our "rag money" was doing us more harm than their armies could, and bent their efforts to increasing the quantity of it. They counterfeited it in large quantities and put it into circulation, aided by natives in the same profession. Congress felt compelled to withdraw two entire issues, but found it not easy to do; and in 1779 it launched on a wild and desperate debauch of the bills, which finally cured the evil by annihilating their value and forcing us to crawl out through the bottom. In January it issued $50,000,000 at a stroke, "on the faith of the United States," redeemable in 1797 — an 18 years' loan without interest, on what then appeared to be phantom security. By June it had issued $35,000,000 more, making $186,000,000, of which it was estimated that $160,000,000 was actually in circulation. The value had now sunk to an acknowledged five cents on the dollar, but, as the real depreciation was always grossly underestimated and postdated, probably not more than half of that in practice. Legitimate trade was mostly ruined, and honest merchants

driven out of business; hardly any one could make money in this welter of speculative values incessantly dropping, except men of alert perceptions and accommodating consciences. But the worse the situation grew, the more fiercely the people and their representatives, except a few superior intellects, refused to be disillusioned, and the more passionately they assailed the imaginary authors of their evils. On 1 Sept. 1779, however, Congress resolved that it would not have over $200,000,000 in circulation, and would not emit the lacking $40,000,000 if it could be avoided. But in a public address they say, with a curious anticipation of modern speech, that paper money is the best and safest kind, because it is the only one that stays with us, and is "always ready and at hand." This was true: it was in no danger of leaving the country. By the end of 1779 it had dropped down to an acknowledged two and a half cents and about a cent in reality, on the dollar. It had in fact reached the spot where any one would give whatever he had of it for any material goods he wished; there was no real and stable value, not even a very small one.

On 18 March 1780 Congress passed an act which was in effect notice that the old bills could never be paid. It was a favorite colonial scheme, when paper money had fallen to a hopeless pit of depreciation, to issue bills of "new tenor" without withdrawing the old. Under the new plan, the bills which were received from the States on the requisitions for $15,000,000 a month were not to be reissued, but replaced by "new tenor" bills for one twentieth the amount, drawing 5 per cent interest, and redeemable in six years; struck for each State in proportion to its monthly quota, and payable by it, but indorsed by the United States; six tenths of the issue to be given to the State treasuries and the remainder held by Congress; the States to provide sinking funds to redeem them at the end of the term. As to the old bills, they would be received at 40 for 1, in liquidation of commissaries' certificates; but the States were advised to repeal the laws forcing bills on any one at a fixed scale. On 26 May it was resolved that these certificates should be received at face value in payment of continental taxes, which was by so much a further inflation. The new-tenor scheme was a partial failure in volume, and still more in quality. Massachusetts, New Hampshire, and Rhode Island took up all their old tenor bills and replaced them by new tenor; New York, New Jersey, Maryland, and Virginia took up part; the rest none. In all, $88,000,000 of old were replaced by $4,400,000 of new; but probably over $100,000,000 remained out. Within a few months, however, the new-tenor had sunk to four for one; and of course the old bills, thus abandoned, became nothing but a speculative hope worth investing a few dollars for a great mass of, as a "flyer"—they had not been formally abandoned, and might yet be paid at a scale. Also, until specie was obtained, even bad currency was something to use. In July 1780 they were officially estimated at 64½ to one, which meant about 200 to 1 in fact. On 16 March 1781 Congress gave up all attempts at issuing paper of any tenor, having put out altogether slightly over $242,000,000. (The figures of $350,000,000 and upward count in reissues.) It made all debts payable only at current exchange between specie and paper currency, and again recommended the States to amend their tender laws likewise. This was the end of paper currency in that period. The French loans had furnished a moderate stock of gold and silver, and business necessities no longer demanded it. On 1 May the Pennsylvania Council officially rated it at 175 to 1; which the public translated as 500, and gave up the notes as old paper. There was a public celebration of the obsequies in Philadelphia: a barber-shop was papered with it; a dog was tarred, stuck over with the notes, and led through the streets; and men wore cockades of the money in their hats. In Rhode Island there was a mock burial of it. The poor men loaded with it, and those who had invested their savings in it, did not share in the rejoicing. For some reason also, it circulated some months longer in the South than the North, though on 1 August it was rating at 500 to 1 in Virginia. The soldiers in the camps had clubbed together and refused to accept it. The State paper currencies went down in the same way, though not quite so hopelessly: in Virginia the Continental money in 1778 was worth 2,400 to 1 as a chance, while Virginia paper was 40 to 1. The entire amount of still outstanding Continental bills was about $78,000,000 in 1791; in 1843 the amount never redeemed was stated at $73,000,000.

Consult Sumner, 'History of American Currency' (1874); 'The Financier and the Finances of the American Revolution,' Vol. I. (1891; Hildreth, 'History of the United States,' Vol. III. (1849).

Continental Navy. During the summer and fall of 1775, the British attempts to subdue resistance in the colonies on land was supplemented by harrying their shipping and coasts by sea. Several merchant vessels were made prizes in violation of law. Gloucester was fired on, and Bristol bombarded to obtain provisions. Most of the colonies equipped armed vessels for themselves, and commissioned privateers. On 5 October news came that two British transports were on the way to Quebec with military stores; and as our armies needed these worse than the British, Congress on the 13th appointed a board of three (Silas Deane, John Adams — afterward replaced by Christopher Gadsden — and John Langdon) to fit out two swift armed vessels and intercept these or any other store-ships. This board was the Navy Department of the Revolution for a time; it was turned into a marine committee, marine board, etc., with under boards called the Continental Naval Board, Board of Admiralty, etc. On 18 October Falmouth (now Portland) was bombarded and set on fire; and on the 30th two more and heavier vessels were authorized. The naval committee was doubled and made general managers of naval matters, subject to final decision by Congress, which appointed the officers down to third lieutenant — the "patronage" question being as burning here as in the Continental army. The beginnings of the American navy were curiously inauspicious for a nation of skilful and daring seamen, and for a body with so brilliant a subsequent record. The officers were largely incompetent, and the men mutinous. A brilliant exception was Capt. Manly of the schooner Lee, who captured several prizes, including a brig loaded with heavy guns, mortars, and tools.

Finally, on 25 Nov. 1775, Congress gave up the grisly pretense of being at loyal peace with Great Britain, and declared all ships of war employed against the colonies, and all supply tenders for them, lawful prize; authorized privateering and colonial courts to try prizes; adopted rules and regulations for a Continental navy; and on 13 December directed the marine committee to built and fit out five 32-gun frigates, five 28's, and three 24's, by April next. These were estimated to cost $866,666.66, and were to be built at the leading colonial ports from Portsmouth to Baltimore, and elsewhere (Norfolk, Charleston, etc.), if thought advisable. Other vessels might be bought and equipped. On 22 December Esek Hopkins was made commander-in-chief. Among the first lieutenants was John Paul Jones. On 9 November two battalions of marines were authorized. By January eight cruisers had been collected at Philadelphia, and Commodore Hopkins started on a cruise, but was detained six weeks by the ice, and only got clear 17 February. He had been instructed to "annoy the enemy's ships upon the coasts of the Southern States"; but finding nothing of Dunmore's squadron, sailed to New Providence in the Bahamas, where a quantity of British military supplies were stored, stormed the place, and carried off a quantity of stores and 80 cannon, besides the governor and some leading citizens as hostages. On his return he fell in with some armed vessels, which he captured, and the 20-gun frigate Glasgow, which, after a spirited fight, escaped. Congress held an inquiry into Hopkins' conduct in June, decided that he had exceeded his instructions, censured him, and finally dismissed him. This did not encourage enterprise, and naval service became unpopular. No new naval commander was appointed, the President afterward being given that rank. The vessels, however, did some clever work, and captured many prizes; but the greater part of this service was accomplished by privateers. At the time of the Declaration of Independence our navy consisted of six regularly built war vessels and 19 merchantmen with naval armament, the whole with 422 guns. Against this the British had 78 men-of-war, with 2,078 guns.

Next to the Bonhomme Richard's fight, the most creditable naval engagement of the war was Benedict Arnold's battle on Lake Champlain (see LAKE CHAMPLAIN, BATTLE OF). The importance of the naval battles on this inland lake is hardly realizable now; but till the time of railroads the lake was the one route for a large invading expedition between Canada and New York or New England, enabling supplies to be transported where otherwise the mountains or the forests would have made it impracticable. The English had 29 vessels with 89 guns; four longboats with stores; 697 men of the regular navy; and Indian allies. Arnold had 15 vastly inferior vessels, with 88 lighter guns, and about 750 men ignorant of naval service. Several of Arnold's vessels had to be abandoned and destroyed; two were captured; but several were saved in spots the English could not reach, by Arnold's heroic risk of himself. The British loss was about 40, the American about 80. But the battle lost the British the campaign; the struggle had been so severe that Sir Guy Carleton, the commander, did not venture to assail Ticonderoga, and shortly after retired to winter quarters.

The most famous work done by the navy, however, resulted from commerce-destroying in British waters. Our fleets were nearly as much masters of the English Channel as the English were at the time of the Armada, though we never had more than three or four ships there at a time; for the English could not protect their own commerce. No other enemy ever disturbed the marine insurance rates, not even France across the channel; but in a short time now they rose to prohibitive rates, and the companies even refused to insure English bottoms at any premium, so that the Thames was crowded with French vessels. The alarm and fury of the English were shown not only in the execrations of "pirate" which they lavished on the lawfully commissioned war vessels and their captains and crews, and in the barbarous misusage of the latter with which they revenged themselves when they captured any, but in the abiding hereditary tradition of their writers: they then invented false accounts of John Paul Jones (q.v.), and still term him a "notorious pirate," although he was no more a pirate than Nelson, and much less than Rodney, who even turned pirate on his own people. In 1776–7 the Lexington was engaged in this work, and in 1778 was joined by the Reprisal; but the former was finally captured and the latter foundered. The Surprise was then secretly bought from England and fitted out at Dunkirk; but on her beginning to make captures the English government forced the French by threats to give her up. The Revenge was then bought, and became even more successful. But the most magnificent success was won by Jones (see BONHOMME RICHARD), in 1778–9. In the former year he closed a wonderfully successful 28 days' cruise — from 10 April to 8 May — by capturing a more powerful vessel than his own (see RANGER AND DRAKE, ACTION OF). In the latter the marvelous engagement of the Bonhomme Richard with the Serapis, the most creditable naval victory of the world, dwarfs all else.

Meantime Congress had ordered the construction of three 74-gun men-of-war, five large frigates, and one or two smaller vessels; but as money ran short, they were never finished. At the end of 1778 the navy consisted of four 32-gun ships, two 28's, one 24, one 20, three 18's, one 12, and one 10 — 14 in all, with 332 guns; while England had on the American coast 89 ships with 2,576 guns. In 1779 the most notable events were the capture on 7 May of seven transports with about 50 guns and some 300 men, by a Boston squadron under Capt. J. B. Hopkins, son of the ex-commodore; that of eight prizes worth over $1,000,000, in July; that in August, by two Continental vessels on a short cruise, of six prizes with 54 guns; and on 7 May, the same day as the first, a most bloody and desperate action of an hour between two 12-gun brigs, the United States Providence and the British Diligent, in which the latter lost 8 killed and 19 wounded out of a crew of 53, or over half. In 1779 and 1780 Capt. John F. Williams won two brilliant victories in 14-gun and 18-gun Massachusetts State vessels. But on 13 Aug. 1779 a heavy disaster befell the waning little Continental navy. Three vessels, a 32, a 14, and a 12, accompanied a fleet of Massachusetts privateers to dislodge the English from a fort

near the mouth of the Penobscot; but, seven English war-ships coming up to reinforce the three already there, the privateers fled, and the Continental vessels had to be run up the river and destroyed. By the fall of Charleston four more — two 28's, a 24, and the celebrated 18-gun sloop Ranger — were captured or destroyed; another had been lost; and at the end of 1779 the navy had but six vessels left, so that it was very hard to run the English blockade. Officers and seamen were scarce also; for the English dreaded the American privateers and naval destroyers so much, few as they were, that they systematically refused to exchange prisoners, and connived at the destruction of the Americans in pestilential hulks or prisons. In October 1780 the Saratoga, after taking three prizes, which were recaptured, foundered; and in 1781 the Trumbull was captured after a fight against superior force in which she was crippled. But the small remnant still won some victories. The Alliance on 28 May 1781 captured a 16-gun and a 14-gun brig; and early in 1782 the Deane captured four vessels with 48 guns. In April 1782 was fought a very brilliant action by a privateer, one of the most remarkable of the war: the Pennsylvania State cruiser Hyder Ally, Lieut. Joshua Barney, having 16 6-pounder guns and 110 men, engaged the British sloop-of-war General Monk, with 20 9-pounders and 136 men. Despite this enormous disparity of force — 96 pounds of metal against 180 pounds — the American vessel forced the British to strike in half an hour, with a loss of 20 killed and 33 wounded, against 4 killed and 11 wounded. Another remarkable contest was won by a private Philadelphia cruiser, the Congress, off the southern coast. She had 20 guns, but was manned almost entirely by landsmen, seamen being unobtainable. On 6 Sept. 1781 she fell in with a British 16-gun sloop-of-war, the Savage, with her regular complement of seamen. In about an hour and a half, lying so close that the guns scorched the opposing gunners, and shot were thrown by hand, the British vessel was fairly shot to pieces, and forced to surrender, with a loss of 8 killed and 24 wounded, against 30 of both on the privateer. The last naval fight of the war was between the Alliance, Capt. John Barry, and a heavy English ship, which the former drove off during a run to Havana.

The Continental vessels lost during the Revolution numbered 24, with 470 guns. The British loss was 102, with 2,622 guns. The American navy and the privateers together captured about 800 prizes from the British. British privateers did not capture a single Continental vessel; American privateers captured 16 English cruisers, with 226 guns. Consult: Maclay, 'History of the American Navy,' Vol. I. (1893); Cooper, 'History of the Navy of the United States' (1839).

Continental System, a plan devised by Napoleon to exclude Great Britain from all intercourse with the continent of Europe. The history of the continental system began with the famous decree of Berlin of 21 Nov. 1806, by which the British islands were declared to be in a state of blockade; all commerce, intercourse, and correspondence were prohibited; every Briton found in France, or a country occupied by French troops, was declared a prisoner of war; all property belonging to Britons was accounted fair prize, and all trade in British goods was entirely prohibited. No vessel coming directly from Great Britain or British colonies, or which had been there since the publication of the edict, was to be admitted into any harbor, and all vessels attempting to avoid this edict by false declarations were to be confiscated, with all their goods, as British. The reasons assigned for this decree were, that Great Britain did not acknowledge the international law accepted by civilized nations, but treated every individual belonging to the country of the enemy as if found in arms; made even the crews of merchantmen prisoners of war; extended the right of conquest over merchantmen and private property, and the right of blockade over places and harbors not fortified; over the mouths of rivers; nay, over whole coasts and countries. But many of these measures had always been taken, in maritime wars, even by France herself, as long as she had the means. One great reason for this and all the subsequent decrees of Napoleon was that he considered Great Britain his inveterate enemy and the enemy of the political doctrines which took their rise from the Revolution.

Great Britain immediately directed reprisals against the Berlin decree, first by an order in council of 7 Jan. 1807, by which all neutral vessels were prohibited to sail from one port to another belonging to France, or one of her allies, or to a nation so much under her control that British vessels could not have intercourse with it. Every neutral vessel which should violate this order was to be confiscated with her cargo. A second decree of 11 Nov. 1807 was much more oppressive to commerce. By this all harbors and places of France and her allies in Europe and the colonies, as likewise every country with which Great Britain was at war, and from which the British flag was excluded, were subjected to the same restrictions as if they were closely blockaded; all commerce in the manufactures and productions of such countries was prohibited, and vessels engaged in such commerce were to be confiscated, as also all those vessels whose certificates showed that they were built in the enemy's country. Another order in council declared the sale of vessels by the enemy to neutrals unlawful, and the intended transfer of property void.

Hardly were these orders promulgated when France made counter-reprisals. By a decree of Milan of 17 Dec. 1807, aggravated by a decree of the Tuileries 11 Jan. 1808, every vessel, of whatsoever flag, which had been searched by a British vessel, and consented to be sent to Great Britain, or had paid any duty whatever to Great Britain, was to be declared denationalized, and to have become British property; and in every case such denationalized vessel, as also those which had broken the blockade declared against the Ionian Islands, or had sailed from a British harbor or British colony, or those of a country occupied by the British, or which were destined for any such ports, were declared good prize. In order the more effectually to annihilate the British commerce, the tariff of Trianon, respecting colonial goods, was proclaimed 3 Aug. 1810. This was extended by another decree of 12 September of the same year, and both were followed by the decree of Fontainebleau, 18 October of the same year, directing the burning of

all British goods. These decrees were to be executed with more or fewer modifications in all countries connected with France. The consequence was that the price of colonial goods rose enormously; a regular smuggling trade was carried on at different points; for instance, at Heligoland, which was sometimes so crowded with persons concerned in this business that a ducat was paid for a barrel to sleep in; thousands of substitutes for colonial goods, particularly for coffee and sugar, were invented, and a variety of manufactures grew up on the Continent which were the germs of very extensive and flourishing branches of industry. The system was abolished immediately after the fall of Napoleon.

Continentals, or **Continental Army,** the army of the United States during the Revolution. In May 1775, after the battle of Lexington, the Provincial Congress of Massachusetts requested the Continental Congress to assume control of the forces which had gathered around Boston. Further outside pressure led the latter Congress, in June, to vote for raising a «Continental army» (the name «Continental» in all these cases expresses the hope, long entertained, that Canada would join the revolt), and for a loan of $2,000,000 to support it. On the 15th George Washington was appointed commander-in-chief; then four major-generals were appointed, Artemas Ward, Charles Lee, Philip Schuyler, and Israel Putnam; and an adjutant-general, Horatio Gates. Lee and Gates were bitterly opposed in Congress, and were only confirmed by Washington's influence, as men of approved military capacity. It is curious that Congress was right and Washington wrong, and that Lee's treachery and Gates' incompetence and intrigue nearly ruined the cause and Washington together. The brigadiers appointed were general officers in colonial service, with two others; and the inferior colonial officers were confirmed in their rank and shortly given Continental commissions. For commissary-general was chosen Joseph Trumbull, son of the governor of Connecticut, Washington's right-hand man and adviser, who kept a great general store in Lebanon. There was a further reason for this. The food surplus of the country came mainly from three great valleys,—the Connecticut, the Hudson, and the Delaware; the last two were held by, or liable to raids from, the British during most of the war, and the Connecticut valley was the one rich farming country which the British could not molest. Hence the first two commissary-generals were both Connecticut merchants. Washington appointed his aide, Thomas Mifflin of Pennsylvania, quartermaster-general; and Dr. Benjamin Church of Boston was made director of the army hospital. There was no paymaster-general till late in 1776, when William Palfrey of Boston was appointed. On 12 June 1776 Congress voted to appoint a «Board of War and Ordnance» of five members; in 1777 this was changed to a «Board of War,» to consist of three persons not members of Congress. This board has not left an enviable historical reputation; but it lacked neither ability nor patriotism. In part its troubles were due to civilian misunderstanding of and contempt for military claims and feelings; in part to the insistence by the States on their share of army patronage, as now of civil patronage, which drove some of the best generals from the service and contributed to Arnold's treason.

The army was constituted by taking into colonial pay the militia regiments of the various colonies, and enlisting others for a year. The number on the war office rolls during 1775 was 27,443, besides an estimate of 10,180 militia for a few months' service during 1776, 46,891 regulars, 16,700 militia as before. Had these all been in the field and good troops, and well equipped, they would have been fairly sufficient, though not what could or should have been raised; but half or more were on paper, the material was poor, the equipment insufficient, and the whole system incompatible with effectiveness. The term of enlistment was too short for the soldiers to learn their business; the militia absolutely refused to submit to discipline, and their insubordination affected the regulars. Washington during the campaigns of 1776 urged upon Congress a plan for a permanent army; that body sent a committee to the camp at Harlem Heights, and drew up a scheme generally in accord with his views, which Congress adopted. The «armies» of different sections were to be consolidated into one body, of 88 battalions with 750 men each, to be raised in the States according to population and resources; besides a Canadian regiment to be called «Congress' Own.» The largest numbers, 15 battalions each, were to come from Massachusetts and Virginia. The men were to be enlisted for the war, with a bounty of 100 acres of land each at the end; officers, higher amounts; colonels, 500; and $20 bounty for each recruit. The States were to enlist their quotas, arm and equip them; and to appoint the officers from colonel down, though Congress was to commission them. But the plan worked slowly and poorly. Enlistments for the war were so few that a three years' term was substituted; to stimulate even these, Massachusetts began and other States continued the policy of greatly increasing the bounties, and towns and counties bid still higher; but this rather made the process slower, men waiting to see how high the bids would go. Washington was shortly invested with dictatorial powers to remove any officers under brigadier, and fill the vacancies at his discretion; and allowed to raise 16 extra battalions. This somewhat strengthened his scanty lines, and enabled him in a slight degree to rectify the mischief done by the State patronage, give commissions to good officers, and keep others from retiring. But even so, and despite incessant drafts from the militia, the total number of soldiers enrolled in 1777 was but 34,820 regulars and 10,100 militia; in 1778, 32,899 and 4,353; in 1779, 27,699 and 5,135; in 1780, when the Carolinas and Georgia were in British hands, and none of their troops were on the roll, 21,015 and 5,811; in 1781, when Cornwallis surrendered, 13,292 and 7,298. It would seem that if the British could have held out a little longer, or sent one more army to America, the Continental army would have melted into nothing without the country taking pains to keep it up.

The reason was not lack of men, nor any ruinous exhaustion of resources; it was simple administrative anarchy (see CONFEDERATION, ARTICLES OF), which could not collect and dis-

tribute the resources we possessed, and which left the soldiers half fed, less than half clothed, and for long periods unpaid. This was increased by a jealous dread of the army itself (see CINCINNATI, SOCIETY OF THE), bred by historical experience which they had as yet no other to countervail; they appreciated victories, but were not inclined to pinch themselves for daily supplies. In 1777 the soldiers' back pay was settled up in Continental money, at about 12 for one, though Massachusetts made good a part of the depreciation. Arrears steadily accumulated till the end of the war, though in 1778–9 a half-pay system for seven years was provided for the officers, and a gratuity of $80 for the men. In January 1781, the Pennsylvania regulars struck, and were pacified with difficulty and by certificates for their pay; the New Jersey troops followed suit; and Congress in alarm made requisition on the States for $879,342 to pay the arrears. About half the amount came in, and Massachusetts and New Hampshire sent gratuities to their men; but the rest lagged. About this time the Articles of Confederation were adopted, making the consent of nine States necessary for appropriations; Congress was even more helpless than before; and as the time of a general disbandment drew near, the officers began to fear that it was intended to turn them off without paying them, and if they did not receive it while in the field they never would. Meantime Congress was debating the subject. The later Federalist party wished to fund the army dues as well as the other public debt, and give the army interest-bearing certificates; the decentralizers wished to leave it to the States to settle each with their own troops. The officers, finding the half-pay project highly unpopular, wished to commute it for a lump sum, in cash or securities. About this time, 10 March 1783, an anonymous letter called a meeting of the officers in camp at Newburg, and an anonymous address suggested that if Congress refused justice, they should desert the country in a body, under Washington's lead. Washington denounced this call as seditious, but called a meeting himself, at which his influence kept patriotism uppermost; but he wrote urgently to Congress, and it finally agreed to commute the half-pay into five years' full pay in certificates at 6 per cent interest. The States were very indignant at this, New England especially denouncing the whole scheme of half-pay: the Massachusetts legislature passed a resolution that it tended to "raise and exalt some citizens in wealth and grandeur to the injury and oppression of others." The soldiers were furloughed on three months' pay till the British should evacuate New York, when they were discharged. The number of troops nominally furnished by each State is as follows:

Massachusetts, 69,907; Connecticut, 31,939; Virginia, 26,678; Pennsylvania, 25,678; New York, 17,781; Maryland, 13,912; New Hampshire, 12,497; New Jersey, 10,726; North Carolina, 7,263; South Carolina, 6,417; Rhode Island, 5,908; Georgia, 2,679; Delaware, 2,386. Total, 231,791.

Adjutant-generals: Horatio Gates of New York, Joseph Reed of Pennsylvania, Timothy Pickering of Massachusetts, Alexander Scammell of New Hampshire, Edward Hand of Pennsylvania.

Quartermaster-generals: Thomas Mifflin of Pennsylvania, Stephen Moylan of Pennsylvania, Mifflin again, Nathanael Greene of Rhode Island, Timothy Pickering of Massachusetts.

Commissary-generals: Joseph Trumbull of Connecticut, Jeremiah Wadsworth of Connecticut, Ephraim Blaine of Pennsylvania.

Director-generals of hospitals: Benjamin Church of Massachusetts, John Morgan of Pennsylvania, William Shippen of Pennsylvania, John Cochran of New Jersey.

Paymaster-generals: William Palfrey of Massachusetts, William Pierce of Georgia.

Inspector-generals: Thomas Conway, Baron Steuben.

Chief engineers: Louis L. Du Portail, Thaddeus Kosciusko.

Contin'gent, the name often given to the quota of troops which is to be furnished by each member of a number of states composing a confederation.

Continuity of State. See CRITICAL POINT.

Contorniati, kŏn-tôr-nē-ā'tē, ancient medals which have occupied the attention of antiquarians for a long time, and, on account of their rarity, are highly esteemed in cabinets. They are formed of a thin plate of metal (not of two different sorts, as is often supposed) with a flat impression. They differ from other ancient coins by having a furrow upon both their sides, where the others have a wreath of pearls. These hollowed lines (It. *contorni*) may have occasioned their name. Another characteristic of genuine *contorniati* is a cipher composed of the letters EP or PE, of which no satisfactory explanation has as yet been discovered, together with numerous impressed characters, and a great number of palm branches, the cavities of which are often filled with silver. They are also added by a second hand, and thereby are essentially distinguished from the "monograms," so called in the language of the mint. They resemble the *signa incusa* (*contremarques*) on the Roman medals. All the *contorniati* are of bronze, and equal in size to the large bronze coins called *medaglioncini* by the Italian collectors. Their form is various, their workmanship rude, and their inscriptions are frequently different from the usual curial style upon the ancient coins. From these circumstances we may conclude that they did not belong to the age of the Roman emperors whose images they bear, but to a later one. Eckel, in his masterly treatise on the *contorniati,* follows the opinion of Morelli and Mahudel, who consider them to have been made from the reign of Constantine the Great to that of Valentinian. It has been ascertained that they were not struck by public authority; and the ancients have transmitted no account of their destination, which must, therefore, be left to conjecture. The frequent representations of race-grounds, palms, men shouting to the charioteers, and even the images of the emperors upon them, make it probable that they were distributed as tickets of admission to the circuses in Rome and Constantinople.

Contour, kŏn-toor', the outline or defining line of any figure or body; also the horizontal outline of works of defense. When the conformation of the ground or works is described by contours or horizontal sections, these sections are taken at some fixed vertical interval from each other suited to the scale of the drawing or the subject in hand, and the distances of the surface at each interval above or

below some assumed plane of comparison are given in figures at the most convenient places on the plan.

Contraband of War (Lat. *contra bannum*, "against the proclamation") is a name applied to certain commodities during hostilities between states which acknowledge what are called the laws of nations. One such law is, that neutral nations must not carry on, for the advantage of either of the belligerent powers, any branches of commerce from which they are excluded in time of peace. Another is, that the name of contraband of war shall be given to such articles as pertain to military or naval warfare — guns, ammunition, and stores of all kinds. Unless there are special treaties, defining exactly what articles are contraband of war, the interpretation of this law often leads to much embarrassment. Another law insisted on by England during the Napoleonic war was, that each belligerent shall have a right to visit and examine neutral ships, to see whether they carry any articles which are contraband of war, and which seem likely to be intended for the enemy. A neutral state may carry on ordinary trade with either belligerent except when prevented by blockade (see BLOCKADE); but the ships, according to the above rules, must not contain articles contraband of war; nor must a conterminous land frontier be crossed by such commodities. If a merchant evades these rules, he does so at his own risk; his merchandise may be seized, and his own government will not protect him. At various times discussions have arisen whether corn, hay, or coal can ever be included in the list of articles contraband of war; they are obviously articles of peaceful commerce; but they are also essential to the maintenance of an army, and sometimes a supply would give one belligerent a greater vantage over the other. Especially is this the case in reference to coal in the present age of war-steamers, so that there has arisen a distinction between absolute and occasional contraband, the commodities just mentioned being occasional. Gen. B. F. Butler soon after the outbreak of the Civil War solved the question of the status of southern negroes, who had taken refuge with the Union army and were demanded back by their masters, by asserting that they were contraband of war, a claim with little legal basis, but of much convenience to the Federal authorities.

Contrabass, kŏn'tra-bās, or **Double Bass,** the largest instrument of the violin kind. Originally it had only three strings, but now it has generally four, the lowest tuned to E below the bass stave, the others to A, D, and G of that stave. Some players still prefer the three strings, but four are required in orchestra playing.

Contract, an agreement between two or more parties to do or not to do a particular thing, upon a sufficient consideration. Executed contracts are those in which nothing remains to be done by either party, and where the transaction has been completed, or was completed at the time the contract was made, as where an article is sold and delivered and payment therefor is made on the spot. Executory contracts are those in which some act remains to be done, as when an agreement is made to build a house in six months, to do an act before some future day, or to lend money upon a certain interest payable at a future time. Express contracts are those in which the terms of the contract or agreement are openly and fully uttered and avowed at the time of making, as to pay a stated price for certain goods, to deliver a horse, etc. Separable contracts are those the considerations of which are by their terms susceptible of apportionment or division on either side, so as to correspond to the several parts or portions of the consideration on the other side. Simple contracts are those not of specialty or of record. Specialties are those which are under seal, as deeds and bonds. Unilateral contracts are those in which the party to whom the engagement is made makes no express agreement on his part. Verbal contracts are simple contracts. Written contracts are those evidenced by writing. Every contract should be so complete as to give either party his action upon it; both parties must assent to all its terms. To the rule that the contract must be obligatory on both parties there are some exceptions, as the case of an infant, who may sue, though he cannot be sued on his contract. There must be a good and valid consideration, which must be proved though the contract be in writing. There is an exception to this rule in the case of bills and notes, which are of themselves *prima facie* evidence of consideration. And in other written contracts, when consideration is acknowledged, it is *prima facie* evidence thereof, but open to contradiction by parol evidence. There must be a thing to be done which is not forbidden by law, or one to be omitted which is not commanded by law. Fraudulent, immoral, or forbidden contracts are void. A contract is also void if against public policy or the statutes, even though the statute be not prohibitory, but merely affixes a penalty. In the construction and interpretation of contracts the intention of the parties is the pole-star, but their intention must be found expressed in the contract and be consistent with rules of law. The court will not make a new contract for the parties, nor will words be forced from their real signification. The subject-matter of the contract and the situation of the parties is to be fully considered with regard to the sense in which language is used. The legality of the contract is presumed and is favored by construction. Words are to be taken, if possible, in their comprehensive and common sense. The contract will be supported rather than defeated. All parts will be construed, if possible, so as to have effect. Construction is generally against the grantor.

Contract Notes, the same as bought and sold notes (q.v.).

Contractility. See MUSCLE.

Contrac'tions, abbreviations employed with the view of saving labor in writing, and also in former times with the view of saving parchment in extending MS. copies of works, deeds, etc. Contraction takes place in several modes, as by elision; writing a smaller letter above the word contracted; running two or more letters into one character; by symbols representing syllables or words; by initial letters; thus: rec'd for received; Mr. for Master, or Mister; & for and; p for per; S.P.Q.R. for *Senatus populus que Romanus.* When the contraction consists of the initial letter, syllable, or syllables of a word, as ult. for ultimo, it is

more correctly termed an abbreviation. See ABBREVIATIONS.

Contralto. See ALTO.

Contrat Social, kôn-trā sō-sē-āl, a work by Jean Jacques Rousseau, embodying his political ideas and defending the sovereignty of the people. It was published in 1762 and was one of the powerful influences affecting the leaders of the Revolution.

Contravalla'tion, a line formed, in a siege, in the same manner as the line of circumvallation, to defend the besiegers against the sorties of the garrison, so that the troops carrying on the siege lie between the lines of circumvallation and contravallation. As the line of contravallation must be out of reach of cannon-shot from the place besieged, its circumference is necessarily so great as to render both its erection and its defense difficult. It is, therefore, seldom resorted to.

Contravention, an act done in violation of a legal obligation or condition; most frequently applied in Scotch law to any act done by an heir of entail in opposition to the deed of entail, or to the action founded on a breach of law-burrows.

Contrayerva, kŏn-trạ-yėr'va (Span. *contrayerba,* counter herb), the aromatic bitterish rootstock of *Dorstenia contrayerva,* a plant imported from tropical America, and used as a stimulant and tonic. The drug was once in much repute in low fevers, and was considered efficacious against snake-bites, whence the name. See DORSTENIA.

Contreras, Hernando de, ār-nān'dō dā kōntrā'rās, Spanish adventurer: b. Spain about 1520; d. Panama May 1550. He was the son of Rodrigo de Contreras (q.v.), governor of Nicaragua. After the fall of his father, and the confiscation of his property, Hernando and his brother, Pedro, with a number of dissatisfied officers, arranged a plot to seize Peru and Panama, which the brothers claimed as inheritors of the estate of their grandfather, Pedrarias. Hernando was to be king of the new realm, but was never proclaimed, as the failure of his attempt within two months made such a course impossible. Panama was captured 20 April 1550, after several Church dignitaries had been slain, and a large part of the royal treasure stored in the city was taken. Hernando took a considerable part of his force to pursue one of the royal officers, leaving Pedro in command at Panama. The citizens improved the opportunity to retake the city, and Hernando was drowned shortly afterward. The other brother was never again heard of.

Contreras, Juan Senen de, Spanish general: b. Madrid 1760; d. there 1826. He entered the Spanish army in youth, in 1778 took an active part in the Austrian campaign against the Turks, and in 1795 commanded against the French. While captain-general he gallantly but unsuccessfully defended Tarragona and was captured by the French. He was imprisoned in the castle of Bouillon on the Belgian frontier, but escaped in 1812, and two years later returned to Spain. His narrative of the siege of Tarragona formed the third volume of 'Mémoires relatifs aux révolutions de France et d'Espagne' (1825).

Contreras, Rodrigo de, rōd-rē'gō dā, Spanish cavalier: b. Segovia, Spain, about 1495; d. Peru sometime after 1557; the last date when he was known to be living. He was appointed governor of Nicaragua in 1531, and sent an expedition into the interior, which discovered and explored Lake Nicaragua. The expedition had trouble with the adventurer, Robles, who tried to seize the newly discovered country, but was defeated. The administration of Contreras was turbulent and marked by constant disputes with the royal authorities and the dignitaries of the Church. Finally he was formally charged with various crimes and misdemeanors, found guilty, driven from the country, and all his property confiscated (1549). He vainly sought redress from the Spanish government, and finally returned to America, going to Peru, where he was not heard of after 1557. For the attempt of his sons to avenge their father's alleged wrongs, see CONTRERAS, HERNANDO DE.

Contreras, Battle of (Mexican name, *Padierna*), in the Mexican war, 20 Aug. 1847. At Churubusco (q.v.), the main road south from the City of Mexico is joined from the southwest by another, running to the hills beyond the hamlet of Contreras. This is about 12 miles from the city; a mile nearer the latter is the hamlet of Padierna. Both villages are on the same small stream; and each is about four miles northwest of San Augustin on the main road, to which the American army had advanced. Just west of Padierna, rising from the banks of the stream, is a ridge called Pelón (Bald) Cuauhtitlan, whose northern side is encircled by another brook, joining the first half a mile north of Padierna. The road to Mexico city winds around the east flank of the ridge, across the brook from Padierna; and crosses the other brook at Auz. lo; west of this, reached by a bridle-path ac oss a third brook, is the village of San Geronimo; while the road keeps on north, across this third and a fourth brook, to the important village of San Angel. Between San Augustin and the first stream lies a field of *pedregal* (rough volcanic rock), four miles wide and running several miles north; it had a wagon road for a mile and a half, but the rest was only practicable for infantry picking their way in open order. The Mexican general, Valencia, with the "Veterans of the North," forming the right of Santa Anna's army, had made his headquarters at San Angel on the 17th; and he decided to occupy and fortify Pelón Cuauhtitlan, two miles southwest, to block the road to the capital skirting it. Powerful batteries were placed to command this and sweep the pedregal; and some 7,000 men were concentrated about the ridge, and facing Auzaldo and San Geronimo. Santa Anna, apprehensive for his position on the main road, ordered Valencia to retire to Churubusco; but Valencia refused. On the 19th Scott, at San Augustin, ordered a road leveled across the rest of the pedregal to Padierna; Twiggs and Pillow to check the enemy meanwhile. When this engagement was sharply in progress, Bennet Riley's brigade, shortly followed by P. F. Smith's, moved north and west across the pedregal and a stony hillock called Zacatepetl; crossed the streams and the San Angel road far in rear of the bridge, driving off in a fierce running fight the Mexican troops which attempted to bar the way; and

quartered themselves at San Geronimo in the hills north of the ridge. Valencia sent for reinforcements to Santa Anna, who brought a division to the hill of Toro, north of San Geronimo, and had the American brigades in a helpless trap if he chose, between his forces on the north and Valencia's on the south; but he did nothing, and at nightfall fell back to San Angel without notifying Valencia. At 2.30 A.M. of the 20th, a dismal morning of cold, rain, and fog, Smith and Riley moved southwest through the steep, gullied, slippery streets of San Geronimo, and unperceived, gained positions southwest of the ridge on the right flank of Valencia's lines, which fronted to the pedregal and Padierna; Smith on a height facing the ridge, Riley masked by a ravine, and Cadwalader east along the ravine, which lay between the ridge and Contreras. Meantime a strong diversion was made by an assault on Padierna and along the pedregal. These preparations were made with the greatest strategic skill, and carried out with the utmost courage and tenacity; but most of them were hardly needed, for the battle was won by a single impetuous onslaught of Riley's troops against Valencia's main batteries on the ridge, when the "Veterans of the North" broke and scattered like sheep. The battle was over in 17 minutes, and the Mexican army a routed mob, in face of a force numbering but a fraction of their own. Shields, who had taken Smith's place at San Geronimo, marched rapidly to Auzaldo to cut off the retreat; but a portion of the army escaped in wild flight toward Churubusco along the San Angel road, while the rest plunged in disorder down the steep flanks of San Geronimo, leaving all impediments behind. No more brilliant victory was won in the war. Scott had not over 4,500 men in sight, to Valencia's 7,000, and Santa Anna's 12,000 within supporting distance; and the natural and artificial defenses should have made the Mexican positions impregnable. The latter lost 700 killed and wounded, and 813 prisoners, including 88 officers, four of them generals; 22 brass cannon, vast quantities of small arms and ammunition, and many hundreds of pack-mules and horses. The American loss was 60 killed and wounded. This rout contributed materially to the winning of Churubusco. Consult: Wilcox, 'History of the Mexican War'; Wright, 'Life of Scott'; Scott, 'Autobiography.'

Contributory Negligence. See NEGLIGENCE.

Contumacy, kŏn'tū-ma-sĭ, the offense of non-appearance in court of a person summoned judicially, chiefly known in countries on the European continent. In civil causes a person in such case may be properly made liable to a decision against him, for his neglect in not appearing to defend his rights; but by an extension of the principle to criminal cases persons are often sentenced, in their absence, to punishment *in contumacian*, as it is called, particularly those who are charged with political offenses, who can expect little justice under despotic governments.

Contu'sions, the lesion of the body resulting from a blow struck by a blunt instrument without breaking of the skin or fracture of a bone. Contusions may involve the skin alone, or they may produce some change in the deeper tissues. In contusions there is, as a rule, some rupture of blood vessels. This results in the extravasation of blood, which, if small in amount, causes minute spots called petechiæ. When elongated in stripes such hemorrhages are called vibices; or, when irregular and small, ecchymoses. When the hemorrhage is large and collected in one place, they are termed hematomata. Contusions, if very severe, may result in gangrene, hence all large contusions need prompt medical attendance, but small contusions may be treated with hot water in which there is some antiseptic, as a one-per-cent solution of carbolic acid; and if carefully bandaged and kept from being infected, they usually recover.

Conus, a genus of gasteropodous mollusks, the type of the family *Conidæ* or cone-shells, so named from the form of the shell. They are found in the southern and tropical seas. The genus comprises several hundred species, some of them having very beautifully colored shells which are much prized by collectors. The rarest and finest of these is *C. gloria-maris.* All have a short, strong foot bearing a water-pore, two tentacles with eyes set on the outside at the centre, and a long syphon. They live in holes in rocks and in the clefts of coral-reefs, and their food consists mainly of other mollusks. Some of the species are poisonous.

Convallaria, kŏn-va-lā'rĭ-a, the typical genus of the natural order *Convallariaceæ,* or lily-of-the-valley family. The order has 23 genera, and about 215 species, widely distributed. Ten of the genera are found in the American flora, among them: *Asparagus, Clintonia, Polygonatum convallaria,* and *Trillium* (qq.v.). See LILY-OF-THE-VALLEY.

Convec'tion of Heat, the transference of heat by means of the upward motions of the particles of a liquid or gas which is heated from beneath. With practically one exception, namely, water below its maximum density point, liquids and gases increase in volume on being heated, and their densities therefore decrease. Hence, if heat be applied beneath a vessel containing a liquid or a gas, the parts nearest to the bottom, becoming heated, rise up owing to their diminished density, their place being taken by cooler fluid rushing in from the sides and falling down from the upper parts of the vessel. Hence a rapid mixing takes place, and it is thus that a liquid heated at the bottom becomes so much more quickly warmed than it would be were the heat applied at the top. The convection currents may be beautifully shown by filling a flask or glass with water, and dropping into it a small bit of indigo or other such solid coloring matter. On placing the flask over a spirit-lamp, streams of heated liquid will be seen rising and carrying the blue particles; while at the same time the cool water, uncolored, will be observed falling in downward streams and taking the place of that which is rising. See HEAT.

Con'vent (Lat. *conventus*), primarily the community of monks or nuns occupying a monastery, priory, or other establishment of a monastic or semi-monastic character. But the word is generally used to designate rather the establishment itself, if it is simply a cloister and not a considerable monastery or an abbey. The parts of a properly equipped conventual establishment are: The church or chapel including the choir,

namely, that portion of the church in which the members assemble to recite or chant the psalms, etc., of the canonical hours; the chapter-house, an apartment in which the inmates assemble to deliberate or discuss community affairs; the cells, or separate quarters of the inmates; the refectory or dining-hall; the dormitory; the infirmary; the parlor for reception of visitors; the library; the treasury; the cloister, an enclosed space for recreation; and the crypt, the convent's place of burial. The word "cloister" is also used in the sense of convent: in that use cloister signifies a religious house access to which is restricted by the laws of the Church.

In the United States, owing to religious upheavals going on in the Old World, a very large number of the religious consecrate of the Roman Catholic Church have found refuge. One of the oldest of our commonwealths, that of Maryland, was settled by the Roman Catholics, who at an early date laid the foundations of numerous convents and monasteries. As the settlements and centres of population pushed further in every direction from the Atlantic coast, the emissaries of the Church were in the van, and the result has been the building and organization of some of the most noted convents in the world. Scarcely a large town in the country is without its convent or nunnery, while in many of the larger cities there are several communities of either sex. The term convent is here applied almost exclusively to an establishment containing a sodality of nuns, the male religious being denominated monks and their establishments monasteries.

It is said that the first convent in England was erected by Eadbald at Folkestone in 630, and the first in Scotland at Coldingham in 670. They were numerous during the Middle Ages. Henry VIII. suppressed them, confiscating their revenues. By the Roman Catholic Emancipation Act of 1829 their erection in the United Kingdom was prohibited, but the Act was from the first so much of a dead letter that they were established in various places with no protest from the community in general. For a long time convents in Great Britain were founded by the Roman Catholic Church only, but in 1875 one was opened at Bournemouth under the auspices of the Ritualist party in the Established Church.

Conven'ticle, a private assembly or meeting for the exercise of religion. The name was at first given as an appellation of reproach to the religious assemblies of Wickliffe, and afterward applied to meetings of petty sects and dissenters generally in the Conventicle Act, 22 Charles II., c. 1, repealed by 52 George III., c. 155. In strict propriety the word denotes an unlawful assembly, and cannot therefore be justly applied to the legal assembling of persons in places of worship certified or licensed according to the requisitions of law.

Convention, Nominating. See ELECTIONS.

Convention of 1787. See CONSTITUTION, FORMATION OF THE.

Conventionalists, in Pennsylvania politics. The Pennsylvania Democrats obtained their first victory over the Federalists in 1799, electing their governor, Thomas McKean, and a majority of the House; but the Senate was Republican, and the electoral vote in 1800 was divided, eight Democratic to seven Federalist. Yet in the legislative session 1803–4 there were only five Federalists in the House and one in the Senate. This rapid conversion of Federalists to Democratic politics, however, by no means implied a corresponding conversion to Democratic ideas, and the victorious party almost at once split into two factions: the "Constitutionalists," or moderates of the Federalist temperament; and the "Friends of the People," or radicals, who wanted a new State Constitution, impeachment and removal of the existent judges, and limitation of the power of the judiciary for the future. The struggle, in fact, was part of that which has ended in making judges mostly elective; and which was begun by the wrath of the Democratic section at seeing the Federalist judges intrenched in position for life, and construing the constitutions their own way. The leaders of the two parties were William Duane and Michael Leib. In 1805 the Federalists adopted the candidate of the Constitutionalists, McKean, and elected him; but in 1808 the "Friends of the People" — who had adopted a programme for practical action, and now called themselves "Conventionalists," as wishing a convention to prepare a new Constitution — elected their candidate, Simon Snyder, and had a long lease of power.

Conventions, Constitutional, in the United States. The State constitutions framed during the Revolution (see CONSTITUTIONS, STATE, FIRST FORMATION OF) were made by various bodies — the regular legislatures, special conventions, committees of safety, etc. — and mostly not submitted to the people, whose understood wish was their sole guaranty of acceptance. But that of Massachusetts even then was worked out at a special convention and submitted to popular vote, and one or two of those previously adopted were shortly superseded by new ones so sanctioned. Since the Revolution this has been a very general method, and the submission to popular vote almost universal, alike in new States and the revisions of old constitutions. The exceptions have always been revolutionary in character, justified or unjustified, but precisely opposite to those of the Revolution: the forcing upon a State of a constitution which the leaders of the movement knew would not be sanctioned by the majority of the people. The Lecompton Constitution of Kansas, 5 Sept. 1857, making it a slave State and forbidding emancipation laws, was one example; recent constitutions in the Southern States disfranchising negroes are others. The constitutional convention, as a special body alone permitted even to propose for public action changes in the fundamental law, is peculiar to the United States. In foreign countries the regular lawmaking body has this function, though it may call a special session for it, or a specially heavy majority be required for it; no country would overturn its settled institutions by a majority of one. The American plan, of confining the legislative body to changes within the organic framework, and requiring specific popular consent to alterations of the latter, was initiated largely at the advice of John Adams. This formal constitutional convention is the exact reverse of the revolutionary convention in this and other countries. The latter by its essence is the overthrow of existent

legal sanctions by force, and the use of this revolt to establish new ones; the former is called in pursuance of legal provisions or prescriptive understandings, by a regular government to amend its own basis. Hence also it is restricted to the special purposes of its call, and so far as it transcends them it becomes revolutionary. The convention which framed the Constitution of the United States was semi-revolutionary: it was legally called, but it utilized the call to propose and submit a plan for discarding the entire system of government and substituting a new one; its excuse was national necessity, its bill of indemnity the ratifying of the Constitution by the States. The method of convention is by no means universal or obligatory, however. Some States provide for the adoption of the desired amendments in two successive legislatures, and then their submission to the people; some allow either; some make no provision at all; some merely disallow any changes not agreed to by certain majorities or legislatures.

Conventions. See ELECTIONS.

Conventions, Revolutionary (see also CONVENTION, CONSTITUTIONAL; CONSTITUTIONS, STATE, FIRST FORMATION OF). Where the legal governments of countries have become the very grievance against which people rebel, the latter have no organ of expression save tumultuous or representative popular assemblies. The latter are usually called conventions. Thus, in England, the convention parliament of 1399 deposed Richard II. and gave the crown to Henry IV.; that of 1660, after the downfall of Richard Cromwell, proclaimed Charles II.; that of 1689, after the flight of James II., proclaimed him abdicated and William III. king. These were simply parliaments, except that there was no royal authority to call them. In Massachusetts, the convention of May 1689, at the same time as that in England, superseded the Andros government by one of the people. That of South Carolina in 1718, to form a provisional government in place of the proprietary government, is another instance. In all these cases, the conventions were administrative bodies, governments pro tem. So during the Revolution, when the royal governors proclaimed the colonial assemblies dissolved, they were in the habit of reassembling as conventions, and they constituted the provincial government until regular constitutions were in force, which in fact they often framed and adopted themselves. The later constitutional conventions, creatures of State law, and limited to the preparation of a plan of government to be afterward voted on, have nothing whatever in common with the above, and are in fact only enlarged consulting boards, representative enough to imply fairly the entire public feeling. Of the first sort were the nullification convention in South Carolina in 1832 (see COMPROMISE OF 1833), and the secession conventions of 1860 and 1861.

Convergence. Cases often occur where two animals of different groups, with a different ancestry and affinities, but with similar habits, so closely resemble each other that not only the ordinary observer, but the experienced naturalist, is deceived by their close resemblance. A familiar example is the whale, which so resembles a fish that by many it is even supposed to be one. Now, the whale is a mammal, bringing forth its young alive, and suckling it. The cetaceans form an order by themselves. There are strong reasons for believing that they are the descendants of some group of land vertebrates which walked on all fours, but which, perhaps driven by competition, were forced to adopt marine life, and became wonderfully adapted to an aquatic life, during this process losing by disuse their hind limbs, while the fore legs became converted into fins. By adaptation to the same medium, a fish and a whale have a similar shape and a strong superficial resemblance. The same is the case with certain extinct whale-like lizards, such as the ichthyosaurs. These, with the plesiosaurs, are now supposed to have descended from some earlier four-footed terrestrial reptiles, which, becoming adapted to oceanic life, assumed a fish-like form.

Cases of convergence resulting from similar burrowing habits are seen in the *Amphibia* and reptiles. Certain amphibians (*Cœcilia*) and several extinct Carboniferous forms, have lost their limbs by disuse; they are worm-like, from adopting the habits of earthworms. Among the lizards the glass-snake (*Ophiosaurus*) and a few other forms have lost their legs in consequence of burrowing in the sand. There is a form (*Bipes*) in which a pair of legs are retained. Snakes have evidently descended from four-legged forms, the boas still retaining vestiges of the hind legs. It is not an easy matter to separate some of the legless lizards from small boas, owing to the convergence in their mode of life.

The thousands and tens of thousands of the boring larvæ of insects, belonging to quite different groups, have strikingly similar forms owing to their similar habits; thus the headless and apodous maggots of flies resemble those of ants, wasps, and bees. Among jumping mammals, the kangaroo, the jerboa, and jumping mice have similar large muscular hind legs, with a reduction in the number of toes, although they belong to different sub-classes or orders. The kangaroo is a marsupial and we have marsupial or kangaroo rats and mice which can be separated only by an expert from ordinary rodents. The koala mimics the bear, the pouched weasels look like genuine weasels, and so on.

A multitude of other examples can be cited to illustrate the effects of convergent habits, or the influence of similar conditions of life, or adaptation to such and such surroundings. It is most probable that the large majority, if not all, of the cases of mimicry among butterflies and other insects generally attributed to the action of natural selection, are examples of convergence, resulting from exposure to similar physical conditions of light, temperature, etc., which have produced similar styles of coloration, outlines in their wings, etc.

While convergence is not in itself a primary factor of organic evolution, use and disuse are such factors, and convergence in habits or modes of life, resulting in use or disuse of parts, have had much to do with the evolution of so extreme specialized groups as the whales, the snakes, the plesiosaurs and ichthyosaurs, as well as other minor groups of animals.

Convergence is of rare occurrence in plants, because their fixed mode of life does not admit of the exercise or disuse of parts or organs.

Conversano, kŏn-ver-sä'nō, Italy, a town in the province of Bari, on a hill, 18 miles southeast of the town of Bari. It is the seat of a bishop, and has a citadel, a handsome cathedral, several convents, a diocesan seminary, and a hospital. The district produces wine, oil, almonds, flax and cotton; and a good trade is carried on in these articles. The foundation of the town is attributed to the Etruscans. Pop. 9,731.

Conversation, the oral interchange of ideas among two or more persons. It may be formal or informal, in the latter sense differing little in meaning from "speech or talk." In its formal sense it is sometimes spoken of as "polite conversation," and it may cover a wide range of topics. As an art, conversation may be said to have flourished in the courts and palaces of Italy from the Middle Ages onward, and in the salons of France during the 16th, 17th, and 18th centuries. In England, in the 17th and 18th centuries, conversation was perhaps at its best. Some of the "polite conversation" of this period has been reserved in the form of "table talk," but some of this literature might be better described as "monologue."

Con'verse, Florence, American writer: b. New Orleans 30 April 1871. She graduated at Wellesley College in 1893, began writing for the magazines, and has been a member of the editorial staff of The Churchman (New York) since January 1900. She is the author of: 'Diana Victrix,' a novel (1897); 'The Burden of Christopher' (1900); 'Long Will, a Romance' (1903).

Converse, George Albert, American naval officer: b. Norwich, Vt., 13 May 1844. Educated at Norwich University, he was graduated from the United States Naval Academy in 1865, was in the torpedo service in 1869–72, instructor at the torpedo station (Goat Island, Newport Harbor, R. I.) in 1885–9, and in charge of the station in 1893–7. He was promoted commander in 1889 and captain in 1899. In 1897–9 he commanded the U. S. S. Montgomery, seeing service in the Spanish war; in 1899 was made chief of the bureau of equipment, with rank of rear-admiral; in September 1902 was assigned to the command of the Illinois; and in March 1904 became chief of the bureau of ordnance. He is regarded as one of the foremost ordnance experts in the navy.

Converse, Harriet (Maxwell), American philanthropist and author: b. Elmira, N. Y., 1839; d. New York, 18 Nov. 1903. For some years she traveled in Europe, contributing to the American press, and in 1883 published a collection of verses, 'Sheaves,' which passed through several editions. In 1884 she was formally made a member of the Seneca Indians, and for many years labored in defense of the rights of Indians both in New York and elsewhere. In 1891 she finally secured the defeat in committee of a bill introduced into the New York legislature with the purpose of depriving the Indians of their lands, and thereupon was elected a member of the Seneca national council and installed a chief of the Six Nations. She made valuable collections of Indian curios and antiquities. Among her further writings is 'Myths and Legends of the Iroquois Indians' (1903).

Converse, James B., American Presbyterian clergyman: b. Philadelphia 8 April 1844. He graduated at Princeton 1865, and Union Theological Seminary, Virginia. He edited the 'Christian Observer' 1872–9; was engaged in pastoral and evangelistic work 1879–88; and edited the 'Christian Patriot' 1890–5. He has published: 'A Summer Vacation Abroad' (1878); 'The Bible and Land: argument in favor of single tax' (1889); 'Uncle Sam's Bible, or Bible Teachings About Politics' (1899).

Conveyancing, a term including both the science and the act of transferring titles to real estate from one person to another. Sometimes it is applied in a restricted sense to the cumbrous forms which the feudal system has rendered necessary for the transference and tenure of landed property. When left to shape itself by individual practice, without legislative intervention, there were several causes rendering such conveyancing cumbrous and complex. The theory of the feudal tenures and hierarchy remaining unchanged throughout the social revolution which had substantially abolished superiority and vassalage, and brought land out of feudality into commerce, the feudal ceremonies of the Middle Ages were necessarily retained, and they were adopted by fictions and explanations to modern exigencies. It seems strange that not many years have passed since in Scotland, when a parcel of land was bought and sold, a party of men assembled on it and went through the old form of feudal investiture by the delivery of so much earth and stone from the superior bailiff to the vassal's attorney, who took instruments and had the whole recorded at length by a notary of the empire. In England, from the want of the general system of registration known in Scotland, the complexities of conveyancing had become so inextricable, that one of the most approved forms of transference was a fictitious suit and judgment of possession called a fine and recovery. To these various sources of complexity must be added the timidity of conveyancers, who, afraid to commit themselves by attempting to abbreviate or reconstruct the forms which they find in existence, repeat them with additions from time to time as new circumstances must be provided for. Consequently to keep conveyancing within rational bounds the legislature, both in England and the United States, has interfered from time to time, by sweeping away excrescences, and providing brief and simple forms. All instruments under seal are spoken of as deeds, but the term deed is usually understood as applying to conveyances of land. Every person capable of holding lands (excepting idiots, persons of unsound minds, and infants), seized of or entitled to any estate or interest in lands, may alien such estate or interest at pleasure, subject to the restrictions and regulations prescribed by law. In nearly all of the States of the American Union every grant in fee, or of a freehold estate, must be subscribed and sealed by the person from whom the estate or interest conveyed is intended to pass, or his lawful agent; if not duly acknowledged before its delivery, its execution must be attested by one or more witnesses (the number varies in the different States) and if not so attested it will not take effect as against a purchaser or encumbrancer until so acknowledged. A deed will not take effect, so as to vest the estate or interest intended to be conveyed, except from the time of its de-

livery. Almost any act of the party executing a deed, importing an intention to deliver it, will be sufficient, or it may be delivered as an escrow, on conditions, and will take effect on the performance of such conditions, from the time of the delivery. A deed should be founded on sufficient consideration, and it must not partake of anything immoral, illegal, or fraudulent.

Conveyer, a mechanism for conveying something, usually loose material, from one place, and depositing it at another place, distinguished in mechanics from a carrier. Conveyers may be divided into two general classes: those that operate with endless chains or belts, and those that travel along cableways or on a trussed support. These mechanisms have come into very extended use during the past 20 years, being employed in large excavating operations, and in handling coal, grain, cement, ore, and similar material. Their manufacture is carried on by a dozen or more concerns in the United States. One of the simplest and earliest forms of conveyer consists of a pair of endless chains, connected at intervals with cross-pieces or scrapers. These are used to pile up coal for storage. At the centre of what is to be the pile of coal a pole is erected, and to the top of this one end of the conveyer is attached, while the other end is located a little above the ground level, near a steam engine or other motive power. As coal is dumped within the space the scrapers convey it upward toward the pole, and as the lower end of the conveyer may be moved to any point in the circle about the pole, coal dumped anywhere in the circle may be smoothed up and pushed toward the centre, until all lies in a symmetrical pile.

A common form of conveyer consists of a sheet iron trough through which travels a linked belt or chain device having cross strips or scoops. Any loose material dropped in the trough is carried along by the scoops to the point where the linked belt bends for its return.

The Hunt conveyer consists of a series of sheet iron buckets or small cars, hung between parallel lines of flat links, that constitute chains. The buckets swing on trunnions or pivots placed above the centre of gravity, so that they always remain upright, no matter what is the inclination or route of the chains, until they reach a dumping or upsetting mechanism. The links have wheels that run on little tracks, so that the whole constitutes a miniature railway train. The cars or buckets will carry either liquid or dry material. This is called a noiseless conveyer, because the provisions for lubrication do away with all objectionable noise, the latter being a special nuisance with conveyers of the scraper type. The driving-wheel of the Hunt conveyer has a series of large pawls, that engage with pins on the links, and provide a slow, but steady and powerful motion. Capacity is obtained by the size of the buckets and not by speed.

Bucket conveyers, more or less similar to those just described, are commonly employed to supply large boiler plants with coal, and to carry away the ashes. In plants located by a waterway, such as that of the Arbuckle sugar refinery, the coal is hoisted in grab-buckets, direct from the hold of a vessel, and dumped into the buckets of a conveyer, which transports it to a large pocket or storage room located above the boilers. Thence the coal is fed through automatic stokers to the boilers. Running along below the boilers is another line of conveyer buckets that receives the ashes from the hoppers below the boilers and carries them out to a dumping place, which is often a large elevated hopper, from which the ash wagons can load by driving directly under it, and opening a discharge gate. All large railway terminal stations have a coaling-house arranged somewhat on the plan described. The coal is conveyed to overhead storage by the conveyers, and is dropped direct into the tenders as they come below. At the plant of the Philadelphia & Reading R.R. in Philadelphia monobar conveyers are employed, having a conveying capacity of 120 tons of coal an hour, while the set used to carry away the ashes dumped by the locomotives has a capacity of 20 tons an hour. Nearly all this capacity is needed at times, as the plant is sometimes called upon to load as many as 12 locomotives at once. The monobar conveyer referred to is of the scraper type, the scrapers being attached to a link-belt monobar chain, driven by equalizing gears. Bearing blocks are introduced to reduce the noise.

The Luther ore conveyer has met with considerable sale in Germany. This consists of a series of rectangular sheet-iron pans, moving on roller bearings. It travels quite swiftly, and is used for coal, ashes, sand, sugar, etc., as well as ore. When used for carrying coke, or any other material that tends to wear the metal pans, glass bottoms are employed, which give good satisfaction.

For lumber-mills and large wood-working plants a different style of conveyer is manufactured. The Schroeder Lumber Company's works at Milwaukee, Wis., afford a good example, being equipped with a sort of traveling sidewalk, consisting of parallel planks attached at right angles to two malleable iron chain belts. At intervals a thick plank is inserted to keep in place the hard wood lumber that is piled on to this conveyer, which is really a strip of moving floor for transporting boards to another part of the works. For handling waste ends and kindling, a smaller type of conveyer is used, having hoppers at intervals. Into one set of hoppers the machines that cut up the hard wood drop the end-pieces, etc. Into another set of hoppers the trimmings of soft wood are dropped, and both hard and soft wood are carried up an incline and dumped in an enormous hopper, where the hard and soft wood are kept separate, and may be withdrawn from below as wanted, for kindling or other purposes.

A conveyer has been devised for loading box cars, the loose material being introduced by a spout at the centre of the car, and carried by the conveyer to the ends, in such a manner that the ends are loaded high up, avoiding waste. These are used on the Hocking Valley Railway.

The belt conveyer is simply a long endless belt, supported at intervals by rollers or idlers, so shaped that they curve up the edges of the belt, enabling it to carry along material without spilling off. The belts are sometimes made of leather, but more commonly of cotton duck, faced with rubber. Such conveyers are used in grain elevators, and for ashes, cement, chips, clay, coal, concrete, earth, ore, oyster shells, tailings and the like. The storage tanks of grain elevators employ belt conveyers almost exclusively, the modern circular tanks having a

belt gallery that runs across the tops of the tanks and connects them. The belts thus distribute the grain from the main elevator to the several tanks.

In handling ore, labor is often reduced by means of sorting conveyers, which are made to serve the purpose of sorting tables, at the same time that they serve to convey the ore. These travel slowly, and men stationed at the sides examine the ore as it passes, breaking any pieces deemed too large for the process to which the ore is to be subjected. The large stone-crushing plants very commonly employ belt conveyers, as being the best adapted for handling broken stone. While belt conveyors are used to some extent for handling coal and ashes, they are restricted in use to inclinations of about 20°. For steeper work or direct elevation the bucket type of conveyer has to be employed. All the conveyers that operate with endless chains or belts normally deposit the material at the point where the chains or belts are curved over rollers or sprockets for return. For depositing the material at points along the route, various forms of trippers are manufactured, according to the nature of the conveyer and of the material handled. For filling a conveyer en route there are also in use numerous styles of fillers, many of them being simply spouts leading from hoppers, and others specially designed for the work they are to do.

The type of conveyer used on a cableway is radically different from the foregoing. A wheeled carrier is slung on a supporting rope, usually a steel wire rope, and from this carrier is hung the material to be conveyed. To the carrier is attached a rope, and a conveyer-engine at one end of the cableway pulls the load along to its destination. This is the system followed in coaling vessels at sea. The United States battleship Massachusetts was coaled in this manner during rough weather, the coal being carried aboard under these conditions at a rate of 20 tons an hour.

In excavating work, as the New York subway and the Chicago drainage canal, this type of conveyer is in constant use, owing to its economical construction and portability. The system is employed for handling sand, at glass works, etc.; for discharging cargo from a vessel to a shore where there is no wharf; for carrying material over rivers or rough land, as in new sections of country, where there are no good roads; for transporting the material used in building breakwaters and piers; in the building of dams and locks; and for a variety of purposes in connection with mines. A few conveyers have been built for permanent use, in which an overhead truss or bridge with a rail takes the place of the cableway.

In dredging and excavating there has been a great development of new machinery since 1885, some of which is sometimes called conveying machinery. A description of some of these will be found under the title EXCAVATING MACHINERY.

CHARLES H. COCHRANE.

Convict Labor. The introduction of industry into prison life, apart from its use to keep penitentaries in good order and good repair, is a product of 19th century reforms. Isolated cases it is true occur before. Mabillon, a Benedictine monk of the 17th century, urged a cellular system of imprisonment, labor in the cells, and gardens where prisoners might rest after the day's work. In 1704 Pope Clement XI. opened a prison at Rome, where the industrial feature proved successful in the case of boys. A famous prison built in Ghent in 1775 by Viscount Vilain XIV. had a well-organized labor system, intended to benefit the prisoner and make him useful to the state. Two years afterward John Howard published his work on 'Prison Reform.' But in practice before the beginning of the 19th century, and well into it, labor was considered in a penological bearing only as offering the possibility of severer punishment, an idea excellently typified by the Roman system of punishing the city slave by sending him to the country tread-mill, or by the terrible toil of the galley slave in Italy and France. This penal point of view was followed by the fiscal interest of the state and to a certain degree intermixed with it; the state will save, and if possible, make money by means of its use of the time and strength of the convict. Then the disciplinary interest became predominant; the convict will furnish us less trouble if we keep him at work. A further step is taken when the object of convict labor becomes moral and the prisoner is put to work to keep him from idleness, spring of so much vice, and to promote his ability to earn an honest livelihood upon his release. In the latest among these stages a distinct effort is made to furnish the convict with decent and pleasant work, and the old scheme of choosing the most revolting and dangerous, the most degrading and monotonous task has been done away with.

Unfortunately the evolution hinted at has not been completed, and traces of each of the ideals mentioned may still be found in the various systems of Europe and the United States. "At hard labor," for example, is still felt to be a degrading and aggravating addition to the sentence of detention. As far as actual business management is concerned there are two methods of convict labor. In the first, where the "product or profits of labor is shared by the state with private individuals or firms," we may mention three divisions, sufficiently characterized by their common names: the contract system, the piece-price system, and the lease system. The second general class, "systems under which convicts are worked wholly for the benefit of the state" or its parts, again falls into three divisions, the public-account system, the state-use system, and the ways and works system. Theoretically the piece-price system is best in the former class, as it keeps discipline in the hands of prison authorities and leaves business to the entrepreneur; moreover it lacks the faults of the contract system, which to a degree interferes with regenerating influences by the very monotony of highly specialized and largely divided industries. In the second class, the public account system, by which goods were made in prison, under the control of regular prison officers, and were sold in a rather haphazard way, has bulked so largely in the public eye, by reason of the attacks made on it by the representatives of free labor (who overlook the fact that cheaper production is offset by slower production, the prisoner being reckoned one half, or at most only two thirds as efficient as the average free laborer), that the other subclasses have been overlooked. Of these the state-

use system had only a limited field and could equally well be attacked by labor unions, which naturally desire to supply state institutions as well as other sources of demand. But the state-use system is growing; it is used in most of the northern States and is authorized by the Federal government for the Fort Leavenworth penitentiary.

The lease system calls for special notice. Its particular habitat is the South, where after the war a remodeling of the penitentiary system was demanded because of the addition of the negro factor to the problem, more than 90 per cent of convicts in most States being negroes. Both expense and the need of out-door work on the part of the negro made impracticable the continued use of walled penitentiaries, which moreover would have been quite inadequate under new conditions. The lease system came into general use in the late forties, and felons were worked in coal and iron-mills, saw-mills, and farms. A chief inspector had general charge, but the responsibility, which was scarcely more than nominal, was upon the lessee and his inspectors and physicians. In many States this system gave rise to horrible abuses. In Georgia it was abolished in 1897 and the State camp system put in its place. The death rate dropped from over 7 to 1.4 per cent in four years. Pay was allowed the prisoner who volunteered to do extra work, and the more brutal forms of corporal punishment abolished. But even in Georgia the county chain gang, made up of minor offenders, under supervision of county road commissioners, is still cruel and vicious. Worse than the county chain gang of Georgia, where only 45 per cent are hired to private individuals, is the system in other States. Alabama, notably by its contract law of 1901, which was declared unconstitutional in 1903 by a United States circuit court judge, made possible the following scheme of peonage: A minor offender and often a perfectly innocent person is sentenced to a light fine which the constable offers to pay for a certain number of months' work. At the expiration of this period a new charge is trumped up, or the negro induced to attempt escape, he is again tried and sent to the convict camp or fined for the benefit of the constable and his backers. The universal disapproval of this system in the South and the prompt action of the Federal authorities promise its immediate abolition.

On convict labor consult Vol. III. of the 'Report of the United States Industrial Commission' (1900); Liszt, 'Die Gefängnisarbeit' (1900); Wright, 'Prison Labor,' in the 'Catholic University Bulletin' (October 1899); and Roux, 'Le travail dans les prisons' (1902).

Convocation, an assembly of the clergy of England, belonging either to the province of Canterbury or to that of York, to consult on ecclesiastical matters. From the fact that the province of Canterbury is the more influential of the two, the Convocation of the province of Canterbury is often spoken of as "the" Convocation, as if there were only one. In both provinces the Convocation consists of two Houses, an upper and a lower. In the former sit the bishops, and in the latter the deans and archdeacons, along with the proctors, who represent the inferior clergy and the chapters of cathedral churches. In the Convocation of the province of York the usual practice has always been for all the members to sit in one House. Originally convocations were merely ecclesiastical councils that had no special privileges or recognized political status, but gradually they came to assume their present form, being endowed with the right of passing canons, of determining their own taxation, etc. When thus formed into an assembly, having certain political as well as ecclesiastical functions, there was only one Convocation for all England, and this lasted down to the beginning of the 14th century, when the clergy of the two provinces began to meet in separate Convocations. The archbishop of each province has the right of summoning Convocation, but he cannot do so without the royal consent, nor can the Convocation pass any canons without the same authority; and from its judicial proceedings there lies an appeal to the sovereign in council. In 1664 the practice of granting subsidies to the crown, in the exercise of the right of self-taxation enjoyed by the clergy, was discontinued, and since that time their functions have been mostly formal. In the reigns of William III. and Queen Anne the Convocation of the province of Canterbury recovered some degree of importance, but in 1717 that temporary influence was again lost, and from that year down to a recent period the practice was to prorogue the Convocation as soon as it had assembled. Since 1852, however, the Canterbury Convocation has met regularly two or three times a year for the transaction of business relating to the Church, and in 1861 it exercised its legislative power, the first time for a long series of years. On the opening of a new Parliament a new Convocation is summoned. If the crown desires to refer any question to Convocation, "letters of business" are issued, directing that question to be taken into consideration.

The term Convocation is also applied to the legislative bodies of the universities of Oxford and Cambridge.

Convolvulaceæ, kŏn-vŏl-vū-lā'sē-ē, or **Bind'weeds,** an order of herbaceous or shrubby plants, usually twining, with plaited corolla, imbricated calyx, alternate undivided or lobed and pinnatifid leaves; bell-shaped flowers, axillary or terminal; five free stamens; and fruit with two or three cells. Many of the order contain a milky and resinous juice possessing purgative properties more or less drastic. Jalap is derived from the *Convolvulus jalapa,* an inhabitant of Mexico and the southern parts of the United States; and scammony (*Convolvulus scammonia*) is a resinous substance possessed of nearly the same properties as jalap. Some species of the order have tuberous and fleshy roots containing a farinaceous and saccharine principle which fits them for food for man and beast. Among these is *Convolvulus batatas,* the sweet potato, originally from India or South America, but now cultivated in all countries where it can stand the climate. *Convolvulus dissectus* abounds in prussic acid and is one of the plants used in the preparation of the liqueur called noyau. The species of *Rhodorrhiza* yield by distillation an essential oil called oil of rhodium, which has a bitter balsamic flavor. Their wood, when powdered, forms an agreeable snuff, and when burned is very fragrant. There are about 40 genera and 900 species widely distributed.

Convolvulin, kŏn-vŏl'vū-lĭn, the purgative constituent of jalap ($C_{31}H_{50}O_{16}$), obtained from the root by treatment with water and strong alcohol. The alcoholic extract is mixed with water, boiled with animal charcoal, filtered, evaporated, and treated with ether as long as anything dissolves. Pure convolvulin is transparent and colorless, brittle at 212° F., fuses at a higher temperature to a clear liquid, and is decomposed by strong heating. It is insoluble in water and ether, but soluble in alcohol. It has no taste or smell. In doses of two or three grains it is a powerful purgative, and in larger quantities is fatal to animals. By treatment with alkalies it is converted into convolvulic acid, and by acids into convolvulinol ($C_{12}H_{24}O_3$) and glucose.

Convolvulus, the typical genus of the natural order *Convolvulaceæ* (q.v.), or morning-glory family, formerly known as bindweeds. There are about 175 species widely distributed in temperate and tropical climates, some 15 of which are found throughout the southern and western United States.

Con'voy (Fr. *convoyer,* "to accompany"), in nautical language, a fleet of merchantmen bound on a voyage to some particular port or general rendezvous under the protection of a ship or ships of war. The name is also given to the ship or ships appointed to conduct and defend them on their passage thither. It is used in much the same sense as the military term "escort."

Convulsion, a disordered action of muscles, known by violent, purposeless, and involuntary contractions. Single muscles or groups of muscles may be attacked, and sometimes the whole body is convulsed; and the contraction of the muscle may be of a tonic or clonic character. In the latter case the muscular spasm is of short duration and soon recurs, each spasm alternating with a period of relaxation; while in the former case the spasm is prolonged, and after a more or less lengthened period passes off. The chief diseases in which convulsions are a characteristic feature are epilepsy, hydrophobia, tetanus or lock-jaw, and Saint Vitus' dance or chorea. They are common also in inflammatory affections of the brain, in meningitis, for example, water-in-the-head, and in other brain affections; and in women hysterical convulsions are not uncommon. Again, convulsions occur in some diseases associated with the introduction of poisonous material into the blood, or the retention of waste substances that should have been expelled. Convulsions in women in childbirth, or afterward, are connected with such a condition, as well as convulsions attending kidney disease. In children convulsions are more common than in adults, and are associated with a more readily excitable condition of the nerve-centres, especially of the spinal cord and an undeveloped controlling action of the higher brain-centres. Children are often the subjects of convulsions during dentition, particularly when accompanied by a disordered state of the bowels or the presence of worms; and often these two latter conditions are the sole cause of convulsions in young persons. In every case the immediate cause of the convulsion is an irritation of some part of the nervous system leading to a sudden and disorderly discharge of nervous energy to the associated muscles, which are thus thrown into contraction.

Convulsionists, or **Convulsionaries,** a sect of religious fanatics originating among the Jansenists of France about 1730. Three years previously a charitable and ascetic deacon of Paris, one Francis, died, and was buried in the cemetery of Saint Médard, in one of the suburbs of the capital. Reports of miracles wrought at his tomb spread among the people, and soon the cemetery was the scene of extraordinary manifestations. As the devotees approached the tomb, many were seized with convulsions, or took to dancing and contortions, accompanied by shouts and other eccentric demonstrations. Some of their utterances were accounted as prophecies miraculously inspired by the venerated dead. Most of them were directed to the support of the Jansenist doctrines; but some of the fanatics, by denouncing the throne, and predicting its downfall as well as that of the Church, drew the attention of the government and the ecclesiastical authorities. The cemetery was ordered to be closed; but the same virtue that seemed to be possessed by the tomb was also inherent in earth surreptitiously obtained from it, and the manifestations continued. Imprisonment failed to stop them, but the fanaticism gradually died out in about 20 years. An account of this sect was published in Paris in 1864, entitled 'Histoire des Miracles et des Convulsion-Saint Médard.'

Con'way, Hugh. See FARGUS, FREDERICK JOHN.

Conway, Katharine Eleanor, American journalist and poet: b. Rochester, N. Y., 6 Sept. 1853. Since 1883 she has been an assistant editor of the Boston Pilot. Her published books include: 'On the Sunrise Slope' (verse); 'Watchwords from John Boyle O'Reilly' (edited); 'A Dream of Lilies' (verse); 'A Lady and her Letters'; 'Making Friends and Keeping Them'; 'Questions of Honor in the Christian Life'; 'Bettering Ourselves'; 'New Footsteps in Forbidden Ways' (travel sketches); 'Other Ways,' a novel; 'Lalor's Maples,' a novel, with Mrs. Erskine Clement; 'Christian Symbols and Stories of the Saints' (1886).

Conway, Moncure Daniel, American clergyman and author: b. Stafford County, Va., 17 March 1832. He was graduated at Dickinson College in 1849, entered the Methodist ministry in 1850, and later studied at the Harvard Divinity School. He held Unitarian pastorates in Washington, D. C., and Cincinnati. From 1863 to 1884 he was minister at South Place Chapel, in London, England, and again, 1892–7. Since 1900 he has lived in New York. His published books include: 'Tracts for To-day' (1857); 'The Rejected Stone' (1861); 'The Golden Hour' (1862); 'Testimonies Concerning Slavery' (1864); 'The Earthward Pilgrimage' (1870); 'Sacred Anthology' (edited) (1872); 'Idols and Ideals' (1874); 'Travels in South Kensington' (1875); 'Demonology and Devil Lore' (1879); 'The Wandering Jew' (1880); 'Thomas Carlyle' (1881); 'Emerson at Home and Abroad' (1882); 'George Washington and Mount Vernon'; 'Omitted Chapters of History Disclosed in the Life of Edmond Randolph' (1887); 'Pine and Palm,' a novel (1887); 'Life of Nathaniel Hawthorne' (1890); 'Prisms of Air,' a novel (1891); 'Life of Thomas Paine' (1892); 'Barons of the Potomac and the Rappahannock' (1892); 'Centenary History of

South Place Chapel' (1893); 'Solomon and Solomonic Literature' (1899). He edited the 'Works of Thomas Paine' (1893–6).

Conway, Thomas, general in American service: b. Ireland 27 Feb. 1733; d. about 1800. He was educated in France, and entering the army there became a colonel. He came to America in 1777 and offering his services to the Continental Congress was appointed brigadier-general, and subsequently inspector-general, with the rank of major-general. He intrigued against Washington to have Washington superseded by Gen. Gates, and he and his associates were known as "Conway's Cabal." He resigned in 1778, went to France, and was made governor of Pondicherry.

Conway, Sir **William Martin,** English explorer and mountain climber: b. Rochester, Eng., 1856. He was educated at Trinity College, Cambridge; was university extension lecturer 1882–5; professor of art at University College, Liverpool, 1885–8; and since 1901 has been Slade professor of fine arts at Cambridge. In 1892 he traveled extensively in the Himalayas, and in the Alps in 1894; he explored the interior of Spitzbergen 1896–7, and the Bolivian Andes in 1898, as well as the glaciers of Tierra del Fuego. Among the high peaks he has ascended are one in the Himalayas of 23,000 feet, and Aconcagua, Illimani, and Sorata in the Andes. He was knighted in 1895 and received a gold medal for mountain surveys at the Paris Exhibition in 1900. He has published: 'Woodcutters of the Netherlands in the 15th Century' (1884); 'Gallery of Art of the Liverpool Royal Institution' (1885); 'The Artistic Development of Reynolds and Gainsborough' (1886); 'Early Flemish Artists' (1887); 'Literary Remains of Albrecht Dürer' (1889); 'Dawn of Art in the Ancient World' (1891); 'Climbers' Guide Books to the Pennine and Lepontine Alps,' etc. (1890); 'Climbing and Exploration in the Kara-Koram-Himalayas' (1894); 'The Alps from End to End' (1895); 'The First Crossing of Spitzbergen' (1897); 'With Ski and Sledge over Arctic Glaciers' (1898); 'The Bolivian Andes' (1901); 'The Domain of Art' (1902); 'The First Italian Renaissance' (1902); 'Aconcagua and Tierra del Fuego' (1902).

Conway, Ark., county-seat of Faulkner County, on the St. Louis, Iron Mountain & Southern R.R., about seven miles east of the bend of the Arkansas River at Sevier, and 25 miles northeast of Little Rock in an air line. The town has an extensive trade in cotton, lumber, and flour. It is lighted by electricity, and governed by a mayor and council. The educational advantages are among the best of any of the agricultural towns of the State. The Methodist Episcopal Church South maintains Hendrix College, established in 1884. The town was founded in 1871. Pop. (1900) 2,003.

Conway, N. H., a town in Carroll County, famous for the beauty of its natural scenery, which makes its villages among the most popular summer resorts in the White Mountain region. The town lies along the Saco River, on the Boston & Maine R.R., about 75 miles north by west of Portsmouth. There are extensive granite quarries in the town, and a few lumber mills. Pop. (1900) 3,154.

Con'way, Conwy, or **Aberconwy,** Wales, a town and parliamentary borough of the county of Carnarvon, about 13 miles east-northeast of Bangor. It is picturesquely situated on the left bank of the Conway River, and is surrounded by an old wall still in good preservation, 12 feet thick, and fortified with towers and battlements. The old castle of Conway, erected toward the end of the 13th century by Edward I., is one of the most magnificent structures of the kind in England. Many parts of it are still entire, including the state hall, which is 130 feet long, 32 broad, and 20 high. A suspension bridge was thrown over the river in 1826, and in 1848 another bridge was built by Robert Stephenson for the accommodation of the Chester & Holyhead Railway. It is a wrought-iron tubular bridge on the same principle as the Britannia bridge over the Menai Strait. Conway unites with Carnarvon, Bangor, Criccieth, Nevin, and Pwllheli in returning one member to Parliament. Pop. about 5,000.

Conway, a river of Wales, rising from two head-streams, one in the southeast of the county of Carnarvon, and the other in the southwest of the county of Denbigh, which unite about 15 miles south of Conway. The united stream flows north, separates Carnarvon from Denbighshire, and falls into Beaumaris Bay after a course of from 25 to 30 miles. It is navigable to Llanrwst, or about 10 miles from its mouth.

Con'way Cabal', 1777–8, in American history: an intrigue headed by Horatio Gates, Charles Lee, Thomas Mifflin (then quartermaster-general), and James Lovell of Boston (Gates' confidant, and an unsparing contemner of Washington); with Thomas Conway as a tool. The prime object was to displace Washington by Gates; and there were plenty of other ambitions which hoped to reap advancement in the overturn. It gained its momentum from that popular clamor for immediate success in a war, which settles into patience and fair judgment as the war proceeds, but rarely before cruel and irremediable wreck has been made of the repute of capable officers. Washington's magnificent use of his slender resources, against superior force, obstructionism, and treachery, was not appreciated; Gates, wrongfully accredited with the laurels of Saratoga, was the hero of the moment, believed to be capable of restoring good fortune; and much better men than the above — the Adamses, Dr. Rush of Philadelphia, etc.— were anxious to have him placed at the head of the army. In November 1777 the Board of War was reconstituted: Gates was made president, with liberty to serve in the field at will — that is, put over Washington's head with power to supersede him; and shortly afterward Conway was made inspector-general, an indefinite position with limitless facilities for spite. Washington had previously opposed his promotion to major-general, on the confidentially expressed ground that he was an empty braggart and tireless beggar; and the angry and disappointed Conway, all impulse and vanity, joined the "cabal" so hotly that it was known by his name. His appointment was meant by the head conspirators as an open snub to Washington, in hope of forcing him to resign at once, or by Conway's power of insult and annoyance. Lovell denounced Washington without stint; anonymous letters were circulated, disparaging him and exalting Gates. Finally Conway sent Gates a letter with a pungent epigrammatic sentence

vilifying Washington; Gates showed it to his aide, James Wilkinson, whose career lacks no incidents but creditable ones; Wilkinson while mellow repeated it to a staff officer of Lord Stirling whom he met on business; Stirling was told of it, and at once warned Washington what his brother officers were writing about him. Washington wrote to Conway that he had been told of the sentence in a letter of his to Gates; Conway was alarmed and let Mifflin know it; Mifflin wrote to Gates that a copy of one of Conway's letters to him must have fallen into Washington's hands, and he ought to be more careful. Gates jumped to the conclusion that Alexander Hamilton, Washington's adjutant, must have rummaged his papers on a visit to his camp in the North; and at once wrote to Washington that some of his letters must have been privately copied, and unprincipled scamps like this should be ferreted out for fear they might betray secrets to the enemy, and that he had sent a copy of Washington's note to Congress — the aim being to discredit Washington as keeping spies to pry into other men's correspondence. Washington saw through the game, and told Gates so plainly enough. He explained precisely where his information came from; adding that he had told no one but Conway, to let him know he was watched, and Lafayette, not wishing to give the British hopes through discords in the army. Gates wrote again, denying that he had ever received more than one letter from Conway, or that even that contained the sentence quoted, and declared Wilkinson's assertion a libel. Unfortunately his second letter was belied by his first, and Washington briefly wrote as much. Then Wilkinson, who had been made secretary to the Board of War, challenged Gates, who denied that he had ever said any ill of him; Wilkinson was calmed till he afterward saw the letter in which Gates had given him the lie, when he wrote a furious letter to Congress against Gates and resigned his place. By this time the whole plot was blown abroad, and had begun to disgust the public with the meanness and trickery of it all, and with the members. Then Gates undertook to send Lafayette on a senseless expedition to Canada, promising him abundant men and supplies; and so utterly failed of providing either, and the scheme was so disapproved by the public, that it pricked the Gates bubble. Conway resigned conditionally, and to his misery and despair was taken unconditionally; Gates and Mifflin were removed from the Board of War, and Gates was assigned to the forts on the Hudson, with emphatic warning to report to Washington. The adherents or helpers of the cabal disclaimed all connection with it, and Conway shortly went to France.

Conwell, Russell Herman, American Baptist clergyman: b. Worthington, Mass., 15 Feb. 1842. He studied law at the Yale and Albany law schools, and was an officer in the Federal army in the Civil War. He was immigration agent of Minnesota in Germany 1867–8; foreign correspondent of the New York *Tribune* and Boston *Traveler* 1868–70; and practised law in Boston 1870–9. He was ordained in the Baptist ministry in 1879; was pastor of Grace Baptist Church, Philadelphia, 1881–91; founded Temple College in 1888; and has been pastor of the Philadelphia Baptist Temple since 1891. He has published: 'Why the Chinese Emigrate'; 'Woman and the Law'; 'Life of C. H. Spurgeon'; 'Acres of Diamonds'; 'Present Successful Opportunities'; 'Lives of the Presidents,' etc.

Co'ny, or **Co'ney,** an old name for the rabbit; used also in the English version of the Bible as a translation of a Hebrew word probably meaning the *Hyrax syriacus,* a rabbit-like animal common in Syria and Palestine, inhabiting clefts of rocks.

Conybeare, kŭn'ĭ-bēr, **John,** English prelate: b. Pinhoe, near Exeter, 31 Jan. 1692; d. Bath 13 July 1755. He studied at Exeter College, Oxford, received orders, and was curate at Fetcham in 1717. He returned to Oxford in 1718, became successively tutor in his own college, preacher to his majesty at Whitehall, rector of St. Clement's, Oxford, and in 1730 master of Exeter College. In 1732 he published his celebrated 'Defense of Revealed Religion,' in answer to Tindal's 'Christianity as Old as the Creation.' In that year also he was appointed dean of Christchurch; and in 1750 succeeded Butler as bishop of Bristol.

Conybeare, John Josias, English clergyman and scientist: b. London June 1779; d. Blackheath, Kent, 10 June 1824. He was grandson of John Conybeare (q.v.), and was educated at Oxford, becoming professor of Anglo-Saxon there in 1807, and of poetry in 1812. He was also vicar of Batheaston, Somerset. He published scientific papers on geology and chemistry, but is remembered chiefly for his 'Illustrations of Anglo-Saxon Poetry.'

Conybeare, William Daniel, English geologist and clergyman: b. London 7 June 1787; d. Itchenstoke, Hampshire, 12 Aug. 1857. He was a brother of J. J. Conybeare (q.v.), and became dean of Llandaff in 1844. He published various geological papers and was eminent among the geologists of his day.

Conybeare, William John, English clergyman: b. England 1 Aug. 1815; d. Weybridge, Surrey, 1857. He published 'Perversion,' a religious novel (1856); and 'Essays Ecclesiastical and Social,' but is principally known for his joint authorship with Dean Howson of the popular 'The Life and Epistles of Saint Paul' (1851).

Cooch Behar, kooch bā-hār', or **Kuch-Behar,** India, a native state and in political relation with the government of Bengal. It forms a level plain of triangular shape, intersected by numerous rivers, and is entirely surrounded by British territory. The greater portion of the soil is fertile and well-cultivated. The chief town, Cooch Behar, contains some handsome public buildings and a splendid new palace of the Maharajah, and has a population of 9,535. Area of state 1,307 square miles. Pop. 600,000.

Coo'dies, The, in the political history of the United States, a nickname applied to those members of the Federalist party in New York who favored the War of 1812. It was adopted from the fictitious name, Abimalech Coody, assumed by the leader of the faction, Gulian C. Verplanck (q.v.) when writing in the public prints.

Cook, Albert John, American naturalist: b. Owosso, Mich., 3 Aug. 1842. He graduated at Michigan Agricultural College 1862, and

was professor of zoology and entomology there 1869–93, when he became professor of zoology in Pomona College, Claremont, California. He was one of the first to make kerosene emulsion (1877), and to advocate and demonstrate the use of the arsenites as a specific against the codling moth (1880). He has published: 'Injurious Insects of Michigan' (1873); 'Manual of the Apiary' (1876; 14th ed. 1886); 'Silo and Silage'; 'Maple Sugar and the Sugar Bush.'

Cook, Albert Stanburrough, American educator: b. Montville, N. J., 6 March 1853. He graduated at Rutgers College 1872, and studied at Göttingen and Leipsic 1877–8, London and Jena 1881–2. He was professor of English in the University of California 1882–9, when he became professor of the same in Yale University. He is best known as an Anglo-Saxon scholar, and as an indefatigable editor of Anglo-Saxon and English literature texts and collections for use in high schools and colleges. His chief publications are: 'Siever's Old English Grammar' (translated) (1885); 'The Phonological Investigation of Old English' (1888); 'First Book in Old English' (1894); 'Glossary of the Old Northumbrian Gospels' (1894); 'Biblical Quotations in Old English Prose Writers. Part I.' (1898); a striking presidential address before the Modern Language Association in 1898; 'The Province of English Philology,' and with C. B. Tinker, 'Select Translations from Old English Poetry' (1902).

Cook, Charles, English Wesleyan clergyman: b. London 31 May 1787; d. Lausanne, Switzerland, 21 Feb. 1858. He entered the Wesleyan ministry in 1817. He traveled extensively in France and on account of his long continued evangelistic labors there is considered the founder of Methodism in France. See 'Life,' by J. P. Cook (1862).

Cook, Clarence Chatham, American journalist and art critic: b. Dorchester, Mass., 8 Sept. 1828; d. Fishkill, N. Y., 2 June 1900. He contributed to the New York *Tribune,* a series of articles on American art 1863–9; and subsequently was its Paris correspondent. He was editor of the 'Studio' until its suspension. He published: 'The Central Park' (1868); 'The House Beautiful' (1878); 'Stools and Candlesticks,' 'Essays on Beds and Tables,' and edited with notes a translation of the 7th German edition of Wilhelm's Lübke's 'History of Art' (1878).

Cook, Edward Dutton, English novelist and dramatic critic: b. London 30 Jan. 1829; d. there 11 Sept. 1883. He was dramatic critic to the *Pall Mall Gazette,* and the London *World.* His novels include: 'Paul Foster's Daughter' (1861); 'The Trials of the Tredgolds' (1864); 'Hobson's Choice' (1866). Other works by him are: 'Art in England' (1869); 'Hours with the Players' (1870); 'Nights of the Play' (1883).

Cook, Edward Tyas, English journalist: b. Brighton, Sussex, 12 May 1857. He was educated at Winchester College, and New College, Oxford, and was subsequently on the editorial staffs of the *Pall Mall Gazette* 1890–2; 'Westminster Gazette' 1893–6; and the London *Daily News* 1896–1901. He has published: 'Popular Handbook to the National Gallery'; 'Studies in Ruskin'; 'Popular Handbook to the Tate Gallery'; 'The Rights and the Wrongs of the Transvaal War' (1901).

Cook, Eliza, English writer of verse: b. Southwark 1818; d. Wimbledon, Surrey, 24 Sept. 1889. She began at an early age to contribute articles to various periodicals, and her first volume of verse, which appeared in 1840, was very successful. In 1849 she published 'Eliza Cook's Journal,' which appeared weekly until 1854. She published 'New Echoes, and other Poems' (1864), and in the same year received a pension from the Civil List. By their simplicity of theme and treatment her poems obtained a large measure of popularity in England and America. Her most familiar poem is 'The Old Arm Chair.'

Cook, Francis Ames, American naval officer: b. Northampton, Mass., 10 May 1843. He graduated at Annapolis 1863, and served for two years with Farragut in the West Gulf squadron. He became lieutenant-commander 1868; commander 1881, and captain in 1896. During the Spanish-American war he commanded the Brooklyn, the flagship of Commodore Schley's flying squadron, which took so conspicuous a part in the battle of Santiago, July 1898, when Cervera's fleet was destroyed.

Cook, Frederick Albert, American physician and explorer: b. Callicoon Depot, Sullivan County, N. Y., 10 June 1865. He graduated at New York University 1890. He was surgeon of the Peary Arctic expedition 1891–2, and of the Belgium Antarctic expedition 1897–9. He has received the decoration of the Order of Leopold, the gold medal of the Belgian Royal Society, and the silver medal of the Belgian Royal Geographical Society. He has written articles for the leading magazines, describing life in the polar regions, and a valuable account of his Antarctic experiences and scientific observations, entitled 'Through the First Antarctic Night' (1900).

Cook, George Hammell, American geologist: b. Hanover, N. J., 5 Jan. 1818; d. New Brunswick, N. J., 22 Sept. 1889. He graduated at Rensselaer Polytechnic Institute, Troy, N. Y., 1839, was senior professor there 1842–6, when he went to Rutgers College, remaining there until his death. At different periods of his service he taught chemistry, natural history, geology, and agriculture. In 1864 he was elected vice-president of the college, and appointed State geologist the same year. In 1880 he was made director of the New Jersey agricultural experiment station. His writings consist chiefly of special contributions to scientific journals, his annual reports as State geologist, and a 'Geology of New Jersey,' published by that State in 1868.

Cook, James, English navigator: b. Marton, North Riding of Yorkshire, 27 Oct. 1728; d. Hawaii 14 Feb. 1779. After a meagre education he was apprenticed to a shop-keeper at Snaith, a small town on the sea-coast. Here he acquired a taste for the occupation of a sailor, and at the commencement of the French war in 1755 entered the royal navy. In 1759 he was made master of the Mercury, which belonged to the squadron sent against Quebec, and performed the hazardous service of taking soundings in the river St. Lawrence opposite the French encampment. He also made a chart of the river St. Lawrence below Quebec in a very satisfactory manner.

In 1768 he was appointed to the command of a vessel destined to convey to the Pacific Ocean persons employed by government to make observations on the transit of Venus. The transit of Venus, 3 June 1769, was advantageously observed at Otaheite; the neighboring islands were explored, and Cook then sailed for New Zealand. Six months were employed in examining the shores of the islands; after which he took his departure for Australia, the eastern coast of which he attentively surveyed. On his return he was raised to the rank of master and commander in the navy. An account of the voyage, drawn up by Dr. Hawkesworth, was speedily published, and a second expedition was planned to explore the Antarctic regions.

On this occasion two ships were employed — the Resolution, of which Capt. Cook had the command, and the Adventure, under Capt. Furneaux. After proceeding as far south as the latitude of 71°, where a barrier of ice opposed any further progress, discovering the island of New Georgia in lat. 54° S., and visiting Otaheite and other places, Capt. Cook returned to Great Britain in 1775. The captain having communicated to the Royal Society a paper describing the regulations and remedies which he had adopted, he was chosen a Fellow of that body, and his experiments were rewarded by the Copleian gold medal. Government rewarded him with the rank of post-captain in the navy, and the appointment of captain in Greenwich Hospital. The narrative of this voyage was drawn up by Capt. Cook himself, and was published at London in 1777.

In July 1776 he sailed on an expedition to ascertain whether any communication existed between the Atlantic and Pacific oceans in the Arctic regions. In this voyage he again commanded the Resolution, which was accompanied by the Discovery, and explored a considerable extent of the western coast of North America. He also discovered the Sandwich Islands, and to Hawaii, one of this group, he returned from his American survey to pass the winter of 1778. In February Capt. Cook sailed for Kamchatka, but was compelled by an accident to put back to Hawaii. A boat having been stolen by one of the islanders, the captain went on shore to seize the king of Hawaii, and keep him as a hostage till the boat was restored. The people, however, were not disposed to submit to this insult; their resistance brought on hostilities, and in attempting to reach his boat Capt. Cook and some of his attendants became victims to the fury of the irritated islanders. A complete account of this third voyage appeared in 1784. The first two volumes were by Capt. Cook himself, and the third by Capt. James King. A medal in commemoration of him was struck by order of the Royal Society; his eulogy was pronounced in the Florentine Academy, and was made a prize subject by one of the French scientific societies. Consult Kippis, 'Life of Captain James Cook' (1788); Besant, 'Captain Cook' (1890); Wharton, 'Captain Cook's Journal During His First Voyage Round the World' (1897); Synge, 'Captain Cook's Voyages Round the World' (1897).

Cook, Joel, American journalist: b. Philadelphia, Pa., 20 March 1842. He was admitted to the Philadelphia bar 1863, but adopted journalism as a profession. He was a war correspondent with the Army of the Potomac, 1862–3, went on the editorial staff of the Philadelphia *Public Ledger* 1865, and has been its financial editor since 1883. He is also president of the City National Bank in Philadelphia. He has published: 'The Siege of Richmond, May-June 1862' (1862); 'A Holiday Tour in Europe' (1879); 'An Eastern Tour at Home'; 'Brief Summer Rambles near Philadelphia' (1881); 'England, Picturesque and Descriptive' (1882); 'America, Picturesque and Descriptive' (1900).

Cook, Joseph, American lecturer and author: b. Ticonderoga, N. Y., 26 Jan. 1838; d. there 24 June 1901. He was graduated at Harvard and Andover, and after three years' preaching went to Europe in 1871, where he studied in Germany, and made a tour of the Mediterranean countries. In 1873 he began a series of «Monday Lectures» in Boston, which, endeavoring to harmonize science and religion, and discussing social and political questions, became very popular; and in 1880 began an extended lecturing tour around the world. Besides his lectures, he published a number of works on such subjects as 'Biology' (1877); 'Transcendentalism' (1877); 'Marriage' (1878); 'Heredity' (1879); 'Labor' (1880); 'Socialism' (1880); 'Occident' (1884); 'Orient' (1886).

Cook, Mabel Collins, English novelist: b. Guernsey 1851. She was the oldest child of Mortimer Collins (q.v.), the novelist, and was married to Keningale Cook in 1871. Her writings, which include works on theosophy as well as novels, comprise: 'The Star Sapphire'; 'The Prettiest Woman in Warsaw'; 'Blossom and Fruit'; 'A Debt of Honor'; 'Vivian Romance'; 'The Story of the Year'; 'Light on the Path'; 'The Idyll of the White Lotus'; 'Through the Gates of Gold.'

Cook, Theodore Andrea, English journalist and author: b. Exmouth, Devonshire, 28 May 1867. He was educated at Wadham College, Oxford, and was on the editorial staff of the 'Saint James's Gazette' 1897–1900. He has published: 'Old Touraine'; 'Rouen' in 'Mediæval Towns Series'; 'Tobogganning at Saint Moritz'; 'A History of the English Turf'; 'An Anthology of Humorous Verse'; 'The Spiral in Nature and Art.'

Cook, Thomas, English excursionist: b. Melbourne, Derbyshire, 22 Nov. 1808; d. 19 July 1892. In the earlier portion of his career he was prominently identified with the temperance cause, but becoming convinced that traveling habits on the part of persons in general might be induced by energetic efforts to that end, he began 5 July 1841 by running an excursion train between Leicester and Loughborough on the Midland Railway, England. This was the first publicly advertised excursion train in England. From this small beginning the enormous business of Thomas Cook & Son, Managers of Tours and Excursions (known as «Cook's Excursions») was subsequently evolved. To John Mason Cook, son of the founder (b. January 1834; d. 4 March 1899), the present scope of the business is mainly due. The existing firm is composed of the three grandsons of the founder. To such an extent has the «Cook's Excursion» business developed that the company now has agencies all over the globe, the head office for the United States being in New York.

Cook, William Wilson, American lawyer: b. Hillsdale, Mich., 16 April 1858. He graduated at the University of Michigan 1880, and from its law department in 1882. He is general counsel for the Postal Telegraph Cable Company, and the Commercial Cable Company. He has written: 'Treatise on the Law of Stock and Stockholders as Applicable to Railroad, Banking, Insurance, etc., Corporations' (1887); 'Trusts: their Character, Legality, and Mode of Organization' (2d ed. 1888).

Cook Islands, or **Hervey Archipelago,** in the Pacific, situated near lat. 20° S. and lon. 158° W. The largest islands of the group are Raratonga, Atiou, Mangaia; Raratonga, the largest, has an area of about 32 square miles. The lack of water is in part overcome by the natives using the milk of the cocoa-palm as a substitute. The trade is chiefly with New Zealand; but few products are exported, although coffee, oranges, copra, and other tropical productions flourish. The islands were named after Capt. James Cook, who discovered them in 1773 (see COOK, JAMES). The natives, nearly all of whom are Polynesians, are now Christians. Great Britain took possession in 1888; in 1900 the islands were affiliated in government with New Zealand. Raratonga has a population of about 6,000, the whole group has about 100,000.

Cook, Mount, the highest peak of Australasia; is one of the southern Alps near the centre of the range, on the west side of the South Island of New Zealand. It is 12,349 feet high, is covered with perpetual snow (the snow-line being 3,500 feet lower than in Switzerland), is difficult of access, and was scaled for the first time by the Rev. W. S. Green on 2 March 1882.

Cook Strait, the channel which separates the two principal islands of New Zealand, is from 20 to 80 miles in width; discovered by Capt. Cook in 1770.

Cooke, Charles Wallwyn Radcliffe, English author: b. Herefordshire. He was educated at Emmanuel College, Cambridge, and has published 'Thoughts on Men and Things, by Angelina Gushington'; 'The Diary of Samuel Pepys whilst an Undergraduate at Cambridge'; 'A Treatise on the Agricultural Holdings Act'; 'Four Years in Parliament with Hard Labor'; 'A Book About Cider and Perry'.

Cooke, George Frederick, English actor: b. Westminster 17 April 1756; d. New York 26 Feb. 1811. He made his first public appearance at Brentford in 1776; and in the period between 1784 and 1800 became very popular in the English provinces and in Ireland, attaining a front rank in his profession. From 1801 to 1810 he played at Covent Garden both in comedy and in tragedy, and rivaled Kemble in the public favor. His best characters were Richard, Shylock, Iago, Sir Giles Overreach, and Sir Pertinax MacSycophant. In 1810 he visited the United States and appeared before enthusiastic audiences in the chief cities. A monument marks his grave in St. Paul's churchyard in New York city, erected in 1821 by Edmund Kean, who regarded Cooke as the greatest of actors.

Cooke, George Willis, American Unitarian clergyman and author: b. Comstock, Mich., 23 April 1848. He was educated at Olivet College, Michigan, studied for the Unitarian ministry at Meadville Theological School, and was ordained in 1872. He has since held Unitarian pastorates in Wisconsin, Michigan, Indiana, and Massachusetts. He has published 'Ralph Waldo Emerson, his Life and Writings' (1881); 'Life of George Eliot' (1883); 'Poets and Problems'; 'The Clapboard Trees Parish, Dedham: a History' (1887); 'A Guide Book to the Poetic and Dramatic Works of Robert Browning' (1891); 'The Spiritual Life' (1893); 'Biography of John Sullivan Dwight' (1898); 'History of Unitarianism in America' (1903).

Cooke, Jay, American financier: b. Sandusky, Ohio, 10 Aug. 1821. He entered mercantile life at 15. Having learned banking he founded in 1858 the house of Jay Cooke & Company, which financed the Civil War bond issues of the United States to the extent of $2,000,000,000. The house failed in 1873, causing widespread financial panic. In 1894 he re-established his fortune, investing in Western land and securities.

Cooke, John Esten, American novelist: b. Winchester, Va., 3 Nov. 1830; d. near Boyce, Va., 27 Sept. 1886. He was an extensive contributor of stories, sketches, and verses to various periodicals, and published many books, among which are: 'The Virginia Comedians' (1854); 'Leather Stocking and Silk' (1854); 'Hilt to Hilt' (1869); 'Life of General Robert E. Lee' (1871); 'Virginia, a History of the People' (1883); 'The Youth of Jefferson'; 'Surry of Eagle's Nest'; 'Wearing the Grey'; 'Pretty Mrs. Gaston'; 'Virginia Bohemians'; 'My Lady Pokahontas' (1885).

Cooke, John Hunt, English Baptist clergyman: b. London 4 June 1828. He was educated at Stepney College and after entering the Baptist ministry held pastorates at Clerkenwell, Southsea, and Richmond. He was 20 years editor of 'The Freeman,' and also editor of the 'Baptist Visitor,' which he founded, for an equal term. He has published: 'The Preacher's Pilgrimage a Study of Ecclesiastes'; 'A Grammar of Harmony'; 'The Work of the Holy Spirit'; 'A History of Baptism'; 'Heaven: an Inquiry'; 'Life of King Alfred.'

Cooke, Josiah Parsons, American chemist: b. Boston 12 Oct. 1827; d. Newport, R. I., 3 Sept. 1894. He was professor of chemistry at Harvard University (1850–94), and lectured on scientific subjects in various cities and towns throughout the country. Besides a number of technical works, he wrote: 'Religion and Chemistry' (1864); 'Scientific Culture' (1881); 'The Credentials of Science the Warrant of Faith' (1888).

Cooke, Philip Pendleton, American writer: b. Martinsburg, Va., 26 Oct. 1816; d. 20 Jan. 1850. He graduated at Princeton in 1834, and began the practice of law before he was 21. He devoted himself chiefly to literature and hunting, becoming a popular writer of lyric verse. He was a frequent contributor to the 'Southern Literary Messenger' and his story, 'The Chevalier Merlin,' was appearing in it at the time of his death. Of his poems the best known are: 'Florence Vane,' which has frequently been set to music, and 'Rosa Lee'; and of his short stories, 'The Crime of Andrew Blair,' and 'The Gregories of Hackwood.' His sole pub-

lication in book form was 'Troissart Ballads, and Other Poems' (1847).

Cooke, Philip Saint George, American military officer: b. near Leesburg, Va., 13 June 1809; d. Detroit, Mich., 20 March 1895. He was graduated at West Point in 1827 and rose to the rank of brigadier-general. In the Mexican war he commanded a regiment in the city of Mexico, and in the Civil War sided with the Union and greatly distinguished himself in the Peninsular campaign. He was the author of works on tactics, and of 'Scenes and Adventures in the Army'; 'Conquest of New Mexico and California' (1878).

Cooke, Rose (Terry), American poet and story writer: b. West Hartford, Conn., 17 Feb. 1827; d. Pittsfield, Mass., 18 July 1892. She married Rollin H. Cooke in 1873. Her complete poems were published in 1888, 'The Two Villages' being her best-known poem. Her short stories treat of New England rural life, her most acceptable work appearing originally in the 'Atlantic Monthly' and other periodicals. Her published books include: 'Poems' (1860); 'Happy Dodd' (1878); 'Somebody's Neighbors' (1881); 'The Sphinx's Children and Other People's' (1886); 'Complete Poems' (1888); 'Steadfast,' a novel (1889); 'Huckleberries,' a collection of short stories (1891).

Cooke, Sir William Fothergill, English electrician: b. Ealing, Middlesex, 1806; d. 25 June 1879. He served in the Indian army from 1826 to 1831; and, after studying medicine at Paris and Heidelberg, abandoned this for telegraphy, and in 1837 entered into partnership with Prof. Wheatstone. After experiments on various railway lines, they patented the single needle apparatus in 1845. In 1846 Cooke formed a company, which paid $600,000 for the partners' earlier patents. In 1867 Cooke and Wheatstone received the Albert gold medal; Wheatstone was knighted in 1868, and Cooke in 1869.

Cookery, the art of preparing food for eating. The savage does little or no cooking; he lives on roots, fruits, insects, and raw flesh, and when he cannot procure food, he twists his belt tighter and tighter; the barbarian makes a fire and hunts and fishes, but still eats much of his food raw, or with the slight disintegration of fibre given it by the motion of his body as he carries the food on his steed. Neither cares for variety, nor has any purpose in eating other than to satisfy hunger. With the development of agriculture, came an increase in food supplies, in the use of fire in cooking, and an advance in civilization; and with the development in man's social nature, eating ceased to be a mere grabbing game, and food was shared with friends,—and strangers also, for there were no public inns,—as an evidence of good will. Later, feasting was a part of all hospitality, and banquets in honor of the gods, of victory, or some special event, came to be considered the highest form of social physical enjoyment. As the ancients in times of prosperity sought the rarest foods (500 nightingales' tongues were often made into one pie), and served them in the most costly manner (whole cities being ruined, it is said, where Xerxes was entertained for two meals), so history repeats itself, and some modern hosts spare no labor or expense in setting before their guests the most unique concoction their chef can prepare, as the highest expression of good will. But they often have no concern as to the nutritive effect of their offering. The thoughtful person feels that extravagant cooking and riotous feasting are not necessary to true hospitality, nor to the genuine enjoyment of food. He has learned that the true reasons for cooking food are:

First, to have the time and energy needed to digest and assimilate unprepared food, to use in getting a living and developing his mental and moral nature.

Second, to facilitate mastication and digestion, by softening hard and tough substances, changing starch into dextrin, sugar into caramel, and connective tissue into gelatin, developing improved flavors and odors, and having at least a part of the food warm.

Third, to destroy parasites and disease germs.

Fourth, to keep foods which are perishable that he may enjoy them when out of season.

The cooking of food includes several important processes, not always considered, some of which call for the highest degree of intelligence; but too often cooking is regarded merely as a form of manual labor. Taking these in their natural order we have:

Selection.— This was once a question of mere environment; food nearest at hand being the "Hobson's choice" of the savage, as it now is of the very poor in many lands. Climate and non-intercourse with other nations limit choice, as invasion, travel, and increased trading facilities extend it. From the limited, but not always scanty fare of the Pilgrims, to the cosmopolitan markets of the present day, is a wonderful advance, and the modern American often yields unwisely to their temptations. Appetite guides us safely in this choice of material, when it has not been impaired by too great indulgence in improper food. To select from this vast supply, food sound in texture, free from adulteration, seasonable, not exorbitant in price, adapted to individual need, and suitable in quantity, needs no small amount of judgment in the buyer, who often must also be the cook.

Separation.— The removal of the inedible from the edible portions of food is important, for the thoroughness with which it is done, has much to do with making food palatable. Perhaps in no other part of the work has there been greater improvement over the primitive methods, as man's idea of what is inedible takes him farther and farther away from the savage, some of whose methods are too repulsive to bear allusion. Our forebears were entertained before the feast by the slaughtering of animals in their presence, but now the refined taste is offended by the sight of a fowl dressed for the table in his discarded feathers; or a bit of hull in a supposed-to-be coreless apple, or food served in inedible scooped-out skins.

Combination.— The union of various materials often produces a more palatable food than any one would give alone. Association, custom, and appetite have much to do with deciding whether certain combinations are harmonious or otherwise. Saffron, tansy, asafetida, decayed fish powder, and hosts of other strange flavorings, do not appeal to us, although highly prized by other nations. Pies,

supposed to be filled with delectable compounds, but out of which dwarfs sprang and danced, and blackbirds sang, pleased our ancestors; and surprise is still a pleasant element in cookery. But it is not pleasant to find the biscuit which was supposed to be sweet with the nutty flavor of the wheat, redolent with alkali.

Literature is replete with legends of the accidental discovery of the improved flavor found in a bit of the forbidden flesh on the altar, of fish rescued from burning seaweed, of bread made lighter with a portion of left-over dough, and of many others which led to new ways of preparing food. The most fanciful legend seems credible when we remember the many times in one's own experience when accident or necessity has led to new combinations. Scientific proportion, correct measurement, thorough mixing, and sufficient judgment to allow for the "total depravity of inanimate things" are needed to insure uniform results. So to blend materials that they will develop "what ingenious cooks the relish call" is the fundamental principle of cookery, for "all foods are tasteless till that makes them good." It is the undesirable combinations of the odors from the different foods in the ovens and kitchens of many hotels and restaurants, that makes the unsatisfied boarder long for home cooking.

The Belgians, Swiss, and Austrians are said to have best acquired the art of retaining in a high degree in each food, its full essence, aroma, and properties, so that each dish has no odor or flavor from another. It is said one of the Roman epicures had a separate cook and separate kitchen for each dish.

Too much time and thought are given to the making of new combinations merely to gratify the desire to excel one's neighbors in our luncheon. This causes great nervous strain and physical fatigue, and imposes upon the guests, a deal of unnecessary work for their digestive organs in the undoing of these combinations.

Manipulation.— For the manual part of cookery, tools and utensils are needed, which if wisely selected, will not oblige one to say with Telemachus,

> Lend me, I pray you, the sauce pans
> In which you boiled your beans.—*Timocles.*

That cook is fortunate who has the strength and endurance needed for the back-and-arm-aching parts of the work, and still more fortunate if she possesses the deftness of hand and keen sense perception of the culinary artist; for we cook by the senses of touch, smell, and hearing, as truly as by sight and taste. And those for whom she cooks are happy indeed if she knows how to apply heat (see *Methods*) in the way that food will yield the greatest amount of nutriment in the shape best fitted for the body to assimilate it, otherwise much food will be wasted in the cooking and wasted in the body.

Decoration.— This is the last step in the manual part of cookery, but an important one, for "the imagination should be fed when we feed the body, they should both sit at the same table." Those who labor with the larger muscles are usually sufficiently hungry to eat whatever is clean and wholesome; but the non-hungry person, or one who works with the small muscles of the hands or eyes, needs the stimulus which the senses of sight, smell and taste send to the stomach, to arouse his sense of hunger. This class of persons increases as civilization advances. There are some foods which if one ate them blindfolded, would satisfy the mouth and the stomach would not demur. The nose rebels at Camembert, but the mouth approves. The eye should not be pleased and the tongue offended, but all these "gate tenders of the stomach" should agree in approval, if we would derive the best effect from our food. The tendency of the modern cook to make superfluity of garnishing conceal both merit and defect in material, is to be deplored. Simplicity in design, harmonious blending of color and material, enhancing rather than disguising the individuality of each dish, with the least expenditure of money and labor, are most to be desired, and make of this indeed a fine art.

> To take some meat that some one else has bought
> And then to dress it tolerably, is
> What any cook can do.
> A perfect cook is quite another thing,
> For there are many admirable arts,
> And of all of these he must be thorough master,
> Who would excel in this. He first must have
> A smattering of painting and indeed
> Many the sciences which he must learn
> Before he's fit to think of cookery.—*Nichomachus.*

Cookery as a Science.— But little thought was given to this aspect of cookery by the ancients; probably more among the Greeks than among other nations, for the Greeks worshipped Hygeia, the goddess of health, and lived on coarse foods, barley bread, oil and wine. Wheat was called the "marrow of man" and "running, fatigue, hunger, and thirst" were their seasonings. Cookery attained a high degree of development during the Attic Age. The following quotations show that the Greeks understood the qualifications of a cook, and the effect of heat and water on food; and the third hints that our kitchen maids of to-day were not the first cooks who hurried up the fire with oil.

> His mind must comprehend all facts and circumstances;
> Where is the place and what the time for supper;
> Who are the guests and who the entertainer;
> What fish to buy and where to buy it.—*Atheneaus.*

> Fish that are fat are pleasant to the palate, but heavy and difficult of digestion, therefore they are better cured or roasted, for by that process their fatty parts are got rid of. Oysters when boiled get rid of most of their saltness which they infuse into the water which boils them, and this water is apt to disorder the stomach; but roasted oysters have all their evil properties removed by the fire.—*Mnesithus.*

> Placing all my pans upon the fire, I soaked the ashes well with oil, to raise a rapid heat.—*Archedius.*

The cook held the life and honor of his master in his hands, so common was poisoning by food; honors and wealth were bestowed upon those who had ability; those from Sicily ranking highest.

It was not until chemistry had advanced to the position of an exact science, and had evolved methods of analysis for organic substances, that the nature of food constituents, the changes in the nutritive value of food brought about by cooking, and what becomes of food in the body, could be determined.

Although vast strides have been made since Count Rumford, an American, who lived in Europe the latter part of the 18th century, taught the world how to cook and was the first to note the changes in the nutritive value of food on a large scale, the insight and method of the scientist,— the science of cookery is yet in its infancy.

The Agricultural Department in Washington has done a fine work along the lines of scientific analysis and experiment in food values, and its bulletins, issued frequently and free to any one on application, supply the latest and most reliable information. Investigations have also been made by many of the most civilized nations into the best way of preparing food for the army and the inmates of prisons and hospitals. Chefs gain their knowledge of the art of cookery by apprenticeship to noted chefs, taking a long and thorough training in every branch of the work. In Germany young ladies of the best families are trained in the kitchens of the nobility, and there are probably no better cooks and housekeepers in any land. Training in the home, by "mother's way," is all the teaching many skilful housekeepers have received, but this, combined with judgment and faculty, has produced much good work.

During the last half of the 19th century, schools for instruction in cookery were opened in England, the agricultural colleges of the West, New York, Boston, and other large cities. Here not only the art, but the scientific principles were taught, and the pupils included children from the mission schools, servants, housekeepers, young and old, college and medical students, and ladies of wealth and leisure. The first outgrowth of this beginning was the establishment of schools for the training of teachers of cookery, and later cooking was made a part of the regular course in the public schools. Boston led in this part of the work, and now at the beginning of the 20th century, there are but few States in the Union and but few European countries where cooking schools are not found in successful operation.

Literature.— Cooking and feasting have been the theme of brush and pen, of song and romance in all countries, and from the earliest days of book-making, cookery has had quite a literature of its own. The names of Archestratus, Herodotus, Homer, Apicius, Lucullus and many others, are associated in the minds of the student, with the cookery and banquets of the Greeks and Romans. To attempt to enumerate those who have helped in the development of modern Italian, French, and English cookery, would be to do injustice to many of whom limited space would prevent mention. If one were to ask for the catalogue of culinary literature in any large public library in America, it would be found to be quite a volume, so rapidly has the literature of cookery multiplied, since it has taken front rank among the arts and sciences.

It has been claimed that men are the only really good cooks, chiefly because they make it their business for life and strive to excel in the art, whereas women adopt it only as a means of support until marriage relieves them from its necessity. And Dr. Johnson said that "women could not write good cook books." Perhaps men are better fitted to be chefs in hotels and large establishments, and to work with and manage a great body of men, and from having no other duties they have had ample time and means to give the subject more study. But when we recall the many women who have always prepared good, wholesome (if not fancy) food for their large families,— those who have catered to institutions, and those who have done fine work in teaching the science of cookery in schools and by their books and lectures, we question the statement. The American cook book of the 20th century is not a mere compilation of untried and inaccurate recipes, it is not a record of only one person's experience, where much is left to judgment, nor of a style of living too extravagant for the average home; but it is an evolution from the best experience of all nations, a collection of exact formulæ deduced from actual experiment, giving the results of the latest scientific research, and all presented in an entertaining way in the best literary style.

Evolution.— The evolution of cookery as traced in food, would be something after this order: The first foods were natural; milk, wild fruits, and vegetables, flesh and fish, eggs and animal fats, honey and salt, oily seeds, and beverages made from simple fermentation of fruit-juices and of milk. The second stage might be called one of cultivated and manufactured or combined foods: the cereals, grains, and legumes were developed into bread, cakes, puddings, and malted drinks, milk into butter and cheese; intercourse with other nations brought a greater variety of vegetables, fruits, condiments, and beverages. The present stage is one of refined foods. The refinement of flour and yeast, the concentration of the sapid principle in meat and its use in soups and sauces, the refinement of fruit and vegetable juices into sugar, and its increased use in fancy cakes, pastry, desserts, and artistic confectionery, are typical of the most advanced and refined forms of cookery.

In tracing the evolution of cookery among different nations, we find it has had the customary rise and fall of all the arts; increasing in variety, magnitude, and indulgence with the growth and prosperity of each nation; its national characteristics always largely determined by climate and natural advantages, but varied by invasion, intermarriage of rulers and nobility, and the advance of civilization. Persia with her fruits, sweets, wines, and her lavish display, modified the simplicity of the Greeks; the luxury and extravagance of the Romans disappeared under the invasion of the Goths, who cared only for wild fruits, fowl, venison, horseflesh, and curdled milk. During the Middle Ages the best cooking was done in the monasteries. They had ample means and their many fast days incited them to the invention of many disguises. In Italy during the Renaissance, cookery, with the other arts, became more refined, and France soon felt the influence, through the Medici. She had early learned economy through necessity from famine and the exactions of her rulers; her many revolutions compelled every peasant to learn to make something savory of weeds, acorns, snails, rats, and other things which many nations reject. Modern French cookery dates from Louis XIV. and attained great height under his successors. The nobility and even royalty spent much time concocting new dishes, Richelieu made mayonnaise, and Bechamel, the sauce bearing his name. The French made great use of meat essence as a dressing for meats, and it was considered a great improvement over the oil of the south and the animal fats of the north. Large amounts of meat, poultry, and game were often used solely to secure a small amount of glaze with which to dress an entrée; this shows an

extravagant as well as an economical side to French cookery. Under Napoleon French influence was widelv extended and it is said he left a French chef in every land he invaded. There are more chefs from France in America than from any other country. Austria and Switzerland rank next to France in excellence of home cookery. England's love for pork began with the Saxon invasion, and though condemned by some of her colonists, it is yet the main stay of her laboring classes. The coarse tastes of the Danes were modified by the soups and stews of the Normans. Many of our culinary terms are of Norman origin, and the surnames Cook and Butler came from professionals in that line. After groaning for centuries under saddles and sirloins, England's tables became more simple, for after the Reformation rich cooking was considered popish. Although modified by the modern French, England is still the great meat-eating nation. "The English do their culinary work at the table with their palate-scorching table sauces, but the French do theirs in their saucepans." Scotland with her barren hills, lacked vegetables, but mutton, game, and fish were abundant; her cock-a-leekie and haggis show the influence of France.

There are still a few distinctly American dishes, many of them borrowed from the Indians, some made from native products, but a large number are but modifications of the customs in the homes of the earliest settlers. The Yankee's love for pie may be traced to the mother country, and for the doughnut to Holland. The Dutch left a strong impress on New York and the Germans in the middle States. Extravagance in methods, great waste of fuel and material and the indigestibility of some of our national dishes, have been our defects, but a large part of genuine American cookery will compare favorably with that of other nations. Within the last half century travel and wealth have changed our tastes in a measure, enabling many to have chefs from abroad who command very high salaries. But little has been gained from that nation whose daughters were the first to whom we relegated our kitchens and our cooking, except about the cooking of our most common vegetable. We have gained far more of value from the sons of China and Japan. France has done more than any other nation in teaching us economy and artistic effect, and the influence of Spain is apparent on our western coast and our new possessions. The advantage of this influx of foreign element into our cuisine has been greatest in cities and among traveled classes. In remote country places and everywhere among native laboring communities, there is need of knowledge of some of the economical foreign methods. Cooking teachers find it wise to accept some of the suggestions from their pupils of German and Italian parentage, instead of insisting that our methods are always the best. No doubt many foreign nations would derive equal benefit and enjoyment from some of our dishes which are seldom seen there. Canvasback ducks, softshell crabs, strawberry shortcake, fish balls, pumpkin pie, prairie chicken, red-snapper, cranberries, and oysters in many ways, are eagerly welcomed by the returning traveler.

The cultivated American of colonial descent, while loyal to the virtues of succotash and the four B's of Boston, which are similar in nature and food value to the tortilla and frijoles of Mexico and the lentils of Egypt, is learning what to accept and what to reject from the solid puddings, pastry, bread, and meats, of England; the spicy cakes, sour vegetables, sausages, and delicatessen supplies of Germany; the complex soups, sauces, entrées, souffles and artistic disguises of the French; the pungent Spanish puchera; the savory Hungarian goulasch; and Turkish pilaf; the Italian polenta, risotto, and macaroni; the hors d'œuvres of Russia and Scandinavia, and the curries and fruits of the tropics; and from them all he is beginning to evolve a simplicity and an individuality which may be characterized as truly American. He prefers on his meat the sauce of its own juices, he insists on having no doubt as to the identity of his veal and chicken, he has accepted the piquancy of the green salad with its soothing oil in place of the sweets of the pudding and the sharpness of his mother's pickles. The nutty Vienna roll has taken the place of the half-baked raised biscuit, and he finds the bit of cheese which is the main food of the Swiss or Holland peasant, with the fruits and nuts of the savage, a good substitute for the soggy pie of his aristocratic ancestor.

Evolution of Methods of Cookery.— It is sufficient for our purpose here to consider foods merely as animal and vegetable, with albumen as the type of the former, and starch of the latter, albumen requiring a low and starch a high temperature. (See Foods.) Starch and albumen are frequently combined in natural food, and still more frequently in cooked food, but they must be digested by fluids of a different nature, one an alkaline and the other an acid. Therefore, how to cook them that each may best do its work in the body, is the problem of good cookery.

Heat.— Cooking means, to prepare by heat (Latin *coquo*), and in all its phases, heat is the important factor. The heat of the sun causes plant food to grow and ripen; the heat of the living animal prepares its flesh and products for the higher animal, man; he applies artificial heat in cooking vegetable and animal foods, and after eating them, his own internal heat helps in the assimilation of the food into his body. The absence of heat sufficient to be called *cold* is essential to make many foods more palatable. *Water* is removed from some foods by concentration, and added to others for the solution of albumen and the hydration of starch. *Air,* for the expansion of various substances the development of improved flavors and the dissipation of disagreeable odors is essential, and care should be taken that it be pure as possible.

Fuel.—Heat for cooking purposes was obtained first by drying foods in the sun. Many kinds of flesh, fish, and fruit are still prepared in this way. Then came the burning of wood, oil, coal, gas, coal oil, and alcohol; the latest advance is the use of electricity, the expense of which has retarded its adoption, but its merits are great and its possibilities unlimited.

Heat is applied to food in two ways: through hot air, as in broiling, roasting, and baking; and through hot liquids, as in boiling, frying, and their variations.

Broiling or *Grilling* is cooking by close contact with the fire. The primitive way was on the coals: the smoke and ashes

may have led the barbarian to wind the meat round a stick and hold it over the fire, much as the Turks do now with their strips of mutton, or kabobs. To save personal attention the meat was suspended from a stick; later it was cooked on bars of wood or iron, called a gridiron, hence our word grilling, and was turned when partly cooked. The modern improvement of this time-honored method is the wire broiler, used over red-hot charcoal, or under the gas flame, and frequent turning has been found to be the secret of good broiling. Contact with the fire sears the fibres, with a slight loss of outside substance, but it seals the juices inside and gives the richest possible flavor. "The gridiron is the thermometer of civilization." *Toasting* is simply the broiling of bread and other cooked starchy foods, in order to develop dextrin. It sometimes develops charcoal. *Pan-broiling* is cooking in a very hot dry pan, with sometimes the merest film of grease to prevent too great loss of substance by adhesion. The quick searing gives almost the same flavor as in direct broiling. A convenient way for the chafing dish and oil stove.

Put the anchovies in the heated pan and in a moment
They will begin to hiss and are done.—*Archestratus.*

Roasting is a modification of broiling, at a lower temperature, adapted to large pieces of meat and poultry, which, on account of their thickness, are placed at a greater distance from the fire after the first searing. In early times the animal was dressed and hung at once over the fire; when the fire was made in a hole, sticks were laid across on which the animal rested; we call it a barbecue. After fires were built on the hearthstones and cooking was done inside, the meat was hung on a frame placed in front of the fire, and was turned and basted by the cook's attendants. This was the common way of cooking meat in the great baronial halls of England for many centuries and may still be seen in old country inns. The modern spit has its clock-work attachments, which turn the meat, dip up the gravy and pour it over at regular intervals. In warm countries but little roasting is done; and although once the only way in America, it is now seldom done except in hotels, and by those who have ranges with a special attachment for roasting, or who have revived the old custom on the hearth of their country kitchens; for there are many who still think the old Greek method greatly superior to the cooking of meat in the oven, which is commonly called roasting.

Many are the ways and many the recipes
For dressing a hare, but this is best of all.
To place before a set of hungry guests
A slice of roasted meat fresh from the spit,
Hot, seasoned only with plain simple salt,
Not too much done. And do not you be vexed
At seeing blood fresh trickling from the meat,
But eat it eagerly. All other ways
Are quite superfluous, such as when cooks pour
A lot of sticky, clammy sauce upon it.—*Archestratus.*

Baking is cooking by the heat radiating from a hot oven. The principle is the same as in roasting and broiling, namely, a quick searing of the outer surface for the sake of the flavor and to retain the juices, then a lower temperature that the heat may reach the centre without burning the outside. If the oven is not hot, or water is used at first, the juices are drawn into the pan, enriching the gravy at the expense of the meat. Flesh which has tough connective tissue, cartilage and bone, should be cooked a long time, and needs the solvent action of water, after the first browning. Baking renders watery vegetables drier and more savory, develops new flavors in fruits and grains, and changes some of the sugar in the crust of cake into caramel and the starch in the outside of bread into dextrin. Some forms of baking are so nearly allied to stewing, that it is impossible to make a strict divison, but there is a great difference in the flavor developed by the two methods. In baking, the temperature is the important point, varying from 212° to 400° for different articles. The oven thermometer is the evolution of the old-time "hand and try cake" methods. Baking was done first in the hot ashes, then in a hole in the ground — the primitive oven — where a fire was built on stones and after it had burned down to coals, food was laid in, either in clay pots, or wrapped in moist leaves, then covered with brush or leaves, and left to cook slowly for a long time. Bread-fruit in the South Sea Islands is baked in this way. Pounded and moistened grains made into a thin batter were spread on hot stones by a dextrous sweep of the hand, cooking almost instantly; this was the first bread; the process may be seen now among the Arizona Indians in making piki. Some one found it better to cover the oven permanently and have an opening at one end; this was the beginning of the brick oven.

At the hearth fires, a covered utensil to stand near or over the coals, and later the Dutch oven, answered for daily use; the great brick oven near the chimney soon followed, and here enough "rye and injun" bread, pies, cookies, Indian meal pudding, and beans, were baked to last a large family through the week.

The kitchen range is an evolution of an American invention about the beginning of the 19th century. In many European countries they still use tile and brick stoves without ovens, all of the baking being done outside the home. In America there are ovens of every size and kind, from the tiny tin box for the gas burner or oil stove, the jacketed box of the Aladdin oven (see OVEN, ALADDIN), which concentrates and utilizes all the heat from an oil lamp, the ventilated ovens of the coal and gas ranges, to the immense ovens of large baking establishments, with their steam jets, revolving shelves and griddles, and other contrivances for securing the right temperature and texture.

Frying is immersion in hot fat: from 345° to 400°. This is not boiling fat, as it is often called; it is the water in the food, or the fat, if new, which bubbles. Immersion implies depth enough to cover the articles, that the surface may be hardened before the fat can penetrate the food. A coating of egg and crumbs helps a moist surface to harden quickly and keep its shape. Some previously cooked foods are fried merely for the flavor and crispness of the crust. Frying has been called the "curse of American cookery," but it is the wrong use of it, that merits condemnation. Tough meat, and flour mixtures rank with soda, put into cold lard and left to stew and sizzle until hard and soaked with burned grease, have been all too frequently a large part of the daily food on many American tables. It may have originated when it was so much of an undertaking to "fire

up" the brick oven, and the drafts prevented the food in the Dutch oven from getting beyond the palest tint of brown. But there are indications that the broiler, the Scotch bowl, and the stew pan, are taking the place of the spider. When at its best frying is not to be recommended for those with weak digestion, its only merit being its quickness, but this is gained at the expense of time in the last stage of the work, digestion. But little frying would be done if everyone had to fry his food and inhale the odors. Frying probably originated where olive-oil was in common use, and oil is still the general frying medium in countries bordering on the Mediterranean. There it is usually done well, for vegetable oil may be heated with less acrid odor than from animal fats. When a pure vegetable oil without odor can be procured at reasonable rates in America, and when housekeepers are willing to believe that it is more economical to fry in a large amount of fat at high temperature and drain the fried food thoroughly, than to let a smaller amount of fat be absorbed by the food, frying will be greatly improved. *Sautéing* is a French term meaning "to toss," or turn over. It is the common way to cook omelets, mushrooms, and other foods which need merely to be browned on each side in a little fat, or stewed in hot butter and tossed about until cooked. *Griddle Baking,* sometimes called frying, is cooking on a hot griddle, with no fat, if of soapstone, and but little if of iron. The griddle is shallow and would not hold fat. For waffles and fancy wafers the griddle is double and revolves over the fire.

Boiling and *Simmering,* terms often applied to cooking in water, regardless of temperature, so long as it is on the fire. At the sea-level, water *simmers,* or bubbles gently below the surface, at 185°, and *boils,* or bubbles all over the surface at 212°. Density, weather, and altitude vary the boiling temperature more or less, but it is easier to make some cooks understand this, than to convince them that water can not be made any hotter after it once boils all over, at least not in the ordinary kettle. The scientifically trained cook knows that "just a smile at one side of the meat" will cook it perfectly, and some of the foreign peasants seem to have known it intuitively, but the average cook in our kitchens piles on the coal until the water "dances a jig," and then wonders that her meat is stringy and tasteless. The first knows that if she wishes good broth or stock, she cuts the meat small, puts it into cold water and lets the juices soak out, then heats this water to the simmering point. But the average cook never can remember when to use hot, when to use boiling, and when to use cold water. The educated cook knows that rapid boiling is advisable for the first five or ten minutes, to seal the juices inside in boiled meat, —the thinner the meat the shorter the time— and also to cook the starch in grains and vegetables; and that after this, the water should only simmer else there will be great washing out of substance. She knows, too, that when particles of food are to be kept in motion, to prevent adhesion among themselves or to the kettle, as in cooking rice and macaroni, the rapid boiling may be continued that "the rice may dance about." But to the average mind the cooking of food in water is probably more or less guesswork, judging by the results.

Stewing is only another form of simmering. In making a soup a large amount of water is used, and in making a stew, a small amount. In both, the cooking is continued a long time at a gentle heat. Tough meats are improved in flavor by the union with vegetables, spices, and other seasonings. In the soup they are removed, if it is to be clear, but in the stew they are retained. When dumplings of biscuit dough are cooked as a cover for the stew, or shortcake is served around the stew, it becomes a *potpie.*

Fricasseeing, meaning "to fry," is a combination of frying with stewing, by which a flavor like that in frying, or pan broiling, is obtained.

The term is sometimes used when no real browning is done, the simple warming, or stewing in butter at a low temperature, making it, according to some authorities, a fricassee. It is to be regretted that the desire for new names (thinking thereby to have a new dish) has almost obliterated the true meaning of many culinary terms; there seems to be no standard for nomenclature.

Braising is a combination of frying, stewing, and baking, with vegetables, etc., formerly done in a stew-pan having a hollow cover, in which coals were put for the final browning. It is a common way in foreign lands, where ovens are not much used and fuel scanty, only a little being needed for the slow fire for stewing, and each half-burned bit carefully put out by water and laid aside for another time. Braising is now done in an earthen dish, called a casserole, and foods á-la-casserole are becoming very popular at hotels. It may be done in a granite pan with a tight cover and finished in the oven. It is one of the most savory ways of cooking meat, game, and poultry.

Smothering, or *Pot-roasting* is done by quick searing of meat in a little of its own fat, in the stew pan or pot, then adding barely enough water to prevent burning, covering closely (formerly with a lid of dough when it was done in an iron pot before the fire), and cooking slowly in the steam of its own juices. It gives rich, undiluted gravy and very tender fibre; the best way to cook tough lean meat free from bone.

Steaming.— Real steaming is done chiefly in factories, or large establishments, where the steam is confined in boilers and superheated, and then conveyed through pipes to the kettle containing the food. Owing to the expansive force of steam it cannot be confined in an ordinary kettle, and many of our canned fruits, soups, and vegetables are more successfully done there, than they could be at home. But we cook some foods over, or surrounded by boiling water, and call it steaming. In the first way, the food is placed on a perforated pan, above the water, the moist steam surrounds it, and in condensing, gives up its heat, which cooks the food. In the second way, a double or farina boiler is used (or a pail inside a common kettle), the heat is conveyed by the steam or boiling water through the metal, and thence to the food, which is less hot than the water, as the metal has absorbed some of the heat. Steaming makes tough meat tender and moist, and enables us to cook vegetables and glutinous foods without the constant attention

needed, if cooked over the fire, or in a little water. The Romans had a kind of double boiler; also the chafing dish, which is one variety, combined with a sautéing pan. Our grandmothers could cook a pot of hasty pudding without burning it; but with the advent of many more glutinous foods and the knowledge that many foods containing milk and eggs need a low temperature, a great variety of steamers and double boilers have come into use. Our grandmothers lived in their kitchens; it was but little work to "watch the pot" while they spun or wove, and the great kettle of cider apple sauce seldom had even a hint of scorching. But the modern housewife aims to spend as little time as possible in her kitchen. When we learn to think of it as a laboratory, it may tempt (although it may not require) a longer sojourn.

Cooking in water was probably the last to be discovered of the primitive methods, for it could not have been done until water-tight utensils were made; these were first, baskets, made by plaiting grasses, twigs, and rushes; then bowl or troughs were made by burning out hollow places in a log. Stones were heated in the fire and plunged into the water in these baskets or troughs, and this cooked the food. Indians cook their acorn mush in this way, and the Alaskans use their canoes for boilers, heating the water with hot stones, when they boil the salmon for its oil. When clay was found, they learned to shape it into bowls; then into pots with three legs, and thus had a fire-proof as well as water-tight utensil; and after this stewing came into general use. Jacob's savory venison was probably stewed. In spite of luxury, the old men in Greece preferred the black broth made of cuttle-fish. "Rome was raised on gruel," or pulse, made of barley and vegetables, and it is probable that stewing in some of its forms has been the method in most general use, among the masses of the people, who from limitation of means and of food supplies, have learned its value. Stewing is not advisable, as commonly done in America, where a large amount of fire must be kept in one of our immense ranges especially for this purpose, but when it can be done over just the small amount of fire or gas needed, it is undoubtedly the most economical and nutritious way of cooking the cheaper kinds of meat, fish, and poultry, and it is capable of many variations. But the average American man of moderate means does not take kindly to cheap meat. In this "land of the free and equal," he aims to have as nice a cut of steak as his rich employer, and his helpless helpmate probably knows no other way to cook meat save in the omnipresent frying-pan, and has no idea of the principles of the Norwegian cooker. Americans, with the best vegetables in the world, have much to learn about the cooking of them. Too much water and too little cooking are the American faults; just enough butter or oil to prevent burning, and then a slow stewing in their own juices,— saving them generally, instead of throwing them out in the water,— is the better way for many vegetables. Our beverages, our soups, our steamed puddings, our candy-making, and many other foods, are palatable or otherwise, according to our knowledge of cooking in water. A question asked by a lady in the early days of cooking-schools, shows the lamentable ignorance of many women on this important subject: "How shall I know when the water boils?"

It is interesting to note that every primitive method has its counterpart now, not only among the barbarous people, but we find that persons of the highest civilization and refinement, adopt some of them instinctively, when camping necessities suggest their use, or the satiated appetite craves simplicity. No foreign chef has produced anything finer than the trout cooked on a swinging birch bough before the camp door, a potato baked in hot ashes, scalded corn-meal baked on a board on the hearth, sweet corn roasted on hot stones, a planked shad, a Louisiana gumbo, a Brunswick stew, a Rhode Island clam-bake, or beans and pork baked in a bean-hole in the Maine woods.

Revolution.— Many thoughtful minds prophesy that the next step in the evolution of cookery, will be one of "revolution among the eaters themselves." Already many have revolted against meat and other animal foods, vegetarianism having made great advance in favor. Much of the laborious part of cooking has been taken from the home to the public kitchens and bakeries, or to the manufactory of prepared foods ready for the table. The overtaxed digestive organs are demanding relief, by a change to more simple living. A few persons are beginning to understand that the man of moderate means spends too large a portion of his earnings for his food; that there is great waste of labor, fuel, heat, comfort, temper, health, and morality in the cooking of food; that intemperance in eating produces as direful results as intemperance in drinking; that "a man is what he eats," and that high thinking comes easiest after plain living. See NUTRITION.

MARY J. LINCOLN.

Cook's Excursions. See COOK, THOMAS.

Cook's Voyages. The account of Captain Cook's three voyages were written by as many hands; the first by Dr. Hawkesworth; the second by Cook himself; while Lieut. King prepared the third from Cook's notes, and completed the narrative.

The first voyage was undertaken in 1768, to observe the transit of Venus. Having made successful observations at Otaheite in the Society Islands, Cook explored the South Seas, and determined the insularity of New Zealand, hitherto considered part of a great Antarctic continent. He discovered the straits named after him, and amid great dangers explored the eastern coast of Australia, hitherto unknown. In 1772 he started on a second voyage, to explore the hypothetical Antarctic continent. He investigated the specified latitudes, and sailed farther south than any previous navigator. Having satisfied himself that no such continent existed, he turned eastward and discovered New Caledonia, Georgia, and other islands. His third voyage was in search of the Northwest Passage. Sailing about in the Pacific, he discovered the Sandwich or Hawaiian Islands; and then, having explored the unknown coast of North America, he passed through Bering Strait, and surveyed the coast on both sides.

Coolbrith, Ina Donna, American librarian and poet: b. near Springfield, Ill., but while a young girl went to California, where she has

since lived. She has been librarian of the Oakland Public Library (1874), the Mercantile Library of San Francisco, and since 1899, of the Bohemian Club in the latter city. She has published: 'A Perfect Day, and Other Poems' (1881); 'Songs from the Golden Gate,' and contributions in the 'Overland Monthly.'

Cooley, LeRoy Clark, American physicist: b. Point Peninsula, N. Y., 7 Oct. 1833. He graduated at Union College 1858, taught physical science in New York State Normal College 1860–74, when he became professor of physics in Vassar College. He has written several elementary text-books on natural philosophy, chemistry, etc., the most recent being: 'Beginner's Guide to Chemistry' (1886); 'Laboratory Studies in Chemistry' (1894); 'Student's Manual of Physics' (1897).

Cooley, Thomas McIntyre, American jurist: b. Attica, N. Y., 6 Jan. 1824; d. Ann Arbor, Mich., 12 Sept. 1898. He was admitted to the bar in 1846 and became professor of law in the University of Michigan in 1859. He was elected justice of the supreme court of Michigan in 1864 and was chief justice of that State 1868–9, retiring from the bench in 1885. In 1881 he again became professor of law in the University of Michigan. His principal works are: 'A Treatise Upon Wrongs and Their Remedies' (1878); 'General Principles of Constitutional Law in the United States' (1880); 'Commentaries on the Constitution of the United States' (1873); 'Law of Taxation' (1876); 'Michigan' in 'American Commonwealth Series.'

Coolgar'die, Australia, a town in the interior of western Australia, about 330 miles east of Perth. It is the centre of a gold-mining district; the gold fields, discovered in 1891, have been rapidly developed. At first the lack of water was a drawback, but by artificial means an adequate supply is secured. Connections by railroads and telegraph have been made with Perth, Fremantle, and Albany. Pop. 5,000.

Coo'lidge, Susan. See WOOLSEY, SARAH CHAUNCEY.

Coolidge, Thomas Jefferson, American merchant: b. Boston, Mass., 26 Aug. 1831. He graduated at Harvard in 1850, began business as an East India merchant, but later became treasurer of the Amoskeag Manufacturing Company, and closely identified with the New England cotton industry, and large banking and railroad enterprises. He was president and is a director of the Chicago, Burlington & Quincy R.R.; an overseer of Harvard 1886–97; appointed minister to France by President Cleveland 1892; and a member of the joint high commission to adjust disputes between the United States and Canada 1899.

Coolidge, William Augustus Brevoort, American writer in England: b. near New York 28 Aug. 1850. He was educated in St. Paul's School, Concord, N. H., and Exeter College, Oxford, and was ordained to the priesthood of the Established Church in 1883. He was professor of English history at St. David's College, Lampeter, Wales, 1880–1; tutor at Magdalen College, Oxford, 1881–5, and curate of South Hinksey 1883–95. He is a member of various Alpine clubs and has published: 'Swiss Travel and Swiss Guide Books' (1889); 'The Adula Alps' (1893); 'The Range of the Todi' (1894); 'Guide to Grindelwald' (1900); 'Guide to Switzerland' (1901); beside many contributions on Alpine topics to periodicals and cyclopædias.

Coo'lie, a term commonly applied to laborers from India and China. The first coolie emigrants appear to have been Indians, brought from Calcutta, in India, to British Guiana, in 1839, soon after the abolition of slavery in that colony. As free negroes were found to be insufficient to perform the work that had previously been done by slave labor, and the whites could not endure hard labor in a tropical climate, the planters had to look for recruits from other places than Africa. The first attempt to use as laborers, people from India, proved unsuccessful because of the chigre or jigger, a most annoying insect. Various abuses existed almost from the beginning, in the treatment of the laborers, and for a time the government of India forbade the emigration, but it was again allowed when better regulations were made so that the coolies understood their rights, and, also, when health precautions were established in the colonies. For a certain specified amount, the coolies were bound for a term of years and after 10 years' service they were entitled to free passage back to their native country. The Chinese coolies were not entitled to this back-passage. To entice the skilled laborers to remain inducements were offered them, and many did remain. The coolies employed in Guiana, chiefly from India, were in 1891 in number 105,463. Coolies were introduced into Jamaica, the Mauritius, and other British colonies. In 1891 the Indian population of Mauritius was about 250,000 or two thirds of the whole population. In 1855 Great Britain undertook to suppress the importation of the coolies into the colonies in the tropics, and this enabled the Portuguese to gain almost entire control of the trade. The abuses which had crept in made the trade almost as bad as the trade in African slaves. The legislature of Jamaica, in 1869, passed a law requiring more humane treatment from employers toward their coolies. Macao, the Portuguese port at the mouth of the Canton River, China, sent large numbers of Chinese coolies to Cuba and Peru, and under conditions little short of absolute slavery, even kidnapping was practised with impunity. In 1874 a royal commission was appointed to investigate the coolie system in Mauritius. In 1856 the Peruvian government prohibited the introduction of Chinese labor in the manner then prevalent. In Brazil, where considerable numbers of coolies have been employed since 1852, they do not appear to have been treated with the same cruelty. In 1866 the matter was made subject to an international conference and improvements were made by agreements signed by China, France, and Great Britain. In 1873 the Portuguese government made the importation of coolies illegal, and the Indian Emigration Act of 1883 restricts emigration by contract to the colonies where good treatment is given to the laborers. The laws aimed at the correction of the abuses have practically stopped the coolie trade. Consult: Hope, 'In Quest of Coolies'; Jenkins, 'The Coolie'; and reports of the commissions.

Cooling, Velocity of, a body isolated in air or other gas, or *in vacuo,* and surrounded by

bodies colder than itself, loses heat, by radiation in the last mentioned case, and in the former case partly by radiation and partly by convection. The rate at which its temperature decreases depends on a variety of circumstances, — on the nature of its surface, for example. But, other things remaining the same, the velocity of cooling is proportional to the excess of the temperature of the body in question above that of its surroundings. This is Newton's Law of Cooling.

The law of cooling has been verified by Dulong and Petit experimentally. A copper ball was suspended in the midst of a metallic chamber, round the outside of which water was kept flowing, in order to maintain a constant temperature. The copper ball was heated before being suspended in the chamber, and a thermometer was inserted in a hole in the ball, and so arranged that the stem, which was long, projected to the outside of the chamber and could be read there. The fall of the temperature of the ball during equal intervals of time was noted, and it was found to become less and less as the temperature of the ball gradually approached that of the walls of the surrounding chamber, the law of decrease being Newton's, as stated above.

The following example will illustrate practically the meaning of this law: Suppose the temperature of the ball to be 20° higher than that of the enclosure at the beginning of the experiment, and that during the first five minutes it loses 1°, that is, one twentieth or 5 per cent of the excess of temperature. During the next five minutes it will lose 5 per cent of the excess that remains, that is, of 19°. It will therefore lose 0.95°, or the temperature of the ball will be 18.05° above that of the enclosure. At the end of the next five minutes the difference of temperatures of the ball and enclosure will be 17.15°, and so on.

Coomassie, koo-mās'sē, or **Kumassi,** Africa, capital of Ashantee, in West Africa. The houses, formed of stakes and wattle-work filled up with clay, and thatched with palm leaves, are often furnished with arcades and ornamented with painting and carved work. Coomassie was captured in 1874, by the British, and again in 1896. In 1900 they took entire possession and it is now the seat of the British resident. It was made a railroad terminal in 1903. Pop. 18,000.

Coomans, Jean Baptiste Nicolas, zhŏń bäp-tēst nīk-ō-lä, Belgian politician and author: b. Brussels 1813; d. 1896. He was elected to the Belgian house of representatives in 1848, and there became prominent in the clerical party. He was editor of the *Journal des Flandres;* the *Journal de Bruxelles;* the *Courrier d'Anvers;* and the clerical weekly, 'La Paix.' He wrote: 'Histoire de la Belgique' (1836); 'Richilde' (1839); 'Une Academie de Fous' (1861); 'Les Communes Belge' (1863); and 'Portefeuille d'un Flaneur' (1863).

Coomans, Pierre Olivier Joseph, pēār ō-lē-vē-ā zhōzĕf, Belgian painter: b. Brussels 28 June 1816; d. 1890. He was educated at Antwerp as a pupil of De Keyser and Wappers. He later went to Algeria, where he spent several years; among his paintings which deal with African subjects are: 'The Deluge'; 'Landscape in the Province of Constantine'; 'Emigration of Arab Tribes'; 'Dancing Arab Women'; other works of his are: 'Conquest of Jerusalem'; 'Defeat of Attila'; 'Feast of the Philistines'; 'Lesbia'; 'Last Days of Pompeii.' In 1888 he made a visit to the United States with his two daughters, DIANA and HEVA. Both are artists also and have lived mostly in New York since 1890. Diana's pictures include: 'The Spinner'; 'A Fruit Merchant of Pompeii'; 'A Fête at Pompeii'; 'At the Callirhoe Spring'; 'Attentive Listener.' Among Heva's works are: 'Beautiful Days'; 'Pompeiian Flower Merchant'; 'Captive'; 'The Message'; and 'Under the Spell.'

Coombs, Annie (SHELDON), American novelist: b. Albany, N. Y., 1858; d. New York 1890. She wrote: 'As Common Mortals' (1886); 'A Game of Chance' (1887); 'The Garden of Armida.'

Coomptah, or **Kumpta,** a town of India, in the presidency of Bombay, division of Concan, district Canara, 100 miles north of Mangalore. It stands on the north side of Kumpta Creek, and was a place of consequence till it was pillaged and burned by the troops of Hyder Ali. After a long period of decline it has begun to revive, chiefly in consequence of the rapid extension of cotton cultivation in the district. Pop. about 11,000.

Cooper, Anthony Ashley. See SHAFTESBURY.

Cooper, SIR **Astley Paston,** English surgeon: b. Brooke Hall, Norfolk, 23 Aug. 1768; d. London 12 Feb. 1841. He studied medicine in Edinburgh and London and in 1792 he visited Paris, where he attended the lectures of Desault and Chopart. In 1793 he was appointed professor of anatomy at Surgeon's Hall; and in 1813 professor of comparative anatomy to the College of Surgeons, and became in 1822 one of its court of examiners. In this year appeared his great work 'On Dislocations and Fractures of the Joints.' Having performed a slight operation on George IV. he was created a baronet in 1821. His practice, which had been long extensive and lucrative, now largely increased. In 1827 he was elected president of the Royal College of Surgeons. His 'Lectures on the Principles and Practice of Surgery' appeared in 1824-7.

Cooper, Charles Alfred, English journalist: b. Hull 16 Sept. 1829. Since 1876 he has been editor of the Edinburgh 'Scotsman.' He has published: 'Seeking the Sun,' a series of letters on Egypt (1891); 'Letters on South Africa' (1895); 'An Editor's Retrospect' (1896).

Cooper, Edward Herbert, English novelist. He was educated at University College, Oxford, and has published: 'Geoffrey Hamilton' (1893); 'Mr. Blake, of Newmarket'; 'Wyemarke and the Sea Fairies' (1900); 'Wyemarke and the Mountain Fairies'; 'The Monk Wins' (1901); 'Children, Race Horses, and Ghosts,' a collection of short stories; 'The Eternal Choice'; 'A Fool's Year' (1901); 'George and Son'; 'Wyemarke's Mother'; 'Resolved to be Rich.'

Cooper, Ellwood, American horticulturist: b. Lancaster County, Pa., 24 May 1829. For 10 years he was engaged in business in Port au Prince, Hayti, but went to California in 1870, and devoted himself to fruit culture. He was the first manufacturer of olive oil in the United States, inventing special machinery for the pur-

pose. He is also the inventor of machinery for hulling and pitting almonds, and for hulling and washing English walnuts. Since 1885 he has been president of the California State Board of Horticulture, and for three years was president of Santa Barbara College. He has published: 'Statistics of Trade with Hayti' (1868); 'Forest Culture and Eucalyptus Trees' (1876); 'Treatise on Olive Culture' (1882).

Cooper, Emma Lampert, American artist: b. Nunda, N. Y. She graduated at Wells College, and studied art in New York, Paris, Holland, and Italy; taught painting in Rochester, N. Y., 1893–7, but since 1898 has lived abroad. At the Chicago World's Fair (1893) she received a medal for her water color, 'The Bread Winner'; and another at the Atlanta Exposition (1895) for an oil painting, 'Behind the Dunes.' Others of her pictures are: 'Mother Claudius' (1890); 'Picardy Hillside' (1897); 'High Noon, Cape Ann'; 'Old Kitchen in Gruyere, Switzerland.'

Cooper, George Henry, American naval officer: b. Fort Diamond, N. Y., 27 July 1821; d. Brooklyn, N. Y., 17 Nov. 1891. He entered the navy in 1837, became captain in 1867, commodore in 1874, and rear-admiral in 1881. He was on sea service for more than 25 years, and on shore or other duty for more than 18. In the Florida Seminole Indian war he served in co-operation with the army; during the Mexican war he led an assault against Point Isabel, was captured at Monterey, and after being exchanged, took part in the attacks on Tobasco, Alvarado, and Tuxpan; during the Civil War he commanded, among other vessels, the monitor Sangamon, which was on picket duty inside the Charleston roads. He was commandant of the Brooklyn navy yard, and in command of the North Atlantic squadron from 1880 until his retirement, 27 July 1884.

Cooper, Henry Ernest, Hawaiian politician: b. New Albany, Ind., 28 Aug. 1857. He graduated at the Boston University Law School 1878; was admitted to the Suffolk County (Mass.) bar; and settled in Honolulu 1890. During the Hawaiian revolution of January 1893, he was chairman of the Committee of Safety, and on 17 Jan. 1893 read the proclamation abrogating monarchical government in the islands. He became a member of the advisory council in the provisional government; a circuit court judge 1893–5; minister of foreign affairs 1895–9; acting president of the republic, January to March 1898, and has served as head of the departments of justice, public instruction, and interior, and as attorney-general 1899–1900.

Cooper, Jacob, American clergyman: b. Butler County, Ohio, 7 Dec. 1830. He graduated at Yale 1852, studied theology in Edinburgh, took his Ph.D. at Berlin 1854, and became a Presbyterian clergyman. He was professor of Greek in Centre College, Kentucky, 1855–66; chaplain of the 3rd (Union) Kentucky regiment 1862–3; professor of Greek in Rutgers College 1866–83, and of philosophy and logic there since 1893. His published works include: 'The Eleusinian Mysteries' (1854); 'Biography of George Duffield' (1889); 'Biography of President T. D. Woolsey' (1899); 'Biography of President William Preston Johnston' (1900); 'The Passage from Mind to Matter' (1901); etc.; and frequent contributions to leading theological reviews, such as 'Bibliotheca Sacra,' 'Methodist Review,' 'Princeton Review,' and the Reformed Church 'Quarterly Review.'

Cooper, James, American senator: b. Frederick County, Maryland, 8 May 1810; d. Camp Chase, Columbus, Ohio, 28 March 1863. He graduated at Washington College, Pa., 1832, studied law and began practice at Gettysburg, Pa. He was elected to Congress 1838 and 1840; to the State legislature 1843–8; was attorney-general of Pennsylvania 1848, and elected a United States senator 1849. Subsequently he settled in his native town, and when the Civil War broke out took command of the Maryland volunteers, organized them into regiments, and on 17 May 1861 was made a brigadier-general. He was in command of Camp Chase at the time of his death.

Cooper, James, Scottish clergyman: b. Elgin 13 Feb. 1846. He was educated in the University of Aberdeen, entered the ministry of the Kirk of Scotland and was pastor of St. Stephen's, Broughty Ferry, 1873–81, and the East Parish, Aberdeen, 1881–98. He is a professor of Church history in the University of Glasgow and has published 'Aberdonensis'; 'Bethlehem'; 'Ecclesiology of Scotland'; 'Four Scottish Coronations.'

Cooper, James Fenimore: b. Burlington, N. J., 15 Sept. 1789; d. Cooperstown, N. Y., 14 Sept. 1851. His father, Judge William Cooper, removed in the year following the novelist's birth to recently acquired tracts of land, in the wilderness of central New York, about Otsego Lake, on the shore of which he had already fixed the site of the village of Cooperstown. Here he built the mansion called Otsego Hall, which his son acquired in after years, and in which he wrote the greater number of his works. Young Cooper entered Yale College at 13, but left the course half finished. In 1806 he went to sea in a merchantman, and served in the navy of the United States from 1808 till his marriage in 1811. For the next nine years Cooper was engaged mainly in managing and improving his farm possessions, first near Cooperstown, then in Westchester, with no discovered or suspected bent toward literature. Chancing to read a book of fiction that aroused his dislike, he professed himself able to produce a better, and being held half jocularly to the task, wrote 'Precaution,' published in 1820. It was only an indifferent novel, but it was praised by friends, and Cooper was drawn to give himself to authorship. In 1821 'The Spy' appeared, winning immediate popularity both in England and at home. Cooper's chance of success lay, not in graces of style, which he showed small disposition to cultivate, nor in imitation, but in his large knowledge of colonial and pioneer life and of the sea. In 'The Spy' he had utilized his acquaintance with many details of the Revolutionary struggle, and with Westchester as "the neutral ground." His next work, 'The Pioneers' (1823), concerned itself with life and folk in the wilderness about Cooperstown, where he had been brought up, and which he introduced, under the name of Templeton, as the centre of the action. In 1824 he published 'The Pilot,' in which he first makes use of his knowledge of seafaring. Suggested by 'The Pirate' of

Scott, it was written to show how much more might be made of expert nautical knowledge than Scott had been able to effect. It really created a new literature of the sea. In another year Cooper had completed 'Lionel Lincoln,' a painstaking novel of Boston and the Revolution, but never popular. This was followed (1826) by 'The Last of the Mohicans,' which became quickly famous, being translated widely into foreign tongues. Its popularity was mainly due to skilful handling of the Indian characters, Uncas and Chingachcook, and still endures.

Beginning with 1826, Cooper spent seven years in Europe, continuing his authorship, and supplying much needed knowledge of men and things. 'The Prairie,' 'The Red Rover,' 'The Wept of Wish-ton-Wish,' and 'The Water Witch' continued the series begun before he sailed. On account of distorted notions held abroad concerning the people of his country, Cooper wrote 'Notions of the Americans; Picked up by a Traveling Bachelor'; but the book failed of its purpose, edifying Americans rather than enlightening Europeans. He wrote, besides, three novels, 'The Bravo,' 'The Heidenmauer,' and 'The Headsman,' dealing with continental scenes and characters, but their American bias tended to lessen his popularity. His manner of meddling with unpersonal matters got him into some trouble at this time. He determined in consequence to write no more. Coming back to America, near the close of 1833, he found the general crudeness of taste, and the greed of wealth more pronounced, after his foreign stay, and he did not spare his criticism. The result was greater unpopularity at home than he had incurred abroad. His combative temper prompted his putting out the satiric novel of 'The Monikins' (1835), which had small effect. In the three years following he published 'Sketches of Switzerland' and 'Gleanings in Europe,' in which he gives his impressions of the Swiss, the French, the English, and the Italians, and renews his strictures on foreign and domestic faults. The result was increased bitterness and abuse. A dispute with the people of Cooperstown, over his rights in Myrtle Grove, on Otsego Lake, made matters worse, for the press of the State took sides against him, misrepresenting his motives and spirit in the case. Relief was at length secured from this sort of persecution; Cooper pursued the chief offenders for libel, and won his suits. In 1838 he published the two novels, 'Homeward Bound' and 'Home as Found,' and in the next year 'The History of the Navy of the United States,' a work long had in contemplation, and received with fresh abuse from the press. The resulting trouble was settled, by a board of arbitration, in Cooper's favor. In 1840 he published 'Mercedes of Castile,' and the famous 'Pathfinder,' followed the next year by 'The Deerslayer,' generally considered, with the preceding novel, the best of the Leather-Stocking Tales, which include, with these, 'The Last of the Mohicans,' 'The Prairie,' and 'The Pioneers.' Cooper's powers of description and portraiture were now at their best. In 1842 'The Two Admirals' and 'Wing and Wing' appeared, and in 1843 'Wyandotte,' and 'Ned Myers,' the latter being the true story of a sailor comrade of earlier years. In 1844 'Afloat and Ashore' came out in two parts. Three anti-rent novels, 'Satanstoe' (1845), and 'The Chainbearer' and 'The Redskins' (1846) followed; and in the last-named year 'Lives of Distinguished American Naval Officers' appeared. 'The Crater' (1847); 'Jack Tier,' and 'Oak Openings' (1848); 'The Sea Lions' (1849), and 'The Ways of the Hour' (1850), all indifferent novels, complete the list of his more considerable works. His death was at Cooperstown, where he had lived mainly since 1833. Cooper was of a social temper until opposition withdrew him from society. His judgments, except in matters of tact and policy, were generally acute and sound, and his integrity was heroic. His conceptions of the Indian character have been frequently disapproved, but were the fruit of deliberate study. The standard biography is Lounsbury's in 'American Men of Letters' series.

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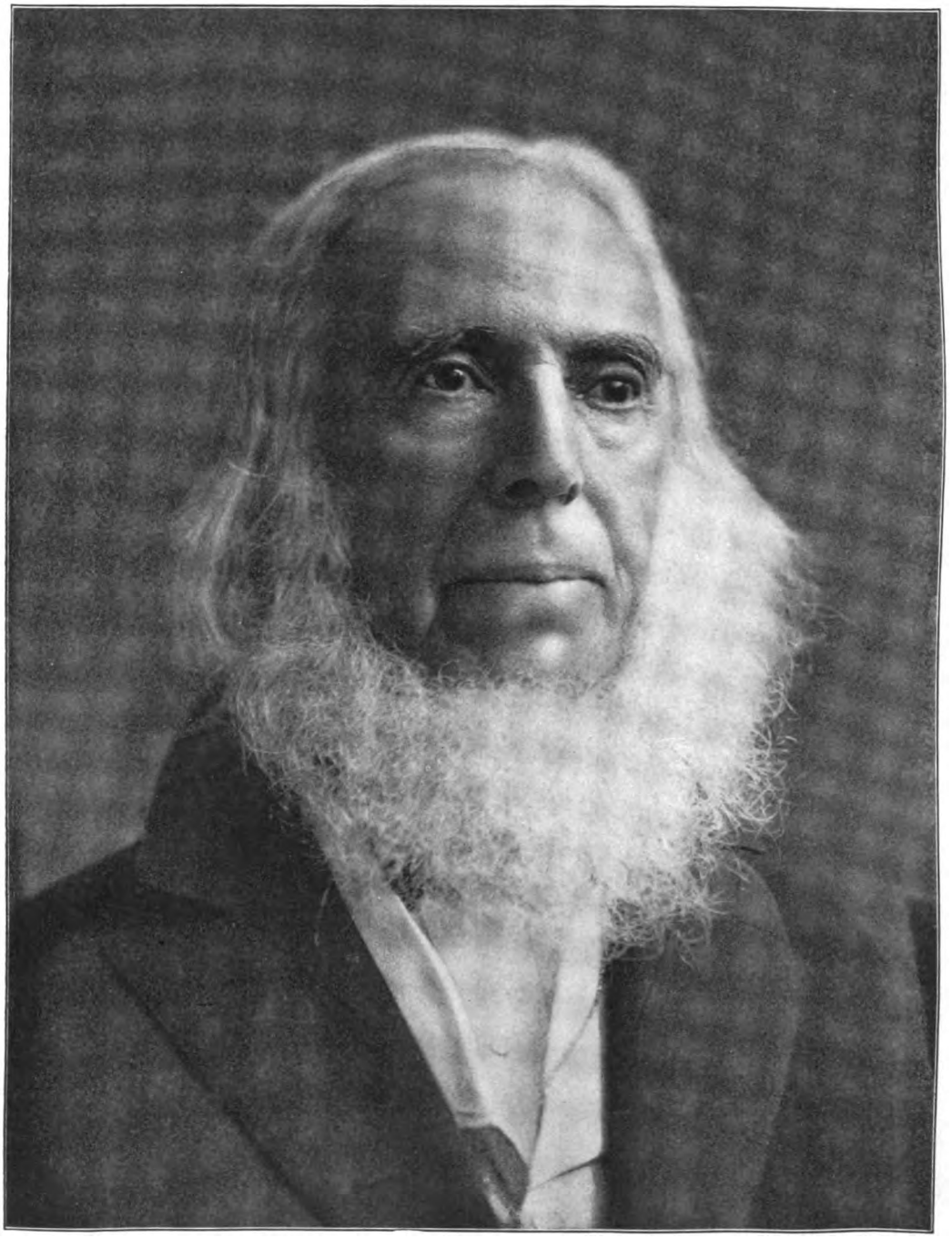
Cooper, Myles, English loyalist: b. England 1735; d. Edinburgh, Scotland, 1 May 1785. He was the second president of King's College, now Columbia University, New York. He studied at Oxford, became Fellow of Queen's College in 1760, and in 1761 published a volume of miscellaneous verse of correct style, but full of artificiality and classical imitations. In 1762 he became assistant to Dr. Johnson, president of King's College, New York, and after a year as professor of moral philosophy, Cooper, then 28, was elected president in May 1763, upon the resignation of Johnson. Upon his accession the college had a faculty of four members. Both discipline and members rose during his administration, and George Washington praised him highly for his care of young Mr. Custis. From 1767 to 1771 Cooper was in England, and after his return to America showed himself not only a typical high-churchman and Tory, but the master of a trenchant and sarcastic pen. He published 'The American Querist' in 1774 and in the same year wrote 'A Friendly Address to All Reasonable Americans on the Subject of Our Political Confusion,' a pamphlet answered by Alexander Hamilton, then an undergraduate at King's, and by Maj.-Gen. Charles Lee, who rivaled Cooper in virulence. His 'What Think Ye of Congress Now?' (1775) urged that Americans were not bound by the decrees of Congress, as that body had transcended the powers granted to it. In the same year he was forced to leave New York, narrowly escaping ill-treatment at the hands of a mob. His departure from America he described in a poem in the 'Gentleman's Magazine' for July 1776. In England he received a parish in Berkshire after a short residence at Oxford, where he preached in 1776 a sermon entitled 'National Humiliation and Repentance Recommended, and the Causes of the Present Rebellion in America Assigned,' a violent attack on the English Whigs. During the last years of his life he was senior minister of the first Episcopal Chapel in Edinburgh. John Trumbull, in 'McFingal,' speaks of "punster Cooper's reverend head," and he seems to have been a wit of rather free and convivial habits.

Cooper, Peter, American manufacturer, inventor, and philanthropist: b. New York 12 Feb. 1791; d. there 4 April 1883. His early education was of the scantiest description, and in boyhood he assisted his father in making hats, at 17 learning the trade of coachmaking. He



PETER COOPER.

subsequently invented a cloth-shearing machine and engaged in various occupations, finally settling upon the manufacture of glue, which he carried on for half a century. About 1830 he became interested in iron manufacture and in 1845 removed his iron business from New York to Trenton, N. J., and was the first to roll wrought iron beams for fire-proof structures. In 1830 he built from his own designs the first locomotive engine ever constructed in America. He was also interested in the canal system of his native State, and, at a later date, in telegraphic communications, being president of several telegraph companies. He took an active share in the enterprise which resulted in laying the first Atlantic cable. In 1876 he was nominated for the presidency of the United States by the Independent party, receiving nearly 100,000 votes at the autumn elections. In 1854 he established in New York the well-known Cooper Union (q.v.). He published 'Political and Financial Opinions with an Autobiography' (1877); 'Ideas for a Science of Good Government' (1883).

Cooper, Samuel, American military officer: b. Hackensack, N. J., 12 June 1798; d. Cameron, Va., 3 Dec. 1876. He was graduated at the United States Military Academy in 1815 and served on the staff of General Macomb from 1828 to 1836, when he was promoted captain. He was assistant adjutant-general from 1836 to 1841, and in 1848 was brevetted colonel for meritorious service during the Mexican war. In 1852 he was appointed adjutant-general of the army. He resigned this commission at the outbreak of the Civil War and tendered his services to the Confederacy, under which he became adjutant-general and inspector-general of the army. He wrote 'A Concise System of Instructions and Regulations for the Militia and Volunteers of the United States' (1836).

Cooper, Susan Fenimore, American author: b. Scarsdale, N. Y., 1813; d. Cooperstown, N. Y., 31 Dec. 1894. She was the daughter of James Fenimore Cooper, and during the last years of her father's life was his secretary and amanuensis. She was author of 'Rural Hours' (1850); 'Fields Old and New' (1854); 'The Shield: A Narrative'; 'Mount Vernon to the Children of America' (1858); 'Rhyme and Reason of Country Life'; etc.

Cooper, Theodore, American engineer: b. Cooper's Plains, N. Y., 12 Jan. 1839. He graduated at Rensselaer Polytechnic Institute, Troy, N. Y., in 1858, entered the United States Navy as engineer officer 1861–72, and was assistant professor at the Naval Academy 1865–8. In 1872 he assisted Capt. James B. Eads in the construction of the St. Louis bridge, becoming, after its completion, engineer and superintendent in charge. Later he held important positions with the Delaware Bridge Company, Keystone Bridge Company, and as assistant engineer in charge of the construction of the first New York elevated railroads. He was one of the five expert engineers appointed to determine the Hudson River bridge span. He is consulting engineer for the New York Public Library, and for the Quebec bridge. He is an authority on all matters relating to iron and steel construction.

Cooper, Thomas, American physicist and politician: b. London 22 Oct. 1759; d. South Carolina 11 May 1840. He was educated at Oxford, studied law and medicine and was admitted to the bar. Entering into the political agitations of the period, he was sent by the democratic clubs of England to the affiliated clubs in France. In this latter country he took part with the Girondists, but perceiving their inevitable downfall escaped to England. While in France he had learned the secret of making chlorine from common salt, and he now became a bleacher and calico printer in Manchester, but his business was unsuccessful. He next came to America, and uniting with the Democrats opposed with vivacity the administration of John Adams. For a violent newspaper attack on Adams in 1799, he was tried for a libel under the Sedition Act of 1800, and sentenced to six months' imprisonment and a fine of $400. The Democratic party coming into power, he transacted in 1806 the business of a land commissioner on the part of the State of Pennsylvania with such energy as to triumph over difficulties with the Connecticut claimants in Luzerne County, but being appointed to the office of judge, became obnoxious to members of his own party, and was removed in 1811. He then successfully occupied the chair of chemistry in Dickinson College, in the University of Pennsylvania, and in Columbia College, S. C., of which last institution he became president in 1820, and in which he was also professor of chemistry and political economy. On his retirement in 1834, the revision of the statutes of the State was confided to him, and he died in the performance of his duty. Cooper was alike eminent for the versatility of his talent and the extent of his knowledge. He published in 1794, in London, a volume of 'Information Concerning America'; in 1800 a collection of political essays; in 1812 a translation of the 'Institutes of Justinian'; in 1819 a work on 'Medical Jurisprudence'; in 1812–14 two of the five volumes entitled the 'Emporium of Arts and Sciences'; and in 1826 'Lectures on the Elements of Political Economy.'

Cooper, Thomas, English Chartist and poet: b. Leicester 28 March 1805; d. Lincoln 15 July 1892. While a shoemaker's apprentice he studied assiduously, and in 1828 became a schoolmaster and Methodist preacher. In 1841 he prominently identified himself with the Chartist movement as a leader, and was arrested in the following year on a charge of sedition. During his subsequent imprisonment for two years in Stafford he wrote a Spenserian poem, entitled 'The Purgatory of Sucides,' and some stories published under the title of 'Wise Saws and Modern Instances.' Among his other works may be mentioned 'Baron's Yule Feast' (1846), a poem; 'Alderman Ralph' (1853); and the 'Family Feud' (1854), two novels. He lectured much in London and the provinces, and contributed articles to various newspapers. In 1855 he abandoned free-thinking and began lecturing on Christianity. His autobiography appeared in 1872, and his 'Thoughts at Fourscore and Earlier' in 1885.

Cooper, Thomas Sidney, English landscape and cattle painter: b. Canterbury 26 Sept. 1803; d. there 7 Feb. 1902. He studied at the Royal Academy School, went to France in 1827, and settled for three years in Brussels, where he learned much from Verboeckhoven. In 1833 he

exhibited at the Academy, and in 1867 was elected Royal Academician. He exhibited at the Royal Academy 67 years successively. Among his works are: 'Mountains in Cumberland' (1841); 'Ettrick Shepherds' (1842); 'Cattle at Pasture' (1843); 'Summer Evening' (1846); 'Charge of the Household Brigade — Waterloo' (1847); 'Fordwich Meadows — Sunset' (1850); 'Crossing Newbiggin Moor in a Snowdrift' (1860); 'Snowed up' (1867); 'Milking Time in the Meadows' (1869); 'Passing Shower' (1870); 'Children of the Mist' (1872); 'Monarch of the Meadows' (1873); 'There's no Place like Home' (1874); 'God's Acre' (1875); 'Maternal Affection' (1876); 'A Cool Retreat' (1877); 'My Boy' (1877); 'Victor's Shout' (1879); 'Isaac's Substitute' (1880); 'Summer Evening in the Marshes' (1880); 'On Deal Common' (1880); 'Scape Goat' (1881); 'Summer Afternoon' (1882); 'A Sedgy Brook in the Meadows' (1883); 'In the Rob Roy Country' (1883). In 1882 he presented a gallery of art to his native town, and in 1890 published an autobiography entitled 'My Life.' His work is neat and highly finished in character, but conventional and displays no sympathetic study of nature, but rather an excellent imitation.

Cooper Creek, or **Barcoo,** called by the latter name chiefly in its upper course, the largest inland river in Australia. It rises in Queensland at about lat. 25° S., and flows at first southwest and then in a westerly direction, into Lake Eyre. It was on the lower course of this river that Burke, Wills, and King, the explorers, had their headquarters, and here the first two died of starvation, while King was found in the company of natives, after having suffered fearfully from lack of food. See AUSTRALIA.

Cooper River, a river of South Carolina, rising in the eastern part of Berkeley County, flowing across the county in a generally southerly course, and emptying into Charleston Harbor. Although the river has a very short course, it is remarkable for its breadth. It forms, with the Ashley River, the peninsula upon which the city of Charleston is situated.

Cooper Union, or **Cooper Institute,** an institute founded in New York in 1857 by Peter Cooper. Its object is to provide free schools of art and science, and free reading rooms and library for the working classes. The founder chose the word "Union" because he hoped that other liberal persons would unite with him in providing the means for carrying into effect his benevolent intentions. The Cooper Union building was erected at the junction of Third and Fourth avenues, and cost $630,000. An endowment fund was created by the gift of $100,000 during Mr. Cooper's lifetime and another $100,000 was added by his will. The William Cooper memorial foundation was $340,000. The fund has received additional gifts from time to time from Edward Cooper and Abram S. Hewitt, and in 1899 Andrew Carnegie gave $300,000 and later $300,000 more. The increase of annual revenue amounting to $25,000 provided by the three donors last mentioned was intended for the purpose of establishing a day school and of enlarging the operations of the night classes by the addition of special instruction in chemical, electrical, and thermodynamic knowledge. The expenditure made necessary by preparation for enlarging the work of the institute amounted to about $22,000 additional, which was contributed chiefly by Mr. Cooper and Mr. Hewitt. The courses in science include engineering, electricity, chemistry, physics, astronomy, and mechanical drawing; and those of art include architectural, industrial, and ornamental and free-hand drawing, clay modeling, and painting. Instruction is given in music, English literature, wood engraving, and pottery. The institute confers degrees in science and in civil, mechanical, and electrical engineering. There are several scholarships. Additional advantages are offered by lecture courses, a museum, an art gallery, and a library of 39,481 volumes, with a reading room containing current numbers of nearly 500 magazines and newspapers. The institute is divided into the following departments: Night School of Science, Day School of Science, Naval Architecture Class, Night Art Department, Woman's Art School, Stenography and Typewriting School, Telegraphy School, Elocution Class, Oratory and Debate Class. The total number of students in the several departments in 1902 was 3,406. The People's Institute, although holding their meetings in the Cooper Union Building, are not branches of the Cooper Institute.

Cooperage, the art of making vessels of pieces of wood bound together by hoops. Such vessels were in use among the Romans at the period of the Christian era. The upright pieces for the sides of a barrel or cask are called staves. The swelling at the middle of the barrel, called the belly or bulge, is formed by skilfully shaping each stave broad in the middle and narrowed at the ends so as to form part of the required double conoid. A skilful cooper can work this curve so accurately that no further fitting or alterations shall be needed when the staves are put together. The staves are made to meet at their inner edges and by driving the hoops very hard, the inner part is compressed till the slight gaping outside is closed, and thus slight inaccuracies of fitting are remedied. The bulging shape of barrel and cask seems only a fashion. It has been suggested that the purpose is only to make more difficult the cooper's trade. During the last few years a strong effort has been made to introduce perfectly cylindrical casks in their place; the room saved in packing cars, etc., being the strongest argument for the new shape, which could be made by much cheaper machinery besides.

There are several branches of cooperage. The wet or tight cooper makes vessels for holding liquids. The dry cooper does inferior work, such as barrels for containing dry goods, where an inferior degree of accuracy is sufficient. The white cooper makes churns, pails, etc., which for the most part have straight sides. The best work is made of oak, which must be thoroughly dried before being put together. In warm countries, the drying of the sun is sufficient, and casks are therefore mounted in summer only; but in the United States, artificial drying is commonly resorted to. The hoops are hammered down from the narrow to the wide part of the cask, by means of a mallet striking a piece of wood held against the hoop. Iron hoops are sometimes put on hot, in order that their contraction on cooling may bind the work together. Most ingeniously constructed machinery is now generally used in barrel-making.

Co-operation, in modern parlance the association of people for the accomplishment of any desired end, especially the association of working people for the management of their industrial interests in store, workshop, or other undertaking, and the equitable distribution of profits. The advantages of co-operation consist in the lower prices paid for the ordinary articles of life and of manufacture, the common use of capital, machines, buildings, water power, and in common production. Instances of co-operative industry have been discovered among English miners and New England fishermen in the 17th century, and among Greek sailors of the Levant. Co-operative societies established as early as 1777–95 are still in successful operation. The earliest in England was founded in 1794 at Mongewell, in Oxfordshire, by Shute Barrington, bishop of Durham. During the Owenite agitation, between 1820 and 1845, hundreds of co-operative societies rose up. Robert Owen (q.v.), failing to convert his brother manufacturers to the innovations he had introduced for the benefit of his operatives in his New Lanark mills, appealed to the government to adopt measures that would alleviate the poverty of the laboring masses, but without success. He therefore abandoned these efforts, and turned to the task of establishing co-operative communities that would put his ideas into practice. One hundred and seventy shops had been organized under the Owen plan in 1830, but four years later most of these had ceased to exist.

The modern movement first took practical and permanent form with the formation of the Rochdale Society of Equitable Pioneers in 1844. The founders were 28 Lancashire weavers, nearly all Socialists of the Owen school and Chartists. The original capital was $140, slowly collected by subscription of two pence, and afterward three pence a week. With this capital they opened a store for supplying themselves with provisions; but at first they had only flour, butter, sugar, and oatmeal to sell. They limited the interest on shares to 5 per cent, and divided the profits among members in proportion to their purchases. When it was proposed to take out a license for the sale of tea and coffee the members did not pledge or subscribe amounts, but "promised to find" small amounts ranging from two pence to one pound, and the latter sum was actually the largest offered. A motion was made that members who would not trade with the store be paid off, but those who desired to see co-operation advance under the principle of freedom opposed the motion, and it was withdrawn. At the end of 13 years they had a membership of 1,850, a capital of $75,000, and their annual sales amounted to $400,000. This successful society with its organization and methods of conducting business became a model which was followed in many parts of England and abroad. In 1864 a wholesale society with annual sales amounting to over $200,000,000, with a membership of 1,512,399 and a capital of nearly $330,000,000, was established at Manchester, and in 1869 a second at Glasgow. They work in harmony and are practically one institution. The wholesale society is a federation of retail societies for the supply of goods to the various societies composing it, with purchasing and forwarding depots in England, the United States, and on the continent. It owns eight steamships. It has extensive productive works, boot and shoe factories, woolen cloth works, corn mills, etc. There is also a co-operative fire and life insurance society. Since the inception of the co-operative stores in Great Britain a business of $4,500,000,000 has been transsacted and $360,000,000 in dividends paid to their members. The Woolwich Society is an organization of 10,000 men and women. They own six stores, the finest bakery in London, farms, stables, tailor shops, boot and shoe works, etc. One of the most notable examples of that kind of co-operation that includes profit-sharing is the South Metropolitan Gas Company, whose receipts are shared with 3,000 employees. The Leeds Co-operative Store is perhaps the most famous single experiment. It is evident that probably 1,000,000 families, or a sixth of the whole population of England, have their wants in whole or in part supplied by co-operative stores.

Building and loan associations (q.v.) are purely co-operative organizations, and existed in form in England as early as the latter part of the 18th century. The date generally assigned for their beginnings in that country is 1836, for in that year Parliament adopted an act for their regulation. The Friendly societies are co-operative in reality, though not in name. In 1827 the first English paper for the propaganda of co-operation was established, entitled the Brighton Co-operator. In 1871 the Co-operative News was established as the organ of the societies. Since 1869 annual congresses of co-operative societies have been held throughout England. The Congress of 1902 had 1,100 delegates, with reports for 1901 from 1,604 societies, giving a membership of 1,919,555; a gain of $7,291,000 in shares, $2,574,474 in profits, and $6,614,124 in investments. Nearly $45,000,000 was distributed to members during the year as cash dividends. In the Australian colonies co-operation has made a marked advance. There are many Friendly societies there. In 1873 the Co-operative Union was consolidated, with a regular constitution. It is governed by a board of 12 members, representing the six sections into which the union is divided. There were 48 additional societies not reporting. The movement for co-operation in Ireland has lately shown a decided progress. There are in the island 232 co-operative dairy or creamery societies, 101 agricultural societies, 52 co-operative banks, and 39 other organizations; total membership 40,000. Although in Great Britain co-operation has succeeded best in the form of distribution, that is, in co-operative stores for supplying the domestic wants of the workman's family, in continental Europe other phases of the movement have been more prominent.

In France co-operation began with the Revolution, and that nation is one of the few in which the state has stepped in to aid associative ventures of this kind. Building contracts have been awarded co-operative industries by the government, and M. Waldeck-Rousseau's known friendliness to the principle has awakened encouragement among the members of the various societies. Co-operation in different modes of agriculture has achieved some success in France. In 1900 there were 2,500 co-operative societies, 1,489 being devoted to distribution. Two hundred and fifty workshops are operated according to this principle. Paris has a very large and successful society. In Germany and Italy the

co-operative idea has led to the formation of many people's banks, furnishing mutual credit to workmen and also small tradesmen. The People's Banks in Germany were founded by Schultze-Delitzch, the probable date being 1851, Schultze traveling through Germany, addressing large audiences, and explaining his plan. He encountered the most determined opposition. Bismarck obstructed the movement. Yet these credit loan institutions spread, and Germany today possesses thousands of them. Schultze himself organized 3,000. There are many throughout Europe. These banks charged in the beginning a high rate of interest — 12 or 14 per cent — though it has since become much lower, and only short-time loans are permitted. The members of most of these credit loan institutions hold but one share, the price of which is placed high, and this is paid in small instalments, the object being to encourage the inclination to save. The total membership of co-operative societies in Germany is about 2,000,000. Productive societies to the number of 255 are engaged in a large variety of industries. There are 1,527 societies engaged in distribution. The spread of the co-operative idea has been especially remarkable in Switzerland and Denmark. In Switzerland in 1897 there were 2,223 co-operative societies, 838 of which were co-operative dairies. These had grown in 1900 to 3,400 societies, 1,400 being dairies. There were 370 organizations for distribution. One sixth of the population are co-operators. In Denmark there are 837 distributing societies and 1,052 co-operative dairies producing an annual output of butter worth $34,000,000.

The agricultural societies were organized in five central bodies, their aims being to purchase provisions, to sell their own products at a profit, to protect their members against over-production, to diminish the cost of production, and to improve and educate their members.

At the end of 1897 there were in the Netherlands 697 societies, 253 of which were for exploiting milk, butter, cheese and other products. In 1900 the total number of organizations had grown to 2,000. The co-operative societies of Belgium numbered 1,000, the dairies leading (227), and doing a business of $3,250,000. In Ghent there is an organization of 25,000 workingmen sharing the profits of stores and factories conjointly owned. A vast baking system is carried on in the same way. Marked progress has been made in Italy, where the Church has taken an active interest in organizations for the benefit of the people. There are in that country 1,200 distributing societies with annual sales amounting to about $10,000,000; 1,737 co-operative banks; 750 dairies and 513 productive labor societies.

In Hungary an interesting feature of co-operation is the share which the state takes in it, as a member adding 1,000,000 crowns to the capital. In that country there are 1,002 banks, many dairies and various other co-operative undertakings. Austria has 5,092 organizations, most of them being of the nature of credit societies. Figures for Russia are not available later than 1896; 1,442 societies were then in existence, 605 of which were banks. Even in Spain the movement is being felt, though the number of its adherents is comparatively small.

In the United States co-operation has made comparatively slow process. A co-operative store in Kingston, Mass., is said to be the oldest existing experiment on the Rochdale plan. It was organized in 1875, but its annual trade is small. These were various co-operative associations formed in the late forties and the early fifties. A bulletin of the Department of Labor issued in 1896 states that "none survive." In modified form, however, one or two still exist, among which is the Protective Union of Worcester, Mass., and the Central Union Association of New Bedford, Mass., organized respectively in 1847 and 1848. In 1886 co-operative business in New England included creameries, banks and building associations. A co-operative coopering association was established in Minneapolis in 1874. In 1882 the students of Harvard University formed a society for supplying themselves with books, stationery, and other articles. It has been a great success and has been imitated at Yale and other colleges. The co-operative creameries in certain of our northwestern States have achieved an astonishing measure of success. Minnesota probably leads in the number and value of creameries in the United States, though New England — Massachusetts notably — has many of them. In 1901 more than 50 Farmers' Co-operative Grain associations were formed in Kansas. The Co-operative Association of America, organized during the same year, in Lewiston, Me., was started with the purpose of developing a federation of various lines of business, beginning with a grocery. The profits are divided semi-annually among the co-operators. In 1901–2 the association accumulated $250,000, and reported a business of $600,000. There are many co-operative communities in the United States, varying much in their methods and characteristics. They have been classified as communistic, socialistic and partially co-operative. So far as it has gone the co-operative movement has been a real and effectual training for the intelligence, business capacity, and moral character of the workmen. It has taught them thrift, foresight, self-control, and the habit of harmonious combination for common ends.

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HENRY DEMAREST LLOYD.

Cooperia, koo-pē'rĭ-a, a genus of plants of the *Amaryllis* family (*Amaryllidaceæ*), so named in honor of Joseph Cooper, a curator of the Botanical Society of London. They are low herbs with coated bulbs, and narrow grass-like

leaves, with flowers somewhat resembling the atamasco lily. There are two known species in the United States, natives of the Southwest, and of Mexico. Drummond's Cooperia (*A. Drummondii*) grows on the prairies from Kansas through Louisiana to Texas, New Mexico, and Mexico. The flower is very fragrant, and because of its habit of blooming at night or in the early evening, is known as the evening star. The giant fairy-flower (*C. pedunculata*) is a favorite for cultivation, as it thrives well in ordinary garden soil, and if placed in a root-cellar in dry soil with an even temperature, will bloom again in the spring.

Cooper's Hill College, properly the Royal Indian Engineering College, at Cooper's Hill, Eng., on the borders of Surrey and Berkshire, was founded in 1871 for the training of candidates for the Indian Public Works Department, the Indian Forest Department, etc. The ridge known as Cooper's Hill (142 feet high) affords a fine view, and gave its name to a poem by Sir John Denham.

Cooperstown, N. Y., village and county-seat of Otsego County, at the outlet of Otsego Lake, and on the Cooperstown and Charlotte Valley R.R.; 90 miles west of Albany. It is noted as having been the residence of James Fenimore Cooper, the novelist. It has Thanksgiving Hospital, a Union free school, knitting mills, national bank, a box factory, and a cheese factory. This was once an old Indian town, but as early as 1769 was owned by George Croghan, and in 1785 was purchased by William Cooper, the father of James Fenimore Cooper. Pop. 2,415. See JAMES FENIMORE COOPER.

Co-or'dinates, in geometry, a term applied to lines, to which points under consideration are referred, and by means of which their position is determined. Co-ordinates determine the position of a point in space or in a plane which is understood to contain all the figure under consideration. They determine position by straight lines only, or by a straight line and angles; in the latter case they are called *polar* co-ordinates. When co-ordinates are at right angles to each other they are called *rectangular* co-ordinates, and when they make any other angle they are *oblique* co-ordinates. Spherical co-ordinates are used for the fixation of celestial objects in the celestial sphere. The term co-ordinate is used because various points in a curve fixed by such lines may be treated in order. Descartes first introduced this method.

Co-ordination (Lat. "arranging in order," "ranking together"), a physiological and psychological term, indicating the normal and harmonious operation of the muscles, especially the voluntary ones, in such actions as walking, motion of the arms, and mastication. Co-ordination is dependent on the perfect and complete action of the sensory nerves and upon the healthy condition and proper interrelation of the muscles concerned. Its failure is usually due to affections of the brain or spinal column and, if the theory of many physiological psychologists be accepted, to any abnormality of the cerebellum, which is reckoned the seat of co-ordination, notably in relation to locomotion. Such lack of co-ordination is styled ataxia. This term is a Greek antonym of co-ordination and implies disorder. Ataxia, although its actual cause, save in the case of the hereditary variety which usually develops between the ages of 4 and 18, is disorder of the spinal column, has many immediate causes, accompanying alcoholism and following diphtheria. Both hereditary and primary ataxia commonly attack the limbs, and locomotor ataxia is the best-known form of lack of co-ordination.

Coorg, or **Koorg,** British India, province bounded by Mysore on the east and northeast, and the districts of South Canara and Malabar on the west; area, 1,583 square miles. The country in general is extremely rugged, and covered with forests, in some parts abounding in sandal and other valuable woods, but in others overrun with jungle, the resort of elephants and beasts of prey; climate is temperate and healthy; soil fertile, and in many parts well cultivated, yielding in abundance rice of superior quality. Great numbers of cattle are reared. Coffee, pepper, cardamoms, and other spices are raised. The manufactures are insignificant. The capital is Merkara. The old fortifications are interesting. High ramparts and deep ditches are so arranged as to be most effective in checking the advance of an enemy. Pop. 180,500.

Coornhert, Dirck Volckertsen, dĕrk fōl'-kĕrt-sĕn kôrn'hĕrt, Dutch poet and scholar: b. Amsterdam 1522; d. Gouda 1590. In 1562 he became secretary of the city of Haarlem, and opposed the Spanish power, until he was imprisoned for a short time, and on his release forced to flee to Cleves and Xanten. In 1572, when the Dutch successfully revolted against Spain, he was made state secretary of the States of Holland. By his poetical writings, 'Book of Songs' (1575), 'Right Use and Abuse of Worldly Possessions' (1585), and several dramas, as also by his elegant translations from Boccaccio and the classics, he earned the title of "restorer of the Dutch language."

Coos Bay, an indentation on the coast of Oregon. It extends into the land about 15 miles and is only one mile in width, thus making it a safe harbor. Marshfield and Empire City are on Coos Bay.

Coosa (koo'sa) **River,** in Floyd County, in the northwestern part of Georgia, is formed by the junction of the Ostanaula and the Etowah rivers; it flows southwest into Alabama and about eight miles north of Montgomery it unites with the Tallapoosa River and forms the Alabama. Its length is about 350 miles. It is navigable for boats of light draft for some distance above its mouth.

Coosy, koo'sē, or **Kusi,** a river of India, rising in Nepaul, and flowing first south southeast to the British frontier, and then nearly due south to the Ganges. It is very rapid and difficult to navigate. Its total length is about 325 miles.

Coot, a strictly aquatic bird of the genus *Fulica,* sub-family *Fulicinæ* and family *Rallidæ,* also called water-hens and crow-ducks. About 10 species are known, distributed throughout the world; but mostly in South America, which has six. The American coot, *F. americana,* is abundant throughout North America, breeding wherever found and resident in the South. Its appropriate habitat is shallow reedy ponds, and sluggish streams. The nest is a disordered heap

of reeds or similar material in or near the water, in a hollow of which 8 to 12 eggs, clay-colored, with brown spots, are deposited. The length of the bird is 14 to 16 inches, but the body is remarkably compressed, and the feet are nearly unique in the lobate webbing of the toes. The color is generally sooty slate, with the lower belly and some other parts white and the bill red at tip and base. The coot is much sought by gunners about the interior lakes. The European coot (*Fulica atra*) is a closely similar bird, slaty in color, with a bare patch on its head, whence the name bald coot; it is found throughout Europe and in Asia.

Coote, Sir **Eyre,** British military officer: b. County Limerick, Ireland, 1726; d. Madras 26 April 1783. He entered the army at an early age; and from 1754 to 1762 served in India. It was by his arguments that Clive was induced to risk the battle of Plassey, and for his services in this and other engagements, Coote was in 1759 given the command of the newly raised 84th regiment. In this year he gained the great victory of Wandiwash; and his capture of Pondicherry in 1761 completed the downfall of the French in India. Coote returned to England, and was knighted in 1771. In 1779 he assumed the command-in-chief in India, with the rank of lieutenant-general, and in 1781 he routed Hyder Ali at Porto Novo.

Coote, Sir **Eyre,** English soldier: nephew of the preceding: b. 1762; d. about 1824. He served as ensign in the English army in the battle of Brooklyn and various other engagements during the war of the American Revolution, became a major-general in 1798, and was made commander-in-chief of the island of Jamaica in 1805.

Coote, Richard, 1st Earl of Bellomont, English colonial governor: b. 1636; d. New York 5 March 1701. In 1695 he was appointed Colonial governor of New England, and was given special authority to arrest pirates. An expedition was fitted out with Capt. Kidd in command, but the latter's own piratical acts caused his arrest in Boston, whence he was sent to England for trial.

Copacabana, kō-pā-kā-bā'nā, **Peru,** a small peninsula on the south shore of Lake Titicaca. It was the sacred place of the Incas, and many ruins of temples and of other buildings are still extant. There is here now a shrine of the Virgin Mary which is visited annually by thousands of pilgrims.

Copaiba, kō-pā'ba, the oleoresin of *Copaiba Langsdorfii* and other species of copaiba. Of these at least 16 are known to give this drug, and seven are known to yield a product that is sent to the United States. Oleoresin copaiba comes mostly from Brazil and the West Indies; it is found in special secretory passages in the wood from which it is obtained by deep gashes cut into the tree, much as turpentine is obtained from pine trees. The oleoresin flows in a steady stream, one tree often yielding as much as from 10 to 15 gallons. Copaiba as it comes into the market varies much in age and variety. The finer sort of Para copaiba is a thick liquid, clear, somewhat resembling Canada turpentine. It may be darker, sometimes resembling sherry. It has a specific gravity of .996, does not mix with water, but is soluble in ether. Distilled with calcium hypochlorite it yields chloroform. Copaiba oil has a peculiar aromatic odor which is extremely disagreeable. The chemical composition of copaiba is extremely complex. It contains at least from 40 to 80 per cent of oil and a large amount of resin, which consists largely of copaivic acid ($C_{20}H_{30}O_2$). Oxycopaivic acid and meta copaivic acids are also found. The action of copaiba is largely exerted on the genito-urinary system, where it acts as a stimulant diuretic and irritant, and is particularly useful in diseases of the bladder, urethra and mucous membranes of the pelvis and of the kidneys. It may be used in bronchial affections also, but is rarely thus employed because of its disagreeable taste and because it very frequently causes an eruption. It is usually administered in gelatine capsules. Its chief commercial use is as a vehicle in oil painting and as a varnish.

Copais, kō-pā'is, formerly a lake of Greece, in Bœotia, fed mainly by the River Cephissus. The only outlet for water collected in this depression was afforded by a number of subterranean channels, called *katavothra,* on the eastern side, and as these were not always sufficient to carry off all the water a shallow marshy lake was formed which varied in size according to the season of the year. In ancient times the land was drained, and from a marsh it became a fertile country; but after a time neglect made it again a shallow lake. In 1886 a French company undertook to again drain off the water, and after working for some time they were superseded by an English company. In 1894 the work was completed and about 60,000 acres of good soil was reclaimed. Consult: Curtius, 'Die Deichbauten der Minyer.' See Bœotia.

Co'pal, a group of very hard resins derived from a great variety of plants both recent and fossil, the botanical names of which are not determined beyond doubt. Its chemical composition is: Carbon 78 to 80.5, hydrogen 8.7 to 10.5, and oxygen 9 to 10.7 per cent. The harder sorts are chiefly derived from fossil sources. In the recent state the resins have been obtained from species of *Trachylobium hymenæa* and *Guybourtia* from Africa, South America and the West Indies. Copal occurs for the most part in irregular pieces. As found in nature all of the fossil gums are covered with a crust of oxidized gum, the result of fossilization. This must be removed by chipping or scraping, or by the aid of alkalis, to prepare the gum for market. The Zanzibar and Angola varieties then have a characteristic "goose-flesh" appearance. Copal is without taste or odor; it has a conchoidal fracture, and a tendency to break into six-sided fragments. It is used in the manufacture of varnish, its particular value arising from its hardness which is about 3 of the mineral scale. The softer varieties are of recent origin, and are known as "spirit copals" because soluble in alcohol or turpentine.

Copal'chi Bark, a bark resembling cascarilla bark in its properties, and produced by a shrub of the same genus, *Croton niveus,* a native of Mexico and of Central America. The bark is in quills a foot or two in length, and has a thin corky epidermis. Copalchi bark is much used as a substitute for cinchona in Mexico, where it goes by the name of *Quina blanca,*

and is imported, though not to a large extent, into Europe. It contains a minute proportion of a bitter alkaloid resembling quinine, and is somewhat weaker than cascarilla bark.

Copan, kō-pān', Honduras, C. A., an Indian village in the southwest, in a mountainous region. The site of an ancient city, some of the ruins of which still remain. The buildings were of stone, and the carvings still preserved show a proficiency in architecture not attained by many of the aborigines. In 1530 the place was captured by Hernando de Charez.

Coparcenary, in law, partnership in inheritance; joint heirship in which each is entitled to a distinct share of the benefits, while the property remains undivided. It commonly arises from the custom of dividing equaliy among coheiresses the property of a man who dies intestate; but even in England, where the eldest son is usually sole heir, local custom may create coparcenary among male heirs.

Cope, Arthur Stockdale, English portrait painter: b. 1857. He is a son of C. W. Cope (q.v.) Among noted portraits by him are those of the present German emperor, Lord Roberts, the Duke of Cambridge, and Lord Kitchener.

Cope, Charles West, English painter: b. Leeds 28 July 1811; d. Bournemouth 21 Aug. 1890. He studied at the Royal Academy and in Italy, and first exhibited at the Academy in 1831. In 1843 he gained a prize of £300 for his picture, 'The First Trial by Jury'; in 1844, by his fresco, the 'Meeting of Jacob and Rachel,' he secured the commission for one of six frescoes for the House of Lords, producing accordingly 'Edward the Black Prince Receiving the Order of the Garter.' Altogether he executed eight frescoes from English history of the 17th century for the House of Lords, while his other works were numerous, the subjects being historical, romantic, or domestic. Of these some of the most important are 'Nereids' (1836); 'Cotter's Saturday Night' (1843); 'Last Days of Wolsey' (1848); 'King Lear' (1850); 'Milton's Dream' (1850); 'Pilgrim Fathers' (1857); 'Evening Prayer' (1860); 'Spring Flood' (1865); 'Shylock and Jessica' (1867); 'The Disciples at Emmaus' (1868); 'Yes or No?' (1873); 'Taming of the Shrew' (1874); 'Anne Page and Slender' (1875); 'Selecting Pictures for the Royal Academy Exhibition' (1876); 'Bianca's Lovers' (1877); and 'Faraway Thoughts' (1881). His etchings have also been much admired. He became A.R.A. in 1843 and R.A. in 1848. His 'Reminiscences' were published in 1891.

Cope, Edward Drinker, American zoologist and paleontologist: b. Philadelphia, Pa., 28 July 1840; d. there 12 April 1897. Oliver Cope came to this country from Wiltshire, England, about 1687, and settled on Naaman's Creek in the northernmost part of the State of Delaware. Oliver's grandson, Caleb, a member of the Society of Friends, was burgess of Lancaster, Pa., in 1776, and incurred the indignation of his fellow-townsmen for offering the hospitalities of his house to Capt. (afterward Major) André and other British prisoners captured at St. John's, Canada, by Gen. Montgomery. Caleb's son, Thomas Pim Cope, settled in Philadelphia, and established the Cope packet line, trading between that city and Liverpool. Thomas Pim Cope's son Alfred married Hannah Edge and was the father of the subject of this sketch.

During the first seven years of Edward's life he was educated at home, and gave early proofs of a restless inquisitiveness and an accuracy of reasoning on what he had observed, very rare in so young a child. Being taken on a voyage by sea from Philadelphia to Boston before he had reached his 7th year he kept a journal in which he recounted the incidents of his voyage and sojourn, amply and very creditably illustrated by sketches. At about the same time he made some visits to the museum of the Academy of Natural Sciences in Philadelphia, describing and sketching the objects he saw. At 13 he entered the Friends' School at Westtown, Chester County, Pa., where, though he devoted his leisure to the collection and observation of plants and small animals, he received better marks in mathematics, astronomy, Latin, etymology, grammar, Scripture, and chemistry, than in physiology, which formed so important a ground work for his subsequent researches. As a young man of 18 he announces to his family that he is to be a naturalist. His letters of this period disclose an undercurrent of gallantry, and some of his descriptions of natural scenes are really poetic; and indeed some not very bad versification still exists to prove that he was capable of fair rhyming.

His father tried to make a farmer of him, and for this purpose gave him a farm near Coatesville, Pa. He learned much of the flora and fauna of this region, but revolted at the thought of settling down to this monotonous life. He longed to grapple with the larger problems of biology, and broadly hints this in a letter of 1858: «Dr. Leidy is getting up a great work on comparative anatomy.» . . . «Such a work will be very useful to those who want to go to the bottom of natural history; it is an interesting study, too, to notice the modification in form, the degradations, substitutions, etc., among the internal organs and bones. The structure, forms, and positions of the teeth, too, are interesting to notice, so invariably are they the index of the economy and the position in nature of the animal.»

In 1859 he published his first paper on the 'Primary Division of the Salamandridæ.' He became a member of the Academy of Natural Sciences of Philadelphia in 1861. He had had his wish to attend Leidy's lectures, and this same year he spent some time with Gill, Kennicott, Meek, and Horatio Wood in the museums of the Smithsonian Institution at Washington. He greatly admired Profs. Henry, Baird, and Arnold Guyot. He was astounded that Guyot believed in the resurrection of the body. He published 6 scientific papers in 1860; 9 in 1861; 13 in 1862; 4 in 1863; 5 in 1864; 10 in 1865; 11 in 1866. These were almost exclusively printed in the 'Proceedings' of the Academy of Natural Sciences and were largely on herpetology. In 1866 he became a member of the American Philosophical Society, and thenceforward published largely in this society's proceedings. Altogether, counting his editorials in the 'American Naturalist,' and five posthumous publications, his life yielded 1,281 separate papers on scientific subjects. The following statement of his work is taken from Prof. Henry F. Osborn's article in 'Science' for 7 May 1897.

As early as 1868 he laid the foundations for five great lines of research on the following subjects: Fishes, Amphibians, Reptiles, Mammalia, and Philosophy. He unconsciously followed Lamarck in ascribing to conscious effort the adaptive changes in species, and this at the age of 28. In 1869 he struck the keynote of all his later evolution in the sentence, "intelligent choice may be regarded as the originator of the fittest, while natural selection is the tribunal to which all the results of accelerated growth are submitted." He accepted the term, Neo-Lamarckian as properly describing his position, which was that, while very many specific characters are adaptive, few generic characters are so, but these latter are the results of the acceleration or retardation of one plan of development preordained by the Creator. As in the case of Huxley, Haeckel, and many other naturalists of the last century, his career started in zoology, but led inevitably to palæontology, as it always must with a man of research so broad of view. Osborn says Cope's work in ichthyology would alone have given him high rank among zoologists. Baur says no naturalist ever published so many papers on the taxonomy, morphology, and palæontology of the amphibia. His work on the Mammalia and Reptilia was immense. At the time of his death Cope had personally named and described 1,115 out of 3,200 known species of fossil vertebrates of North America, or 34.8 per cent.

In 1865 he married Miss Annie Pim, by whom he had one daughter, now the wife of Prof. William H. Collins of Haverford College, Pa He was elected professor of natural science at Haverford College in 1864; was made a member of the National Academy of Science in 1872; received the Bigsby gold medal from the Geological Society of London in 1879; was elected to membership in the Imperial Society of Moscow in 1886; received the degree of Ph.D. from Heidelberg University on the occasion of the celebration of its 500th anniversary, and was elected professor of geology and palæontology at the University of Pennsylvania the same year. In 1891, on motion of Dr. Leidy, he was awarded the Hayden memorial medal. He was president of the American Society of Naturalists in 1895, and president-elect of the American Association for the Advancement of Science at the time of his death. For the titles and those of all of Prof. Cope's publications, see 'Catalogue chronologique des publications de E. D. Cope, Annales de la Société géologique de Belgique t. XXIX. Bibliographie, Liège, 1902'; and the 'Alphabetical Cross Reference Catalogue of the Works of E. D. Cope'; Memorias y Ravista de la Sociedad 'Antonio Alzate,' Mexico, 1902; both by Dr. Persifor Frazer. PERSIFOR FRAZER.

Cope, SIR **John,** English general: d. 28 July 1760. Having been made a Knight of the Bath, in 1742 he commanded the troops sent to the assistance of Marie Theresa. On the landing of Prince Charles Edward in 1745, Cope was appointed commander-in-chief of the government forces in Scotland. After a fruitless march to the Highlands, he returned with his troops by sea to Dunbar, and on 21 September was totally defeated at Prestonpans. His defeat is celebrated in the Jacobite song, 'Hey, Johnnie Cope, are Ye Waukin' Yet?'

Cope, Thomas Pym, American merchant: b. Lancaster County, Pa., 26 Aug. 1768; d. Philadelphia, Pa., 22 Nov. 1854. He began importing goods in his own vessels in 1807, and in 1821 established the first line of packets between Philadelphia and Liverpool. He was held in great respect by his fellow-townsmen, who elected him to many places of trust and honor. During the yellow fever epidemic of 1793 he stayed in the city to aid its victims, and during the smallpox outbreak in 1797 carried food to the houses of those taken with the disease, and in other ways cared for them. He was an executor of Stephen Girard's will; secured the estate of Lemon Hill as a park for the city; and was active in the construction of the Pennsylvania Railroad. The introduction of the Philadelphia water supply from the Schuylkill and the establishment of the Mercantile Library were largely due to his efforts.

Cope, an article of ecclesiastical vesture in the Roman Catholic Church. It is a voluminous cloak reaching nearly to the feet, opening in front, and with a semicircular cape or hood behind. It is usually of silk material, embroidered, or of cloth of gold. It is worn by the celebrant in certain functions, as processions and benediction. The cope is not, like the chasuble (q.v.), reserved to priestly use; it is worn also in solemn processions by the clerics who attend the celebrant, and by the cantors in Church services.

Copeck, (Russian, "a lance"), a Russian copper coin, so called from the impression of St. George bearing a lance. The coin is the hundredth part of a silver ruble, or about the eightieth part of a paper ruble. It varies in value from three fifths to three fourths of a cent.

Copenhagen, kō-pĕn-hā'gĕn ("Merchants' Haven,") Denmark, the capital, situated on the shore of the island of Zealand, in the Sound, which is here about 12 miles broad; an outlying portion, Christianshavn, stands at the north end of the island of Amager or Amak, which is separated from Zealand by a narrow arm of the sea. The channel forms a fine large harbor, which is bridged over so as to connect Christianshavn and the main part of the city at two points. The fortifications on the land side have been removed since 1863; so that the city has now practically incorporated the suburbs Osterbro, Nörrebro, Vesterbro, and Frederiksberg. To counterbalance the expected injury to the city's commerce from the opening of the Baltic Canal, a great free port, free from customs dues, was constructed in 1890–4 to the north of the harbor. The business quarter stretches from the harbor in a northeasterly direction toward the principal and central square, Kongens Nytory, which in itself forms the focus of the life of the city. Farther north and east of this point lies the aristocratic quarter, with the handsome Amalienborg Square and its royal and ministerial palaces; this district is bounded in the extreme north by the citadel and the adjoining public gardens and walks on the shores of the Sound.

Among its few buildings of historical interest or intrinsic beauty, the Metropolitan Cathedral Church, known as Vor Frue Kirke, rebuilt after the bombardment in 1807, possesses statues of Christ and the apostles, and a baptismal font,

designed and in part executed by Thorwaldsen. Trinitatis-kirke is remarkable for its round tower, which is ascended by a winding causeway instead of steps; and Holmens' kirke contains interesting monuments to the great naval heroes, Juel and Tordenskjöld. An English church, built at a cost of $49,000, was consecrated in 1887. The royal palace, called Christiansborg, was rebuilt between 1794 and 1828, but was never remarkable for architectural beauty. The principal part of the vast building was destroyed by fire in 1884, when many precious works of art were destroyed. Happily most of the pictures in its great art gallery were saved. The castle of Rosenborg (1610–24), where the regalia are kept, contains interesting collections of objects of art; and the palace of Charlottenborg (1624), is now used as an academy of arts. Copenhagen is the centre, not only of Danish, but northern literature and art, and is the seat of a number of societies for the advancement of these in all their branches, among which are the Royal Society, founded in 1742; and the Royal Society of Northern Antiquaries, founded in 1825; as well as agricultural, geographical and other societies. The royal library contains over 500,000 volumes, besides great treasures of Sanskrit, and other MSS. The Museum of Northern Antiquities in Prindsens Palais, is unrivaled in its kind, having been made what it is mainly by Worsaae. The Thorwaldsen Museum, opened in 1846, consists of works of art by that sculptor himself, and others left by him to the Danish nation, for which a separate building has been erected. Copenhagen contains also a number of well-supported benevolent institutions, banks, theatres, an exchange, etc. There are statues of several of the Danish kings, of Tycho Brahè, and of the poets. The chief exports of Copenhagen are grain, rape-seed, butter, cheese, beef, cattle, wool, hides, bones, and grain-spirit. Porcelain, pianos, clocks, watches, mathematical instruments, chemicals, sugar, beer, and tobacco are manufactured.

About the middle of the 12th century Copenhagen was but a fishing village, in the neighborhood of which Bishop Axel, or Absalon, built a castle. In 1254 the village obtained the privileges of a town, and in 1443 King Christopher made it the capital of the kingdom. It was several times attacked by the Hanseatic League; was besieged by the Swedes in the 17th century; was bombarded by the English, Dutch, and Swedes in 1700; suffered grievously by fires in 1728, 1794, and 1795; witnessed a great sea-fight in its roads on 2 April 1801, when the English, under Sir Hyde Parker, with Nelson as his second in command, destroyed the Danish fleet; and (to prevent the Danish fleet from falling into the power of Napoleon), was bombarded by the English from the 2nd to the 5th of September 1807, when great destruction was wrought, both in houses and public buildings, and hundreds of persons lost their lives. In 1888 an international exhibition was held here. Pop. (1901) without suburbs, 378,235; with suburbs, 476,806.

Consult: 'Copenhagen, the Capital of Denmark.'

Copenhagen, University of, founded in 1478, by Christian I.; destroyed during the civil wars; rebuilt by Christian III. in 1539; destroyed by fire in 1728; rebuilt by Christian VI. in 1732, and organized as at present in 1788. This is the only university in Denmark and one of the best in the northern part of Europe. It is supported partly by the government and partly by endowment; instruction is free to both sexes. In 1902 there were enrolled 2,000 pupils, and the library contained 300,000 volumes. It possesses also a large collection of Persian MSS., another of Northern MSS. Connected with the university are a surgical academy, an observatory, a botanical garden, a zoological museum, and a polytechnic institution.

Copepoda, kō-pĕp'ō-da, an order of Crustacea, ranked under the sub-class *Entomostraca* and the legion *Lophyropoda*. They are animals of small size, seldom more than 1 cm. in length, with the body divided into two segments, namely, a cephalothorax and an abdomen. There are two pairs of antennæ, two pairs of footjaws, and five pairs of ordinary feet furnished with bristles and adapted for swimming. There is a jointed tail with a tuft of bristles at its extremity. Some are found in fresh water, others are marine. Prof. Huxley says that in addition to the species placed under copepoda by Latreille and Milne-Edwards, the order contains some of the *Epizoa* or *Ichthyophthira*. There are two families, the *Cyclopidæ*, which have but a single eye; and the *Cetochilidæ*, which have two eyes. Possibly a better division of the more than 1,000 genera of this order is into parasitic *Copepoda*, whose distinguishing mark is the mouth with which they suck blood (hence the name *Siphonostomata*), the independent *Copepoda* (*Gnathostomata*), and the false *Copepoda* or *Branchiura*. The English book-name of the *Copepoda* is oar-footed crustaceans, which is simply the rendering of the scientific name.

Copernicus, kō-pėr'nĭ-kŭs, or **Koppernigk, Nicolas,** Polish astronomer: b. Thorn, Poland, 19 Feb. 1473; d. Frauenburg, East Prussia, 24 May 1543. His father was a Pole and his mother a German. From a school at Thorn Copernicus went to Cracow, where he studied medicine, theology, mathematics, and astronomy. The fame of Peurbach and Regiomontanus, the restorers of astronomy in Europe, excited his emulation. In 1496, at the age of 23, he went to Italy, and at Bologna resided two years, studying canon law and astronomy. In 1497, while in Italy, he was appointed a canon of the cathedral of Frauenburg. In 1500 he went to Rome, where he lectured on mathematics and astronomy. Subsequently he studied medicine at Padua, and canon law at Ferrara, where he graduated as doctor in this subject. He returned to Prussia in 1505, and lived for some years at Heilsberg, but his subsequent life was mostly spent at Frauenburg.

He now applied his whole strength to the study of astronomy, which at this time was dominated by the system of Claudius Ptolemy. Copernicus doubted whether the motions of the heavenly bodies could be so confused and so complicated as this hypothesis would make them. He found that some of the ancient Greeks had thought of the possibility of a motion of the earth. This induced him to examine the subject more fully, and he came to the following conclusions: That the sun was the centre of the system; that the earth was a planet like Mars and Venus; and that all the planets revolve

round the sun in the following order: 'Mercury in 87 days, Venus in 224, the Earth in 365, Mars in one year and 321 days, Jupiter in 11 years, and Saturn in 29 years. Although Copernicus knew that the planetary orbits are not circles having the sun in the centre, he was not able to determine exactly their form. This was reserved for Kepler, who completed what may be called the natural history of the subject, and stated his three celebrated laws in the end of the 16th century. Thus Copernicus stands, as it were, upon the boundary-line of a new era. He commences his labors at a time when the belief in the immobility of the earth is universal. He conceives the idea of its motion, and pursues it with unwearied diligence, not for a few years, but through the greater part of his life. constantly comparing it with the appearances in the heavens. He at last confirms his idea, and thus becomes the founder of a new system of astronomy. All this he did a hundred years before the invention of telescopes, with imperfect wooden instruments on which the lines were often only marked with ink. His great countryman, Kepler, has described his character in the following words: "Copernicus, vir maximo ingenio, et quod in hoc exercitio magni momenti est, animo liber." In his celebrated work, dedicated to the Pope, Paul III., "De Orbium cœlestium Revolutionibus,' libri vi. (completed in 1530, although first published at Nuremberg 1543, folio; later editions appeared at Basel 1566, at Amsterdam 1617, at Warsaw in 1851, at Berlin in 1873), his system is developed.

Besides his principal work, we have also by him a work on trigonometry, 'De Lateribus et Angulis Triangulorum.' The first biography of Copernicus was written by the mathematician Gassendi (1654), and for 200 years this work served as the basis of all subsequent biographies of the great astronomer; but in more recent times the labors of Prowe and others have helped us to a better acquaintance with the facts of his life. Count Sierakowski erected a monument to his memory in St. Anne's Church at Cracow, with this inscription: "Sta, sol, ne moveare" (Stand, Sun, do not move). Thorwaldsen, one of the greatest sculptors of our time, executed a colossal statue of Copernicus for the city of Cracow, which is one of the noblest specimens of modern art. Another statue of his by F. Tieck has been erected to him in his native town. Consult Prowe, 'Life of Copernicus' (1883–4).

Cophas, kō'fas, a tribe of Indians who for hundreds of years had lived in Southern California, near Los Angeles, in a place now known as "Warner's Ranch." The Government Agricultural Commission appointed in the fifties to adjust the claims of the Indians and Mexicans, overlooked this tribe and their lands were sold without a hearing. They refused to leave their home, although it was a waste of poor soil, but in May 1901 the Supreme Court confirmed the rights of the white claimants. In May 1903 they were moved by the government to their new home, a fertile tract of land in the valley of Pala, on the San Luis Rey. The tribe numbers 300.

Cophetua, kō-fĕt'ū-a, an African king of legend and ballad verse who married the beggar maid, Penelophon. Shakespeare in alluding to Cophetua calls the maid Zenelophon. There is a well-known poem by Tennyson on the subject. See Percy's 'Reliques.'

Copiapo, kō-pē-ä-pō', or **San Francisco de la Selva,** Chile, the capital of the province of Atacama, centre of an important mining district. Silver and copper are the chief minerals obtained, but gold also is found. There is a railway connecting it with its port, Caldera. In 1819 and 1822 it was destroyed by earthquakes; and in 1851 it was again seriously damaged. Pop. 10,000.

Cop'ley, John Singleton, American painter: b. Boston, Mass., 3 July 1737; d. London, Eng., 9 Sept. 1815. His talent for drawing developed at an early age, and in 1760 he sent anonymously to Benjamin West in England a portrait called 'The Boy and the Flying Squirrel,' which, when exhibited, was highly praised by the best English artists of the time. In 1774 he sailed for England, visited Italy, and settled in London, where he rose rapidly in popularity as a portrait painter, within a few years being elected an associate member and full member of the Royal Academy. Some of his most celebrated paintings are portraits of the English royal family; the 'Death of Lord Chatham,' now in the London National Gallery; 'Siege and Relief of Gibraltar,' in the council chamber of the Guildhall; 'Major Pierson's Death on the Isle of Jersey'; 'Surrender of Admiral De Winter to Lord Duncan'; 'Charles I. Demanding the Five Impeached Members in the House of Commons'; 'The Red Cross Knight'; 'Mrs. Derby as St. Cecilia.' His son, Lord Chancellor Lyndhurst, made a notable collection of his father's works, which was dispersed at public sale in 1864. Consult Perkins, 'Life of J. S. Copley' (1873); Amory, 'Life of J. S. Copley' (1882).

Copley, John Singleton (1772–1863). See LYNDHURST, BARON.

Coppée, François Édouard Joachim, fräṅ swa ā-doo-ăr zhō-ä-chiṅ kŏp-pā, French poet and dramatist: b. Paris 12 Jan. 1842. He was educated at the Lyceé St. Louis; has been librarian of the Senate, and keeper of the Records at the Comedie Française 1878–84. He was a member of the French Academy in 1884, and an officer of the Legion of Honor in 1888. Chief among his plays are: 'Le passant' (1869); 'Fais ce que dois' (1871); 'Le luthier de Crémorne' (1877); 'La guerre de cent ans' (with d'Artois) (1878); 'Madame de Maintenon' (1881); 'Severo Torelli' (1883); 'Les Jacobites' (1885). An edition of his dramas in four volumes appeared (1873–86). Among his volumes of poems may be named: 'Le reliquaire' (1866); 'Les intimites' (1868); 'Poèmes modernes' (1869); 'Les humbles' (1872); 'Le cahier rouge' (1873); 'Olivier' (1874); 'Une idylle pendant de siège' (1875); 'L' exilée' (1876); 'Les mois' (1877); 'Le naufrage' (1878). He has also published a collection of essays 'Mon franc parler' (1894). Consult Claretie, 'François Coppée'; Lescure, 'F. Coppée, L'homme, la vie e'œuvre' (1889).

Coppée, kŏp-pā, **Henry,** American educator: b. Savannah, Ga., 13 Oct. 1821; d. Bethlehem, Pa., 21 March 1895. He served in the Mexican War (1846–8); was instructor at West Point (1848–9, 1850–5); professor of English lit-

erature and history at the University of Pennsylvania (1855–6); president of Lehigh University (1866–75); and professor of history there (1875–95). Besides various educational and military works, he wrote: 'Grant and His Campaigns' (1866); 'History of the Conquest of Spain by the Arab-Moors' (1881).

Copper, a metallic element occurring abundantly in nature, and widely used in the arts, both in the pure state, and as an essential constituent of many alloys. It has been known from the earliest times, and is frequently mentioned by the ancient writers. Prehistoric weapons, tools, and ornaments of copper, as well as domestic implements, remain in profusion to this day; and it has been commonly asserted that copper was known and used before iron, though some authorities consider the evidence of this to be inconclusive. The Romans obtained their best copper from Cyprus, an island in the Mediterranean Sea, and for this reason the metal was known as *Cyprium æs,* or "Cyprian brass," a name that was later contracted to *cuprum* and *cuper.*

Physical Properties.— Copper is red in color, and crystallizes in cubes, octahedra, and other forms of the isometric system, twinned crystals being quite common. When in a finely divided condition it has a specific gravity of about 8.36; but the specific gravity of native copper is 8.84, and that of hammered or electrically deposited copper is about 8.95. It melts at about 2,000° F., and has a specific heat of about 0.093, and a coefficient of linear expansion of about 0.0000092, per Fahrenheit degree. Its tensile strength varies greatly, according to the physical condition of the metal. The following data are commonly used in engineering practice, as corresponding to the tensile strength in pounds, per square inch of sectional area: Cast copper, 19,000; sheet copper, 30,000; copper bolts, 36,000; copper wire, 60,000. The thermal conductivity of copper, at ordinary temperatures, is about 0.74 times that of silver. The specific electrical resistance of hard-drawn copper is 1,620 ohms, and that of annealed copper is 1,584 ohms. A wire of the metal that is one metre long and one millimetre in diameter has a resistance of 0.0206 ohms if hard drawn, and 0.0202 if annealed. These data are for the pure metal, at the temperature of freezing water. The electrical resistance of copper increases by about 0.388 of one per cent for each Centigrade degree of rise of temperature. The electrical resistance is also greatly increased by the presence of small percentages of iron, zinc, tin, phosphorus, or arsenic, and hence great attention is paid to the purity of the copper that is intended for use in electrical conductors. Copper is very malleable and ductile, and may be drawn into small wire and hammered into exceedingly thin sheets. An alloy consisting of 11 parts of copper and 2 of zinc is even more malleable than copper itself, and may be hammered into foil comparable in appearance with gold-leaf, for which it is used as a substitute in certain kinds of work, under the name of "Dutch metal." Copper becomes very soft and malleable when it is strongly heated and immediately immersed in cold water, its behavior under these circumstances being diametrically opposed to that of steel. It may be forged into any shape, but it will not bear more than a red heat, since it becomes brittle at higher temperatures. It does not oxidize readily under ordinary conditions, but becomes superficially tarnished with a coating of carbonate that resists the subsequent action of the oxygen of the air. Copper often gives poor castings, apparently because the molten metal absorbs gases, and these, when given off again at the moment of solidification, make the casting porous. The castings are said to be much more sound when a small quantity of phosphorus is added to the molten metal — usually in the form of phosphor-copper. The large copper cylinders that are used in calico-printing are cast in molds, and are subsequently hammered under a steam-hammer until the metal is sound, and then turned down in a lathe until the surface is true and free from defects.

Alloys.— Many alloys of copper are used in the arts, chiefly under the name of "brasses" or "bronzes." Originally a brass was defined as an alloy of copper and zinc, while a bronze was defined as an alloy of copper and tin. This convention is still retained in a general way, but the same names are applied also, and very commonly, to numerous ternary alloys, containing copper, zinc, and tin, which pass by insensible gradations from a true brass to a true bronze; so that "brass" and "bronze" can no longer be regarded as very definite terms. Alloys of copper with aluminum are called "bronzes," even when no tin is present. See ALLOY.

Chemistry.— The chemical symbol for copper is Cu (*cuprum*), and the atomic weight of the metal is 63.1 if H = 1, and 63.6 if O = 16. Copper forms two distinct series of salts, known respectively as "cuprous" and "cupric" compounds. In the cupric series the metal is a dyad, while in the cuprous series it enters into the ordinary formulæ as though it were a dyad (see VALENCY). Structural formulæ have been given, however, which indicate that the metal is really a dyad in both cases. The cupric series of salts embraces those compounds that are most familiar in the arts. Cupric oxide (known also as copper monoxide, or black oxide) is formed when metallic copper is heated in the presence of air. It may occur as a brownish-black amorphous powder, or in lustrous monoclinic crystals. Cupric oxide is used in the laboratory for effecting the combustion of organic substances, the oxide being intimately mixed with the body to be oxidized, and the whole raised to a red heat, at which temperature the cupric oxide readily gives up its oxygen to either hydrogen or carbon. Cupric oxide (the formula of which is CuO) is soluble in acids, and yields, with them, salts which crystallize well. If a solution of any of these salts be made alkaline by the addition of a caustic alkali, a light blue precipitate of cupric hydrate, $Cu(OH)_2$, is thrown down. Upon heating to 212° F., this parts with a molecule of water and becomes reduced to the black oxide, CuO. If cupric hydrate be precipitated by adding the calculated quantity of sodium hydrate to a solution of copper sulphate, and the precipitate is washed and dissolved in ammonium hydrate, a blue solution is obtained, which is sometimes called "cupro-ammonium hydroxin," and which possesses the singular power of dissolving cellulose (q.v.) without chemical change. When pure cupric oxide is desired, it is most conveniently prepared by heating cupric nitrate to redness. Cupric nitrate is readily prepared by dissolving metallic copper in nitric acid. It crys-

tallizes in large blue prisms, having the composition $Cu(NO_3)_2 + 6H_2O$. Ordinary copper sulphate (cupric sulphate, or "blue vitriol") is manufactured in large quantities by dissolving scales of copper oxide (CuO) in sulphuric acid. It forms large blue triclinic crystals, which have the composition $CuSO_4 + 5H_2O$. The sulphate is used in calico-printing, and in the manufacture of various copper pigments such as Brunswick green and Scheele's green. Cupric chloride, $CuCl_2$, is formed by dissolving cupric oxide in hydrochloric acid, or by acting upon metallic copper by chlorine gas. It is soluble in alcohol or water, and forms acicular crystals having the formula $CuCl_2 + 2H_2O$. Cupric sulphide, CuS, is the familiar black precipitate that is obtained when sulphuretted hydrogen gas is passed through an acid solution of a copper salt (see CHEMICAL ANALYSIS). Copper carbonate, $CuCO_3$, has not been prepared in the pure state, but a green precipitate having the formula $CuCO_3 + Cu(OH)_2$ is thrown down when carbonate of potassium or of sodium is added to a solution of a copper salt; this precipitate being identical in composition with the mineral malachite. Cuprous oxide, Cu_2O, or red oxide of copper, occurs native in red octahedral crystals, and it may also be prepared artificially by heating a mixture composed of equivalent parts of cupric oxide and finely divided metallic copper, or (more conveniently) by heating a mixture of equal parts of cupric oxide and ammonium carbonate, $(NH_4)_2CO_3$, over a Bunsen burner, until all the ammonia is expelled. It is a crystalline powder of a carmine color, melting at a strong red heat, and is used in glass manufacture for the production of a ruby color. The precipitation of this oxide from certain test-solutions is used as a test for the presence of sugar in urine (see URINARY ANALYSIS). Cuprous oxide dissolves in various acids with the production of colorless salts, which are unstable, since they readily absorb oxygen and pass into the corresponding cupric salts. The most important cuprous salt is the chloride, which has the formula Cu_2Cl_2, and is formed by heating metallic copper to dull redness in a current of hydrochloric acid gas, or by dissolving a mixture of cupric oxide and metallic copper in hot hydrochloric acid. It is a white crystalline powder, insoluble in water or alcohol, or in dilute nitric or sulphuric acids, but dissolving in ammonia, or in hot hydrochloric acid. Its solution in either of these menstrua possesses the remarkable property of absorbing carbon monoxide gas. Copper may be detected in solution (1) by the formation of the black sulphide when a stream of sulphuretted hydrogen gas is passed through the acidified solution; (2) by the precipitation of the blue hydroxide, which blackens upon heating; (3) by the deep blue color that its salts give upon the addition of ammonia; and (4) by the precipitation of a red film of metallic copper when a clean, bright fragment of iron is immersed in the solution.

Physiological Action.— In medicine, salts of copper are used as astringents and as antiseptics, copper sulphate being the favored salt. The soluble salts of copper are all exceedingly poisonous, and since the metal is very widely used in the arts, copper poisoning is quite common. In acute poisoning the symptoms are those of an acute gastro-intestinal irritant. These usually develop in from 10 to 20 minutes, though they may be delayed as much as two or three hours. There is nausea and vomiting of bluish material, accompanied by a metallic taste in the mouth, and intense burning in the stomach, with great abdominal tenderness. If all the copper is ejected by the emesis, the patient usually recovers. This is usually the case, but sometimes, when the dose is extremely large, vomiting is ineffectual. In addition to the symptoms already given, intense headache then develops, accompanied by great prostration and cramps, with small, rapid pulse, and collapse; death sometimes following in from 4 to 12 hours, but more commonly after two to four days or more. Chronic poisoning is probably rare, although copper is widely used in preserving foods, and for cooking utensils. Dilute organic acids dissolve copper in the presence of air, and hence articles of food should not be allowed to stand in copper vessels. Cooking utensils of copper are less likely to give rise to poisoning symptoms, when the food is only allowed to remain in them while cooking, because the escaping steam removes the air, and renders solution of the copper far less probable. Acute poisoning should be treated by the use of such antidotes as milk, egg-albumin, and magnesia; and symptomatic treatment should also be adopted to overcome the collapse.

World's Output of Copper.— The United States produces far more copper than any other country, its present output being, in fact, about 55 per cent of that of the entire world. Spain and Portugal (combined production) come next, and then Japan, Chile, Australasia, Mexico, and Germany. The total production of copper for the year 1900 is given in the accompanying table.

WORLD'S PRODUCTION OF COPPER IN 1900.

Country	Long Tons	Country	Long Tons
Argentina	75	Mexico	22,119
Australasia	23,000	Newfoundland ...	2,883
Austria-Hungary .	1,355	Norway	3,935
Bolivia	2,100	Russia	8,000
Canada	8,459	Peru	8,220
Cape Colony.....	6,720	Spain-Portugal ...	52,872
Chile	25,604	Sweden	450
Germany	20,310	Turkey	2,304
Italy	2,753	United Kingdom..	765
Japan	27,840	United States....	268,229
		Total	487,993

Mines of the United States.— Montana produces more copper than any other single State, the output of that State for 1900 being 254,460,713 pounds of the refined metal. Michigan is second, with a production (in the same year) of 144,227,340 pounds. Arizona comes third, with 115,403,846 pounds. California produced 29,639,987 pounds, and Utah 18,504,726 pounds. The mines of Montana are mostly in the vicinity of Butte, and those of Michigan are in the northern part of the State, covering an area 200 miles long, in Houghton, Keweenaw, and Ontonagon counties. (For extensive and valuable information concerning the copper industry of the United States, and in particular that of Michigan, consult Stevens, 'The Copper Handbook.')

Ores of Copper.— The copper obtained in the Lake Superior region is practically all in the metallic form, occurring in masses that vary in size from sand to large masses weighing tons. The largest mass of native copper yet found

was discovered there in February 1857, in the Minnesota mine. It was 45 feet long, 22 feet wide at the widest point, had a maximum thickness of 8 feet, was about 90 per cent copper, and weighed something like 420 tons. In the Montana region the metal occurs mostly in the forms of sulphides, passing through all gradations from chalcocite to chalcopyrite, with considerable quantities of bornite. The mines are mostly confined to a small area two miles long by one mile wide, in the vicinity of Butte; and the actual yield of the average ore at this point, after making allowance for the losses incident to concentration and smelting, is about 100 pounds of copper and 4 ounces of silver, per ton of 2,000 pounds. In Arizona the principal ores are cuprite, malachite, azurite, and chalcocite. Chalcocite (known also as "vitreous copper," or "copper glance") is of a leaden-gray color, and has the composition Cu_2S. It has a specific gravity of about 5.6, and contains (when pure) 79.8 parts of copper to 20.2 of sulphur. Bornite, erubescite, or purple copper, Cu_3FeS_3, has a specific gravity of from 4.8 to 5.4, and is brownish-red in color, often with an iridescent tarnish, in which blue is apt to predominate. Chalcopyrite, yellow copper ore, or copper pyrites, has a specific gravity of about 4.2, and a composition as indicated by the formula $CuFeS_2$. It occurs in various shades of yellow, often with a lively iridescence. When pure it contains 34.5 parts of copper to 30.5 of iron and 35.0 of sulphur. Cuprite, or red oxide of copper, Cu_2O, is commonly red in color, with an adamantine luster; but it is sometimes leaden gray, with a submetallic luster. It has a specific gravity of from 5.8 to 6.2, and, when pure, contains, 88.8 parts of copper to 11.2 of oxygen. Azurite, blue carbonate of copper, or chessylite, has the formula $2CuCO_3.Cu(OH)_2$, and is azure blue in color. When pure it contains 69.2 parts of cupric oxide to 25.6 of carbon dioxide and 5.2 of water. Malachite, or green carbonate of copper, is green in color, and has the formula $CuCO_3.Cu(OH)_2$.

Copper and Brass Industry. The Naugatuck River has its sources in the hills of northwestern Connecticut, and flows southward for about 40 miles to its junction with the Housatonic River at Derby, taking its course through a narrow, winding valley, between steep, well-wooded hills, that rise directly from the river-bank to a considerable height. From Torrington, at the head of the valley, to Derby, there is a fall of about 600 feet. Four times, within six miles from its mouth, the water is diverted from its channel by dams, and held in large reservoirs to furnish water-power. Farther up the valley, wherever it broadens to give room for a village or a city, there are water privileges, and the power is utilized for manufacturing purposes.

In this narrow valley, which contains a population of more than 100,000, evidence of thrift and prosperity is everywhere seen in the neat, comfortable homes of the workingmen, and the fine houses of their employers. This is the seat of the brass-rolling industry of America. Nine great corporations are here directly engaged in this business, producing about three fourths of the total quantity of rolled brass manufactured in the United States, giving direct employment to 9,000 persons, and indirectly to many thousands more. Over 175,000,000 pounds of copper, or about one-half the total quantity of this metal consumed in the mills of the United States, are conveyed annually to the Naugatuck Valley for use in these manufacturing establishments.

The valley of the Housatonic River, running parallel with the Naugatuck through Connecticut, furnishes better water privileges, and broader plains for laying out towns and cities; but in the Naugatuck Valley were found the men of foresight, energy, and activity who could originate great enterprises and carry them to completion. They began the brass-rolling industry 70 years ago. Its development and progress with the growth of the country are due to the energy and ability of those who have conducted the business and furnished the necessary capital for its enlargement. The causes that have led to the concentration of this industry in the Naugatuck Valley are more complex. The cheap power afforded by the water privileges in the valley undoubtedly led to the establishment there of the first rolling-mills, which, as they increased in size and capacity, finally outgrew the water-power, and are at the present day operated by steam, or by steam and water-power together.

The mills originally established in the valley have enlarged and extended from time to time to keep pace with the growing demand for brass. According to the general law governing the concentration of kindred industries and trades in particular localities, new mills were started there, even after the water-power had ceased to be a determining factor in the problem of location. Other advantages, such as the cheapness and accessibility of wood of the variety best suited for annealing purposes, were among the causes that held the trade in the valley. Then, too, there arose a race of workmen skilled from generation to generation in the mixing, rolling, and manipulation of brass; and as time when on and competition increased, the production of rolled metal becoming less profitable, many of the rolling-mills began remanufacturing their own metal. Other corporations were formed, some being direct offshoots from the brass mills, until the location became what it is to-day; a great centre for the reworking and consumption of metal. There are many reasons why it is desirable that a brass-mill should not be too far from the place where its product is chiefly consumed, and thus it happens that, while a few brass manufactories are operated in other parts of the country, the Naugatuck Valley still is and probably will remain the seat of the brass-rolling industry in America. Other enterprises, such as the rolling of iron and steel, thrive best where their raw material, their fuel and labor, are cheapest and most accessible, transportation, labor, and fuel being great factors in the cost of the product; but the brass manufacturer, working a high-priced raw material, and bringing his finished product to the point of nicety in gauge and quality, finds the cost of labor, fuel, and transportation factors of far less importance relatively, and he is governed largely by other considerations in his choice of locality. Therefore, while the shifting centers of the manufacture of iron and steel are marked throughout the country by abandoned furnaces, the seat of the brass-rolling industry remains to-day where it was established 70 years ago, it being a note-

worthy fact that nearly all of the brass-mills outside of the State of Connecticut were constructed and are operated by Connecticut men.

Israel Coe, a farmer of Connecticut, John Hungerford, of Connecticut, and Anson G. Phelps, a capitalist of New York, and founder of the house of Phelps, Dodge & Company, were pioneers in brass manufacturing in this country, and in 1834 they built a brass-mill at Wolcottville, now Torrington, Conn. Previous to 1830, brass was imported, or manufactured here in a very primitive way. As early as 1811 James G. Moffett of New York, rolled brass in small quantities, using for power a sweep actuated by oxen. In 1802 the manufacture of gilt buttons was begun in Connecticut by Abel Porter & Company. At that time these buttons were articles of fashionable use. To obtain brass for this purpose the mixture was cast in ingots at Waterbury, and taken to Bradleyville, near Litchfield, Conn., where there was an iron-mill driven by water-power; here it was broken down and rolled into strips, and returned in a rough state to the button factory in Waterbury, where it was rolled thinner by being passed between two rolls two inches in diameter, driven by horse-power. The copper for brass-making was obtained from old boilers which had been used in distilleries and in sugar-making. This copper was cast into ingots and mixed with spelter, which was obtained from abroad. In 1808 Abel Porter & Company purchased the water-power now owned by the Scovill Manufacturing Company at Waterbury, and soon afterward put in rolls suitable for breaking down and finishing brass. For a period of about 20 years they rolled brass, but it does not appear that their production was any more than enough to supply their own requirements. In 1830 the firm of Holmes, Hotchkiss, Brown & Elton established a mill and engaged in the manufacture of sheet brass at Waterbury. This was substantially the beginning of the sheet-brass business in America, although the metal, in small quantities, may have been occasionally supplied to consumers before that time by the firm of J. M. L. & W. H. Scovill, and by Benedict & Coe, of Waterbury.

There was at that time also a demand for brass kettles, which were manufactured in England by a process known as the "battery" process: that is, they were hammered into shape from metal blanks. The establishment of the mill at Torrington, at the head of the Naugatuck Valley, in 1834, was for the purpose of rolling brass for use in manufacturing these kettles, and to supply the growing demand of the button factories. A small rolling-mill was built, with machinery imported from England, and Israel Holmes of Waterbury, was engaged as manager of the mill. There was great difficulty in securing workmen competent to carry on the business. Mr. Holmes was sent to England, and succeeded in procuring a few experienced men. He afterward made another trip abroad for the same purpose, but the English manufacturers, fearful of losing their American trade, endeavored to prevent him from hiring their men, and it was with great difficulty and some danger to himself that he succeeded in embarking a colony of workmen and their families, about 30 persons in all. These were landed at Philadelphia, taken in a schooner from there to Hartford, Conn., from which place they proceeded on foot through the woods, a distance of 25 miles, to Torrington.

From this small beginning, and with no end of difficulty and discouragement, the enterprise continued to grow. Local competition arose, and in 1840 Edwin Hodges of West Torrington, started a mill for the purpose of making brass kettles, and also for drawing brass wire. This seems to have been the first brass wire-drawing establishment in this country. It was located in Cotton Hollow, in the town of Torrington. The enterprise was unsuccessful, and the mill was soon closed, with the loss of all the capital invested. In 1841 the original enterprise at Torrington was made into a stock company, with a capital of $56,000. It was named The Wolcottville Brass Company, and the incorporators were John Hungerford, Anson G. Phelps, and Israel Coe. The records of this company for the first few years of its existence contain some interesting details. The copper used was imported from Chile, or was obtained in the form of old copper, which was collected from different places throughout the country. The price of copper was then 18¾ cents per pound. Spelter, which was imported, cost 8⅜ cents per pound. The fuel used was mainly wood, but some Lehigh coal was procured, which cost, at Hartford, $8.43 per ton, to which was to be added the cost of transportation by teams from Hartford to Wolcottville. Fire-brick for the furnaces cost $60 per 1,000. The manufactured product, in the form of rolled and sheet brass, was valued at 26 to 30 cents per pound. It was taken by teams either to Waterbury, or 25 miles across a hilly country to Hartford, and from there shipped on sloops to New York. Upon the site of the works occupied by the Wolcottville Brass Company are to-day the great factories of the Coe Brass Manufacturing Company. The name of Anson G. Phelps is perpetuated by the city of Ansonia, the Ansonia Brass and Copper Company, and the Ansonia Clock Company, as well as by the firm of Phelps, Dodge & Company, which he founded; and the name of Israel Holmes appears in the title of the corporation of Holmes, Booth & Haydens, of Waterbury.

The decade from 1840 to 1850 saw the birth of many of the prominent brass manufacturing corporations of the present day. In 1843 a joint stock company at Waterbury was organized under the title of the Benedict & Burnham Manufacturing Company, with a paid-up capital of $100,000. Aaron Benedict was president and treasurer, and John S. Mitchell secretary. Mr. Aaron Benedict continued at the head of the company until his death in 1873. This company now operates extensive works, and gives employment to 967 persons, manufacturing brass, German silver, etc., and remanufacturing metal.

The Waterbury Brass Company began business in 1845 with a capital of $40,000. Among the incorporators were John P. Elton, Lyman W. Coe, Israel Holmes, and Hobart V. Welton. They now give employment to 525 persons, and manufacture brass, brass wire, etc., and also remanufacture.

In 1849 the Naugatuck R.R. was completed, and the product of the valley mills was thereafter shipped by rail to tidewater at Bridgeport.

In 1848 Thomas Wallace and his sons, John, William, and Thomas, began the business of

wire drawing at Birmingham, Conn. Their cash capital was $500. Their knowledge of their trade enabled them to increase their business, and in a few years they built a factory at Ansonia, which has been greatly enlarged, and is now owned and operated by the Coe Brass Manufacturing Company.

The Scovill Manufacturing Company of Waterbury succeeded the firm of J. M. L. & W. H. Scovill, and was incorporated in 1850 with a capital of $200,000, which has since been increased. They now manufacture brass, German silver, etc., employing 2,500 persons, and are extensive remanufacturers of metal.

The Coe Brass Manufacturing Company of Torrington, Conn., was founded by Lyman W. Coe in 1863, and succeeded the Wolcottville Brass Company. Lyman W. Coe, the son of Israel Coe, was the president of the corporation, which began business with a capital of $100,000. Their capital has been increased from time to time, and they now employ 1,650 persons, manufacturing brass, German silver, tubes, wire, etc., with extensive works at Torrington and Ansonia.

In 1844 Anson G. Phelps purchased extensive lands in the vicinity of what is now the city of Ansonia, which was founded by him, and named in his honor. He constructed a dam across the Naugatuck River, a canal, large reservoirs for water-power, and built a mill for rolling copper. The firm of Phelps, Dodge & Company had for some years prior to 1844 operated a copper rolling-mill at Birmingham, Conn. The water privilege at Ansonia is now owned and operated by the Ansonia Land and Water-Power Company, and is the source of water-power for the city of Ansonia. Mr. Phelps brought from the Wolcottville works J. H. Bartholomew and George P. Cowles, who managed the business at Ansonia under the name of the Ansonia Brass and Battery Company, the term "battery" being indicative of the process by which brass kettles were hammered from metal blanks. This method of making kettles was in use until 1851, when it gave place to a patented process for spinning kettles from circular blanks of metal. The business of the Ansonia Brass and Battery Company was conducted by the firm of Phelps, Dodge & Company of New York. A brass-mill was built, and later a wire-mill. The company afterward engaged in the manufacture of clocks. In 1869 this manufacturing enterprise was incorporated under the name of The Ansonia Brass and Copper Company. In 1877 the manufacture and sale of clocks had increased to such an extent that it was decided to form a new joint-stock corporation under the name of The Ansonia Clock Company, which began business on 1 Jan. 1878. The location of this part of the company's business was transferred to Brooklyn, N. Y., where large factories were erected and are now in operation, employing 1,687 persons and producing a daily average of 6,500 clocks and watches, which are marketed in every part of the world.

The Ansonia Brass & Copper Company operates four factories at Ansonia, where they give employment to 1,500 persons, in the manufacture of sheet brass, sheet copper, wire, tubing, etc.

The American Brass Company, incorporated under a special charter from the State of Connecticut, with a capital at present of $10,000,000, — which may, under their charter, be increased to $20,000,000,— began business in January 1900, and now owns the entire capital stock of the following corporations: The Coe Brass Manufacturing Company, The Ansonia Brass & Copper Company, The Benedict & Burnham Manufacturing Company, The Waterbury Brass Company, The Holmes, Booth & Haydens Company, The Chicago Brass Company.

Taking into account the capital employed, and the magnitude of its operations in brass and copper, this company is the most important brass manufacturing enterprise in the world. The constituent companies are operated independently, and increased profit is sought by harmonious and economical management, rather than by any increase in the prices of the manufactured product. The combined companies give employment to 7,000 persons.

During many years brass manufacturing was conducted on what would now be regarded as a very small scale, and, although the methods pursued at the present day are substantially the same as at the beginning, great progress has been made in cheapening these methods, and improving the quality of the articles manufactured. It is stated that in the early forties it was customary for the manufacturers at Waterbury annually to appoint a committee to make the long journey to Baltimore for the purpose of purchasing copper for the season's supply. At that time the purchase of 500,000 pounds of copper was sufficient for a year's supply for these manufacturers. At present that quantity would not supply the demand of the Naugatuck Valley for one day.

Copper and spelter being the metals from which brass is made, a brief account of the sources of supply from which these materials are obtained will throw some light upon the development of the business of brass and copper rolling. The first copper mine worked in the United States was the Simsbury mine at Granby, in Connecticut. The record of this mine extends back to the year 1705. It was worked until 1770, but was not profitable, and only a small quantity of ore was taken out. During the War of the Revolution it was used as a prison, and to-day it is an object of interest on that account. About the year 1719, the Schuyler mine, near Belleville, N. J., was opened aand became one of a number of small mines which were worked in that section of the country for a series of years following. The Gap mine, in Lancaster, Pa., was started in 1732. The production of copper from all these openings, however, was of very little commercial importance, and until the Lake Superior region became a source of supply, the consumers of copper in the United States had to procure their raw material in Chile. It was brought to this country in the form of pigs, and refined near Boston, at Baltimore, and at other points along the coast. In 1844 the Cliff mine, near Eagle River, Lake Superior, was opened, and in 1845 regular records of production were begun. The great development of the copper-mining industry at Lake Superior soon placed the United States in the front ranks of the copper-producing countries of the world, and the product of these mines, being of a quality much finer than the copper produced abroad, naturally took the place of the foreign product for home consumption. Copper production in the United States from 1845 to 1880 kept pace with home consumption, a comparatively

small quantity being exported up to the last-named period, so that the record of the copper produced in the United States between the periods named will indicate the progress made in manufactures of brass and copper. Beginning in 1845 with a product of 100 tons (which was much less than the quantity required for home consumption), the record for periods of 10 years is as follows: 1850, 650 tons; 1860, 7,200 tons; 1870, 12,600 tons; 1880, 27,000 tons.

Comparatively little fine copper was imported to the United States after 1860. In 1879 the Lake Superior region furnished about 83 per cent of the total quantity of copper produced here, but after 1880 the opening of the copper-mining regions of Arizona and Montana increased the output largely beyond the quantity required for domestic use. A heavy exportation at once followed, and this country became one of the world's great sources of supply. The quantity of copper produced in the United States in 1903 is as follows:

1903	Tons (2,240 pounds)
United States production	300,000
Importations	69,530
Exported from the United States	142,190
Estimated consumption in the United States	219,000

It is impossible to ascertain the stock of copper now held in the United States, but it is known that there is a constant stock equivalent to two months' production, either in process of treatment or in transit to market, without considering the stock carried in reserve.

A fair estimate of the average price of copper in the United States from 1845 to 1859 is 20 cents per pound. From 1859 to 1876 the yearly average price of copper varied from 20½ cents to 32 cents per pound, with the exception that in the years 1864 and 1865 the price was advanced, so that in 1864 the average price of Lake Superior copper was 46¼ cents per pound, and in 1865 36¼ cents. After 1876 there was a gradual decline in the yearly average price, which was 18⅝ cents in 1877, and 11¼ cents in 1887. In 1894 the price touched 9 cents per pound, which is the lowest point recorded.

In 1899 the increased demand for copper in the United States and abroad was the cause of a rapid advance in the price of the metal, which sold as high as 18 cents per pound. The enormous exports (159,000 tons in the year 1900) and the steady increase in the demand for home consumption, kept the price between 16 and 17 cents until December 1901.

In the fall of 1901 it became known that a considerable stock of unsold copper had accumulated in the hands of one of the largest of the producing mining companies. Meanwhile, owing to decreased consumption abroad, the exports of copper had fallen off at the rate of about 65,000 tons per annum (the total quantity exported in 1901 being about 95,366 tons). Toward the end of the year there was a sharp decline in the London market, followed by a series of reductions in the price of copper in New York, which, emanating from one source, brought the price, within a period of 30 days, from 16¾ cents down to 11 cents per pound. The first effect of this action was to check consumption, but when it was known that copper could be bought for forward delivery at 11 cents per pound, the demand for manufactured copper increased to such an extent that large buying of the raw material followed, and the price of copper quickly advanced to 12½ cents. The average price of lake copper during 1902 was 11⅞ cents, and in 1903 about 13½. The average price obtained by the Lake Superior mines for copper during 30 years previous to 1903 was about 12¼ cents.

Since we became great exporters of copper, the price of this metal in the United States has been nearly at a parity with the price in Europe. With increased production the cost of mining has been greatly reduced, while improvements in metallurgy and methods of electrolytic extraction, have brought into the market great quantities of copper suitable for the finest work from sources which formerly furnished only coarse and ordinary grades of material. In former years the tariff upon copper affected the price of the raw material in this country, often enabling the mining companies to obtain from the consumer at home a higher rate than that which ruled abroad. The price of copper in this country was sometimes sustained by arrangement between the mining companies, who would market the copper here at a fixed price, and ship their surplus product abroad at a considerably lower rate. The American brass manufacturer was, therefore, usually confined to a home market for his product, and the statement that, in certain cases, he succeeded in taking large foreign contracts for brass, with the disadvantage of having to pay a higher price than his competitor abroad, not only for his raw material but for his labor and supplies, is the best possible tribute to the excellent quality of his work. Ingot copper was admitted to this country, duty free, until the Act of 30 July 1846, when a duty of five per cent was imposed. The Act of 3 March 1857 restored copper to the free list. Subsequently duties were imposed upon copper: in 1861 of two cents per pound, and after that of from two and a half to five cents per pound. The McKinley Bill made the duty one and a quarter cents per pound, and at present ingot copper is on the free list.

The first refined spelter produced in this country was made in the year 1856, at Bethlehem, Pa., from ores mined there, and it was sent to the government arsenal at Washington. Up to 1865 or 1866, the spelter used by brass manufacturers was imported from Germany and Belgium. In 1867 the Missouri Zinc Company, at Carondelet, Mo., began to make spelter from Wisconsin ores. The first year they made about 1,800 tons; the next year about 2,500 tons. This was used in the United States. In 1869 the first zinc ores were discovered in southwestern Missouri, and since then the development of the zinc industry has been constantly increasing. The output of the year 1903 was 157,900 short tons of metallic zinc or spelter. American brass manufacturers have used domestic spelter almost exclusively for the past 25 years, the quality of the American product being superior to that of the foreign article. One of the finest grades of spelter is produced in New Jersey, and is sold at a high price, but the greater part of the spelter produced at present in this country comes from southwestern Missouri and Kansas. At no time within the past 25 years has spelter been admitted to the

United States free of duty. The duty under the McKinley Bill was one and a half cents per pound. Under the present tariff the duty is one cent per pound.

On 13 Jan. 1801, Paul Revere, of Revolutionary fame, wrote to a friend in London, requesting him to go down to Maidenhead, where rolling machinery was manufactured, and ascertain the price of a pair of rolls 9 inches in diameter and 20 inches long, for making sheet copper. Col. Revere was a silversmith, and had previously corresponded with Benjamin Stoddard, secretary of the navy, upon the subject of copper rolling. It is not known whether or not these rolls were procured at that time, but in January 1801, Col. Revere purchased an old powder-mill at Canton, Mass., where he began the production of sheet copper. The business has been carried on continuously since that time, and is now incorporated under the name of the Revere Copper Company. Among the names of those originally connected with this enterprise are Joseph A. Revere, James Davis, John Revere, and S. T. Snow. This company was finally consolidated with the Taunton-New Bedford Copper Company.

In 1812 the Soho Copper Company was established in Belleville, N. J., where there is a good water-power, and water transportation by canal and by the Passaic River. The originator of this enterprise was Harmon Hendricks, the son of Uriah Hendricks, who was an importer of copper and metals. Some of the buildings were of brick, roofed with tiles imported from Europe. The rolling-mill was of wood, and contained one pair of breaking-down rolls, one pair of sheet rolls, and one pair of bolt rolls, all of which were imported from England. The plant and machinery cost $50,000, and were intended for the purpose of furnishing the United States government with heavy copper sheets for boilers, and bolts for ship-building, during the War of 1812. This business has descended from father to son in a direct line, until it is now in the hands of the fourth and fifth generations, and is known as the "Belleville Copper Rolling Mills," operated by Hendricks Brothers, and employing 100 men. In the year 1815 ingot copper sold for 18½ cents per pound, and the price of copper sheets was 39 cents per pound.

The Gunpowder Copper Works were built in 1817 on the Gunpowder River, 10 miles from Baltimore, by Levi Hollingsworth. Water-power was used in manufacturing. In 1866 the rolling-mill was transferred to Canton. It is now operated by the Baltimore Copper Smelting & Rolling Company, who are engaged in smelting, and in the manufacture of blue vitriol and sulphuric acid.

The manufacture of yellow metal for sheathing vessels was the subject of a patent by H. F. Muntz, of Birmingham, England, about the year 1840. This mixture, which contains a large percentage of spelter and can be rolled while hot, being cheaper than copper, naturally came largely into use for ship-sheathing. It was first made in this country by the Revere Copper Company, within a year or two after its production in England. Later, it was made by the Taunton Copper Manufacturing Company, the New Bedford Copper Company, and the Bridgewater Iron Company. The decline of American ship-building, and legislation permitting American vessels engaged in foreign trade to use the foreign metal without payment of duty, have greatly decreased the demand for yellow metal in the United States.

The causes that have tended to localize the manufacture of sheet brass do not affect the rolling of copper. The makers of sheet copper do not remanufacture their product. So that, while out of a total of 16 brass-mills 12 are located in Connecticut, the copper-mills are distributed throughout the country; in Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Michigan, and Illinois.

The manufacture of seamless tubes of brass and copper is an important part of the brass business. These tubes are made in the Naugatuck Valley by the Coe Brass Manufacturing Company, the Benedict & Burnham Manufacturing Company, the Holmes, Booth & Haydens Company, and also by the American Seamless Tube Company of Boston, and by other manufacturers. Early in 1848, Joseph Cotton, Joseph H. Cotton, William E. Coffin, Holmes Hinckley, and Daniel F. Child, all of Boston, despatched to England an engineer, Joseph Fox, to learn how to make seamless brass tubes, paying a large sum to Messrs. Green and Alston, the English patentees, for the instruction of Mr. Fox, and the right to make tubes by their process in the United States. Previous to that time all copper and brass tubes for use in locomotive and marine boilers and for the hundreds of other uses to which tubes were put, were brazed; that is, made of strips of metal put in a rounded form, and their edges brazed together. In 1850 the gentlemen before named organized a corporation called the American Tube Works, of Boston, and began the manufacture of seamless drawn brass tubes. Such tubes have taken the place of the brazed tubes in all cases where steam or other high pressures are involved.

There are no public records showing the present condition of the brass and copper industry in America. Figures can only be obtained by personal application to the manufacturers. The following details, showing the state of the business at present and covering the year ending 1 July 1901, are taken from information furnished by 20 of the largest corporations, and include the entire business of the country in rolled brass, copper, tube, and wire. In a few instances, where information was refused, an estimate of the business has been made, but this does not exceed 13 per cent of the total.

The nominal capital invested is $17,000,000, but the amount of the actual investment is about $29,000,000.

The number of persons employed is 15,558.

The annual consumption of copper is 300,000,000 pounds.

The annual consumption of spelter is 43,500,000 pounds.

The value of the annual product is $73,700,000, of which the metal is valued at $67,250,000, and the remanufactured products at $6,450,000. This includes only remanufacturing by brass rolling mills.

Brass founders or manufacturers of articles of cast brass are not included in the foregoing figures. That is a separate branch of business, and it is carried on by a great number of foundries in the United States, consuming a large quantity of ingot copper and of old metal. Many manufacturing concerns, also, have their own

foundries, where metal is cast, to be used in their various departments.

Any one of the principal establishments in Connecticut will serve as a type of the modern brass and copper rolling-mill. The buildings are usually of brick, roofed with iron, and contained in an inclosure of from 12 to 20 acres. They are generally one story high, and are light and well ventilated. The machinery is of modern construction and the best that can be made. The motive power is steam. In the remanufacturing departments automatic machinery takes the place of hand labor. In the rolling-mill, metal of the finest finish is produced, and brought to a degree of accuracy in gauge which is not usually found in other countries. Eyelet metal, for example, is required to be rolled to a width of six inches, and not to vary more than one two thousandths of an inch in gauge; that is, it must not vary in thickness more than one fifth of the breadth of a human hair. It is well understood by those who are familiar with the methods employed abroad, that nearly all the improved processes of brass rolling have originated in this country; that we have taken the lead in this branch of business from the beginning, and that our products at present, in point of accuracy of gauge and fineness of quality and finish, are far in advance of similar articles produced in other countries. This has been brought about indirectly by the fine quality of our copper and spelter, which has enabled our manufacturers to produce brass of a kind readily adapted to mechanical manipulation, while Yankee ingenuity has taught our mechanics to invent machinery for metal rolling and metal working, which in its turn has created a demand for metal of the utmost nicety in gauge; so that a very large proportion of the brass produced in this country to-day is gauged by the micrometer, which registers fractions of the thousandth part of an inch.

Many of these brass manufacturing corporations have a nominal capital, which represents only a small part of the real sum invested. They have from year to year enlarged their plants, using their surplus earnings, and increasing their outlay without increasing their capital, so that often the real investment is many times the amount of the capital stock. Brass rolling is now carried on upon a narrow margin of profit, so that what would appear to be a fair dividend upon the nominal capital is a small return for the actual investment. As a natural result in some cases new plants, erected with modern machinery, have had to close their doors, being unable to compete with those already established. Laborers employed in brass-works are well paid, and, as a rule, are thrifty, often owning their houses. Difficulty with workmen is of very rare occurrence, and no serious labor troubles are recorded in the history of the business.

ALFRED A. COWLES,
President The Ansonia Brass and Copper Co.

Copper in the Arts, is in demand with an ever increasing expansion. This is apparent from a consideration of its use in telegraphs, telephones, lighting, and railway work. First of all, in telegraphy, copper circuits are more and more in vogue, displacing the iron of earlier periods, and while telegraphy has almost reached its limit of growth, there is a steady demand for copper in operating existing works. In telephony, on the other hand, the employment of copper is increasing by leaps and bounds. New York alone is likely to spend some $25,000,000 on its telephony in the next five or six years, and it is needless to say that much of that money will represent copper cables in subways, wiring of big switchboards, circuits in office buildings, hotels, etc., even the little windings on the instruments making a very considerable total weight in the aggregate.

In electric lighting, copper is being employed more and more every day, and each lamp or motor that goes in demands for its construction many pounds of copper, from the big generator in the dynamo room, up to the key, or switch, that turns on the light, or sets the motor whirling. Here again the increase of pressure for transmission has simply enabled larger areas to be served, and has thus stimulated the use of electricity by the public, and aided the introduction of a variety of apparatus not before in contemplation. The wider availability of current and its lowering price everywhere have given a genuine boom to the use of electric motors, and in this field the circuits are necessarily heavy. In 1900 not five per cent of the power in American factories was electrical, so that the opportunity here can be readily imagined. The producers of motors find their output doubling year after year, while the motors themselves increase in size and of course consume a good deal of copper in their construction, as do the generators which furnish the current alike for light and power.

Electric railway work is obviously a department that consumes copper in enormous quantities. Until recent years the art has dealt chiefly with street railways, and it is imperative that in large centres of population the pressure of the current should be kept down, even when the conductors are put out of the way in a slotted conduit, as in New York. Any one who notices the bulk of the feeder cables, when they are carried overhead on poles, will not need to be told that there is a vast quantity of copper in them. Within the last five years the trolleys have been pushing across the rural districts, and many of them are 50 or 60 miles long, with current delivered at high pressure to sub-stations in order to keep down the amount of copper in the feeding system, but in the aggregate the use of copper here again is enormous. The motors also for this interurban work are bigger, and often there are four of them to a car, instead of two, as in the cities. Every electric car moreover now is wired with copper circuits for electric lighting, and frequently also for electric heating.

In the electric railway field the next step is to the operation of large systems hitherto handled with steam. Here we get into the realm of large units, big weights, long distances, and no matter how high the potential may be at which current is delivered at certain points along the line, vast masses of copper become necessary and cannot be dispensed with. The elevated roads in Chicago, New York, Brooklyn, and Boston are but a beginning in this direction, based upon the use of a third rail to give current to the cars. But while the employment of the rail releases a good deal of copper from the service, the current still has to be fed into the system, and very heavy cables of copper are required to do that. For such work as the

New York Central and the Pennsylvania R.R.'s now are laying out for their metropolitan terminals millions of pounds of copper will have to be laid down. But the innovation will not stop at terminals either here or in Europe.

Copper, Commercial and Industrial Uses of. The chief use of pure copper to-day is for electric work. It is used in the construction of dynamos and motors; great quantities are rolled into wire for many purposes, including submarine cables, long-distance telephone lines, and transmission lines for light and power service.

In this country copper is usually classified in three grades, lake, electrolytic, and casting copper, and is sold in the form of ingots, anodes, and wire bars. Lake copper, particularly that from certain mines in the Lake Superior region, is very pure and tough, and for many years sold at a premium over other grades. It is particularly adapted to the making of copper wire. Electrolytic copper, that is, copper electrolytically worked, now sold just as pure as lake, is used for making wire, and since the quantity of electrolytic sold is much greater than the amount of lake, electrolytic is now the standard used in market quotations. Casting copper usually contains impurities that impair its toughness and electric conductivity, these impurities being arsenic, antimony, and iron. Even a very small percentage of arsenic spoils copper for wire-making. But the impurities named are not usually present in sufficient quantity to impair the value of the copper in making alloys. Casting copper is usually sold in ingots; lake and electrolytic in ingots, wire bars, and anodes. Copper anodes are heavy sheets of the metal, used in copper-plating by electrolysis, particularly in the making of stereotypes, electrotypes, and the process cuts used for printing illustrations in newspaper and magazine work. A large amount of copper is used in this way, though the film of copper on the face of an electrotype is very thin.

Uses of Alloys.— Numerous and important as are the uses of copper, of perhaps even more importance are the uses of its alloys, including gold and silver alloys, various brasses and bronzes, German silver, etc. Copper is added to gold and silver, soft metals, to increase the hardness and resistance to wear. Thus the gold used in jewelry contains from 750 to 920 parts gold with 250 to 80 parts copper. United States gold coin contains 900 parts gold and 100 parts silver, United States silver coin contains 900 parts silver to 100 parts copper. Brass is an alloy of varying composition, but ductile and malleable, that is made into thousands of articles in daily use. Red brass contains 90 parts of copper and 10 parts of zinc; yellow brass contains 60 per cent copper and 30 per cent zinc, but brasses sometimes contain tin, and even lead. Bronze is a more brittle alloy than brass, but becomes ductile after tempering, that is, heating and cooling. The bronze used in making bronze medals usually contains 93.5 to 95 parts copper, 6 to 4 parts of tin, and .5 to 1 part of zinc. Fine statuary bronze contains 9,140 parts copper, 553 of zinc, 170 of tin, and 137 of lead. Gun-metal contains 100 parts copper to 10 parts tin; bell-metal, 78 parts copper to 22 parts tin; speculum metal, 67 parts copper to 33 parts tin. Aluminum bronze, used in ornamental articles, contains 90 to 95 parts of copper and 10 to 5 parts of aluminum. Phosphor-bronze and manganese bronze are alloys of high tensile strength and great resistance to corrosion by acids or alkalies; they are used for making ships' propellers, for pump-valves and pistons, etc. Tobin bronze is used in marine work. An important group of copper alloys, in the manufacture of which a large amount of copper is used, comprises some of the so-called bearing-metals and antifriction metals, used to reduce the friction of moving parts in engines and machinery. These alloys may contain tin, lead, zinc, bismuth, antimony, iron, and phosphorus. «B» alloy, used by the Pennsylvania Railroad, and one of the best bearing-metals known, contains 77 per cent copper, 15 per cent lead, and 8 per cent tin. Of the other alloys mentioned, German silver, used in electrical work and in various semi-ornamental ways, contains 50 parts copper, 25 parts zinc, and 25 parts nickel, or 50 parts copper, 14.8 parts nickel, 3.1 parts tin, and 31.9 parts zinc.

Salts of Copper.— By far the most important salt of copper is cupric sulphate (blue vitriol) $CuSO_4.5H_2O$. The anhydrous salt $CuSO_4$ is white. It is made in a variety of ways; for instance, by boiling copper shavings with concentrated sulphuric acid; but it is now made chiefly at plants for the reduction of copper ores by leaching the roasted ore with sulphuric acid. The uses of cupric sulphate are various. It is used in medicine, in dyeing black on wool and cotton, and as a source of other copper compounds. With a solution of carbonate of lime it forms Bordeaux mixture (a mixture of copper carbonate and sulphate of lime) that is used in great quantities by farmers and growers of orchards and vineyards as a fungicide. An important use of cupric sulphate is as the bath in copper-plating and electrotyping. It is also used in electric batteries.

Copper forms a variety of green or bluish compounds used as pigments. Of these, Scheele's green, cupric arsenite, apple-green in color, is now little used. Brunswick green, a basic copper carbonate, has the same composition as malachite and has been made by simply pulverizing and purifying that ore. Casselman's green, of variable composition, is formed by boiling copper sulphate with an alkaline acetate. Schweinfurt green or emerald green is the most beautiful of the copper greens, but is very poisonous. It is copper aceto-arsenite, $Cu(C_2H_3O_2)_2 3Cu(AsO_2)_2$. When this compound is used for coloring wall-paper, the paper if pasted on a damp wall may give off arsenical compounds, probably arseniureted hydrogen AsH_4 that may cause serious illness to the inmates of the room. Paris green, a copper compound used in great quantities by farmers as an insecticide has essentially the same composition as Schweinfurt green, but owing to the instability of cuprous arsenite part of the arsenic is usually present as arsenate. Commercial Paris green is often grossly adulterated, the percentage of arsenic varying from 10 to 40 per cent.

Verdigris is the name given the bluish-green basic copper carbonate formed on articles of copper or brass exposed to air and dampness. Commercially verdigris green is the ventral acetate of copper, and verdigris blue is the basic acetate, $Cu(C_2H_3O_2)_2$, $Cu(OH).5H_2O$. Both are used as pigments in making oil and water colors.

Copper Ores and their Distribution.—The commercially important ores of copper are, native copper, chalcopyrite, chalcocite, bornite, malachite, melaconite, cuprite, tetrahedrite, and covellite. Other ores are azurite, enargite, atacamite, chrysocolla, and domeykite. Native copper, frequently alloyed with native silver, is mined on a large scale only in the Lake Superior region along a belt of rocks belonging to the Keweenawan series of the Algonkian system, extending from the end of Keweenaw Point to near Ontonagon, Mich. The rocks are igneous and sedimentary, the igneous including amygdaloidal diabases and scoriaceous tuffs or "ash-beds," while the copper-bearing sedimentary rocks are the conglomerates.

The mines first worked were on a fissure cutting across the Keweenawan series. These veins sometimes contained masses of native copper weighing many tons, but these masses, since they could not be blasted, as copper is very tough, had to be slowly cut by chisels into pieces large enough for handling. At present there are very few mines working these cross veins, and the great bulk of the production comes from the mines which follow mineralized chutes in the conglomerates or in the "ash-beds." The copper content of these chutes varies greatly; in the Calumet and Hecla conglomerate chute, on which are the Calumet and Hecla and Tamarack mines, the conglomerate has contained, when mined in large amounts, 5 per cent copper; the present content is probably about 3¼ per cent. At the Atlantic mine rock containing but .6 per cent copper is mined and smelted with profit. In the Lake Superior region, as elsewhere, low-grade rock is now mined at a profit that could not have been realized in former years.

By far the most important ore of copper, commercially, and the most widely distributed, is chalcopyrite (copper pyrites, yellow copper ore) a sulphide of copper and iron having the composition expressed by the symbol $Cu_2S.Fe_2S_3$ and containing when pure 34.4 per cent of copper. It is frequently mixed with a very large percentage of iron pyrites, greatly reducing the copper content of the ore. Chalcopyrite is yellow and softer than iron pyrites, but frequently the amount of iron pyrites present as a mechanical mixture is so large that the ore cannot be told from iron pyrites by its color. Chalcopyrite seems to be the ore from which most of the other copper ores have been formed by chemical changes. It is a common thing for mines that show rich copper carbonates and oxides at the surface to show lean chalcopyrite ores at great depths. Chalcocite (copper glance), cuprous sulphide, Cu_2S, contains when pure 79.7 per cent copper, but part of the copper is frequently replaced by iron or some other metal. The percentage of copper rarely falls below 55 per cent, however, and large veins carrying from 60 to 74 per cent of copper have been worked at the great Anaconda Mine in Montana.

Bornite (peacock ore), a sulphide of iron and copper, $3Cu_2S.Fe_2S_3$, contains when pure 55.58 per cent copper, but the proportion of iron and copper present may vary widely without the mineral losing its purplish-brown color and beautiful tarnish that shows yellow, green, blue, and purple tints. The copper content may vary from 42 to 70 per cent. The ore is generally regarded as a secondary vein mineral resulting from the decomposition of other copper and iron compounds. Malachite, a basic carbonate of copper, $CuCO_3.Cu(OH)_2$, contains theoretically 57.3 per cent copper, but is usually mingled with carbonates of lime and magnesia, oxides of iron, etc., and very rarely found pure. It is of very frequent occurrence in the upper oxidized portions of copper veins forming the "copper blossom" of the prospector. As thin incrustations on worthless rock a very small amount of it will color a whole mountain-side green. No deposits of sufficient purity to be worked for ornamental purposes occur in the United States, but immense masses have been found in the mines at Bisbee, Ariz.

Melaconite (black oxide of copper), CuO, contains when pure 79.86 per cent copper, but part of the copper is frequently replaced by iron or manganese. It occurs as a secondary product in the upper parts of copper-bearing veins, and is not of very common occurrence, though large bodies of it were formerly worked at Ducktown, Tenn., which contained from 20 to 50 per cent copper.

Cuprite (red oxide of copper) Cu_2O, is a secondary ore, a decomposition product of other ores, and though of more common occurrence than melaconite is chiefly of importance from its notably increasing the richness of veins carrying chiefly iron oxide or copper carbonate. Pure cuprite contains 88.8 per cent copper. Some of the mines in Arizona have shown a considerable percentage of cuprite in certain veins worked.

Tetrahedrite (gray copper, fahlerz) is essentially a sulphantimonite of copper, containing theoretically 52.1 per cent of copper, but frequently it also contains arsenic, iron, zinc and silver; thus the copper content varies greatly, and from the presence of antimony and arsenic, which make trouble in smelting, the mineral, in the United States, is mined chiefly for its silver contents, an ore of importance in the San Juan region of Colorado. Enargite, a sulph-arsenate, occurs at Butte, Mont., and in Gilpin County, Colo. Atacamite, an oxychloride of copper, is mined on a commercial scale only in the Atacama desert in northern Chile. It occurs in masses of crystals, and contains 59.4 per cent copper. Malachite is usually associated with azurite. This is an ore of importance in Arizona. Its formula, when pure, is $3CuO.CO_2.H_2O$, and it contains 55.2 per cent of copper.

Of the copper-producing countries, Spain's production comes from the great bodies of low-grade ore, chalcopyrite and pyrite, in the province of Huelva. Of the mines, the Rio Tinto is the most famous. The Spanish deposits were probably worked by the Phœnicians over 2,000 years ago. The Chilean mines are mostly in the province of Antofagasta, and the ores frequently carry silver. Of the mineral atacamite a quantity is mined yearly. The great German mine is the Mansfeld. The copper deposits of the Harz Mountains have been worked continuously for 700 years. The ores are complex, and carry a little silver. There are several large mines in Japan, the largest being the Ashio. The ore is chalcopyrite. The chief producing state in Australia is Tasmania, the ores bornite and chalcopyrite, with pyrite, coming from the large deposits worked by the Mt. Lyell and nearby companies. In Mexico are two important producing centres, one in Lower California, where are the unique deposits worked by the

Boleo Company, and another in Sonora, where large deposits of rich oxidized and sulphide ores have been opened not far from the international boundary. In Canada the great low-grade bodies of pyrrhotite with bornite in the Boundary district of British Columbia promise well.

The copper output of Colorado is largely in the nature of a by-product, since it comes from veins worked or opened for their silver and gold values. Copper deposits occur in Gilpin, Lake, and San Juan counties, the ores being sulphides, chalcopyrite, tetrahedrite, etc. California has some large bodies of pyrite, with chalcopyrite in Shasta County; and in Utah the copper ores near Bingham, in Salt Lake County, are chiefly chalcocite, and carry fair values in the precious metals. Of the eastern and southern States the only important producers are Vermont and Tennessee. The Vermont mines, near Ely, are in veins carrying chalcopyrite and chalcocite; those in Tennessee, near Ducktown, are now working ore that is largely chalcopyrite.

Among the States of the Union Montana owes its pre-eminence in copper-production to the wonderful ore bodies of Butte. These ore bodies, worked for silver at the surface, changed to rich secondary sulphides, while leaner sulphides show in the deep levels of some mines. The ores include chalcocite, bornite, chalcopyrite, enargite, covellite, and tetrahedrite, chalcocite being perhaps the most important; and they often carry considerable silver. The great Arizona copper deposits are near Bisbee, Jerome, and Clifton. At Bisbee the oxidized ores include malachite and azurite, with some cuprite. The principal sulphide is chalcopyrite. At Jerome the ores are bornite, chalcocite, and pyrite, and often carry good values in gold and silver; in fact, the precious metal values of the principal mine in the district, one of the richest in the world, are said to be sufficient to pay all the costs of mining and smelting. At Clifton the ore is chalcopyrite and bornite.

Metallurgy of Copper.— Since the ores of copper vary greatly in composition, and since many contain gold and silver in paying amounts, it follows that the methods of extracting copper differ widely. To describe the chief processes now in use would require more space than can be given here. In general it may be said that high-grade copper ores are smelted direct; low-grade ores, especially if carrying gold and silver, are often smelted; low-grade ores with little gold or silver, in regions where fuel is costly and fluxing scarce, are either concentrated, the concentrates being smelted, or are lixiviated directly. In a way the processes used may be classified as dry, wet, and dry and wet.

The treatment of ores containing less than one per cent copper at a profit in the Lake Superior region is possible because the copper is native, the ore bodies large, and water and fuel can be had cheaply. The rock as it comes from the mines is crushed and sorted, any nearly pure lumps of copper (barrel rock) going directly to the smelter. Rock containing finely divided copper goes from the breaker to steam-stamps, where it is crushed to a fineness of one fourth inch or less. The slimes from the stamps go to concentrating tables, where the particles of worthless rock are washed out; the coarser material goes to jigs by which the particles of copper are concentrated. The final result is «mineral,» material containing on the average 60 per cent of copper; and sands and slimes, containing in some mills not over .3 per cent of copper. The «mineral» goes to smelters. The sands and slimes are thrown away.

Smelting copper ores is practically the only process of extraction classified as «dry,» and is also by far the oldest method of treating sulphide ores. To trace its development in Germany and England is not possible within the limits of this article. The method developed at Swansea, Wales, had the merit of using a wide variety of ores. It involves: (1) Calcination of the working mixture in a reverberatory furnace by which part of the iron and copper sulphides are decomposed, the sulphur escaping as fumes; (2) smelting the calcined ores with siliceous slags in a reverberatory furnace, by which part of the iron, lime, and several other substances are removed as slag, while the copper, with some of the iron, is run off as matter containing about 33 per cent copper, known as coarse metal; (3) calcining the matte in a reverberatory furnace, by which the amount of sulphur is reduced one half; (4) smelting the calcined matte with slags, or with oxide and carbonate ores, in the latter case the product being white metal, containing 78 per cent copper and 18 per cent sulphur with a little iron and silica; (5) fusing the white metal in a reverberatory furnace, and allowing air to pass over it while liquid, the process being called roasting, and the product blister copper, containing 98–99 per cent copper with a little arsenic, sulphurate, etc.; (6) refining, which is done by melting the blister copper in a special type reverberatory furnace, the sulphur and arsenic being removed by oxidation, while the copper oxide formed is reduced by covering the molten metal with powdered charcoal and sticking in a green birch pole.

Many changes have been made in the smelting of copper ores in the United States and the present practice at such great smelting plants as those at Anaconda, Mont., and Bisbee, Ariz., differs greatly from the Swansea system described. At Anaconda the ore is calcined in large furnaces having various devices for stirring the ore. The calcined ore, with necessary fuel and with fluxing material, if needed, is charged into upright blast-furnaces, usually rectangular in cross-section, and sometimes of large size. A hot blast is used. The wells of the blast-furnaces are water-jacketed. The matte produced is run into trough-shaped «converters,» and a blast of air forced through removes the sulphur and most of the other impurities. The resulting black copper is cast into anodes and purified by electrolysis in a bath of copper sulphate, the copper deposited on the cathode being practically chemically pure. The distinguishing feature of American practice is the reduction of labor costs by improvements in devices and methods. In 1902 there were 12 electrolytic copper-refining plants in the United States with a total capacity of 10,120 tons daily; and the plants near New York refine Mexican, South American, and Australian mattes and blister copper that formerly went to Swansea. One of the great advantages of smelting is the recovery of the precious metals with very little extra cost.

Of wet and dry and all-wet methods there are a variety in more or less successful operation in various parts of the world. At Butte some of the ores are crushed and concentrated, the con-

centrates going to the smelter. A large part of the Colorado copper production comes from the concentrates of ores containing silver and gold. Wet processes include: (1) Lixiviation of the ore direct with a solution of ferrous chloride and salt, the copper being precipitated from the solution of cuprous and cupric chlorides by iron; (2) lixiviation of the roasted ore direct with hydrochloric and sulphuric acids, the copper being precipitated as cuprous chloride by sulphurous acid gas; (3) lixiviation of the roasted ore direct with sulphuric acid or with sulphurous acid, the copper being precipitated by iron or, in the case of a sulphuric acid solution, copper sulphate being the final product; (4) gradual lixiviation in heaps. Of the processes named the last is commercially the most important, since it is used at the great low-grade mines of the Rio Tinto district in Spain. The coarse ore is built in heaps 10 to 15 feet high, and 20 feet apart; a fire is lighted in each, and mixed lump and fine ore filled in between, thus a mass of 4,000,000 tons is exposed to sulphurous acid vapors for four to six months, when water is turned on to dissolve the copper sulphate. The percolation and leaching is kept up for about five years, the cupriferous solutions being caught in reservoirs and the copper precipitated by iron.

Electrolytic Refining.—The refining of copper by electricity is very simple in its general outlines, and it is also profitable in cases in which the crude metal contains gold or silver, and the cost of electric power is not too great. Briefly described, the process consists simply in electroplating the metal from one electrode to another, in a solution of copper sulphate; the anode being a plate of blister copper, while the cathode is a similar plate of refined metal. It is found to be possible, in this way, by a proper regulation of the current-strength and of the sizes of the electrodes, to ensure that nothing but copper that is almost chemically pure is deposited upon the cathode; the gold, silver, and other impurities collecting in the bottom of the electrolytic cell as a "mud," which is afterward worked for the recovery of the precious metals. Several methods have been employed for the extraction of copper directly from the ore, by means of a combined chemical and electrolytic process; but these must be regarded as still in the experimental stage.

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Copper, Electrolytic Refining of, a metallic industry, the process of which may best be described by taking as a typical case the great copper refining works at Perth Amboy, N. J. Here, in the course of every month, some 10,000,000 to 12,000,000 pounds of refined copper are deposited in the tank house; and the monthly output from the refining furnaces varies from 15,000,000 to 18,000,000 pounds. The Raritan Copper Works are devoted extensively to the electrolytic refining of the product of the great smelters of the West. The raw product comes to the works in the shape of copper pigs, which measure about 5 inches by 8 inches by 16 inches in length, and whose quality ranges from 95 to 99 per cent pure copper. It receives its first treatment in the furnace house, which consists of three buildings, and the first of which measures 80 by 600 feet and contains four 50-ton anode furnaces and five refining furnaces of the same capacity. The second building measures 80 by 200 feet and contains four 25-ton furnaces; and there is also a blast furnace building. The anode furnaces, as the name implies, are used for melting down pig copper in order that it may be cast into the large flat plates which form the anodes in the depositing tanks. The copper pigs are charged into large reverberatory furnaces, each charge weighing about 100,000 pounds. After about 6 or 7 hours in the furnace the charge is melted, and then for 13 or 14 hours more it is thoroughly worked by methods similar to those used by puddlers in some systems of iron making. The effect of the furnace treatment is to work off some of the impurities, the copper being advanced from 98½ per cent of purity to about 99½ per cent. The slags formed in the furnace treatment by the oxidation of the copper and the impurities combined with the silicious materials forming the sides and bottoms of the furnaces float as scum on the surface of the molten metal. It is skimmed off and sent to the blast furnace to recover the 55 per cent of copper which it contains. After 18 hours' treatment in the anode furnace, the copper is drawn off into a casting machine, which consists of an endless chain of molds, each mold being pivotally carried in and forming part of a conveyer. The tap hole of the furnace discharges into a ladle, from which the metal is poured into the mold. This ladle has a transverse tipping motion and is large enough to hold a charge for one mold, and as much more metal as may run into the ladle while that charge is being poured. The anodes are one inch in thickness, 24 inches in width, and 36 inches in depth. Each is provided on its upper edge with two projecting lugs, which extend over the edge of the depositing tank and serve to support the plate in the electrolyte. The anodes are now loaded on cars and drawn into the tank building. Here they are loaded into frames, each of which holds 22 anodes, which is the total number necessary for each tank.

The tank house contains the whole of the electrolytic plant. It is a single building 200 feet in width and 600 feet in length. The main floor space is given up to 1,600 depositing tanks, which are arranged in four groups of 400 each; and in small additions at the end of the main building are 32 liberating tanks. Four powerful electric cranes for handling the electrodes run the length of the building. The tanks are operated on the regulation multiple system, being arranged

electrically in series, with the electrodes in each tank parallel. The latter are about two feet wide, eight feet long, and three feet deep, and each contains 22 anode and 23 cathode plates arranged in multiple. They are filled with dilute sulphuric acid and sulphate of copper electrolyte, and with a view to securing a constant circulation of the electrolyte the tanks are arranged in sets, with a solution well and a pump to each set. The liquor is drawn from the bottom of one tank and flows over to the next tank below it, the electrolyte being thus brought in thorough contact with the whole surface of the plates in the series of tanks.

The thin cathode sheets which are used in the depositing tanks are formed in what are known as "stripping" tanks, of which there are 180. The cathodes in the stripping tanks consist of rolled plates of pure copper, smeared with grease or plumbago, with their edges protected against the formation of copper by grooved wooden strips. After the cathodes have been in the stripping tanks for 36 hours, they are removed, and the thin sheet of copper is peeled from the plates, the grease serving to prevent any close adhesion of the surfaces. The thin cathode sheets are then flattened out by beating with wooden paddles, and are hung by two thin copper loops, riveted to the plates, from copper rods, the ends of which rest on the edges of the depositing tank. The anodes as they are brought to the tank house from the casting furnace, are hung on special iron frames, on which they are so placed that they will have the proper spacing in the depositing tanks. The traveling crane picks up the frame with its complete set of anodes (22) and places them in position in the tanks, the total weight of the complete set being between four and five tons, while the 23 cathodes together weigh 160 pounds. The action of the current is to transfer pure or practically pure copper from the heavy anode plates and deposit it upon the thin cathode sheets. The latter increase in weight from 6 to 8 pounds to 75 to 80 pounds during the seven days that they are in the tank. At the end of seven days they are withdrawn, loaded on cars, and taken to the refining furnaces. Fresh cathodes are supplied, until the anodes, at the end of 42 or 43 days, have been so reduced as to have to be themselves replaced with fresh anodes.

The product of the tanks, in the shape of heavy deposited cathodes, is taken to the 50-ton refining furnaces, where it is melted down and brought to "pitch," that is, to a purity of 99.88 per cent. In the process of melting the copper takes up a certain amount of oxygen, and this is removed by introducing into the bath of molten metal a pole of green wood the carbon of which combines with the oxygen, and passes off as carbon dioxide. From the refining furnaces the copper is cast into the various forms required by the mills to which the copper is to be shipped. The molds are pivoted at their ends to the links of a conveyer. After each mold is filled with metal, it is drawn through a bath of water, and then tipped over to discharge its contents. The conveyer is operated by a 10-horsepower electric motor, and the ladle is operated by a hydraulic plunger which is under the control of the ladler.

The first process in the treatment of the slimes is to extract the copper, and this is done by boiling the slimes in concentrated sulphuric acid and blowing air through the liquid during the process. The slimes are then washed, dried, and smelted on the hearth of a cupel furnace, and a bullion of gold and silver is recovered. The silver and gold bullion is boiled in large kettles filled with sulphuric acid, where the silver is dissolved and forms sulphate of silver, while the insoluble gold collects on the bottom of the kettle. The sulphate of silver solution is siphoned off into tanks, the bottom and sides of which are lined with copper plates. Here the sulphate is reduced, the silver being precipitated on the copper plates as "sponge silver," which is collected, washed, dried, melted in crucibles, refined, and cast. The gold is collected from the bottom of the kettles and is also washed and refined and cast, the pure silver and gold thus obtained being shipped to the mint.

The power house for the supply of a current necessary for the depositing of 12,000,000 pounds of copper a month is a large one. The boiler room contains eight 400-horse-power and two 200-horse-power Babcock and Wilcox water tube boilers, equipped with the Murphy automatic stoker. The fuel is brought to the boilers, and the refuse, ashes, etc., removed by mechanical conveyers. The engine room contains five vertical cross-compound condensing engines, each direct-connected to a General Electric generator, the largest of which delivers 4,500 amperes at an efficiency of 93.5 per cent.

Cop'peras, the commercial name for ferrous sulphate, or green vitriol. (See IRON.) Copperas occurs native, as the mineral melanterite (q.v.), commonly in connection with deposits of pyrites, from which it is derived by oxidation.

Copper-fastened, a term used of a ship when the bolts and other metal-work in her bottom are made of copper and not iron, so that the copper-sheathing may not corrode the heads of the bolts by galvanic action, which takes place when copper and iron are in contact with sea-water.

Copperfield, David. See DAVID COPPERFIELD.

Copperhead (*Ancistrodon contortrix*), the most widely distributed, and in many places the most abundant of the venomous snakes occurring in the eastern United States. It belongs to the family *Crotalidæ* (q.v.), but with the water moccasin belongs to a genus (*Ancistrodon*), distinguished from the rattlesnakes by the absence of rattles, while the copperhead is peculiar in the presence of a small additional plate between the eye and nostril. The copperhead seldom exceeds a length of three feet. It is brown, with a series of dark blotches on the back, and the triangular head is a bronzy red, from which circumstance it takes its name, while the white color of the interior of the mouth has given rise to another of its names, that of cottonmouth, also applied to the water moccasin. It is sometimes called the red viper. Like other poisonous snakes the copperhead has been exterminated in the thickly settled parts of the northern States, but is still abundant in unsettled regions and in the South. It is partial both to the neighborhood of water and to dry rocky hills and, owing to its activity, its silent approach, and its irascible temper, is justly feared by man and the lower animals, including

non-venomous snakes. Some of the latter, as the blacksnake, will, however, attack and eat it. The customary food of the copperhead consists of small birds and mammals. About seven or eight young are produced at a time, this snake being viviparous; it is said that when pregnant a large number of females will sometimes twine themselves together, whence the descriptive epithet "contortrix." As a true viper the copperhead, as well as many harmless American snakes, is sometimes called an adder, a name which in continental usage is equivalent to viper, "ottern" and "vipern" being interchangeable terms in German. In England adder is the name applied to the only native venomous serpent, the *Pelias berus*.

Copperheads, a name applied in 1862 and throughout the Civil War, to members of the Democratic party in the northern States who violently opposed the prosecution of the War, They were not necessarily in sympathy with the South, but at all events they held that the Confederacy could never be conquered, and that the attempt to coerce the seceding States was hopeless and illegal. The name was generally indicative of a treacherous character, and was a reference to the habit of the copperhead snake, which strikes without warning.

Coppering, sheathing a ship's bottom with thin sheets of copper, to prevent the teredo or ship-worm eating into the planks, and to keep shells and weeds from accumulating on the surface, and so retarding the vessel.

Coppermine River, in Canada, near Coppermine Mountain. It has its source in Point Lake, and flows into Coronation Gulf, an arm of the Arctic Ocean, near Duke of York's Archipelago. Its length is about 325 miles; but the large number of waterfalls along its course render it useless for any travel except by light canoes.

Copper or **Atna River,** a stream in Alaska, rising in the neighborhood of Mount Wrangel, flowing in a generally southern direction west of that mountain, and emptying into the Gulf of Alaska about 30 miles west of Chilkat. The length of the river is a little over 500 miles. Its name is due to the alleged fact that its waters hold copper in solution.

Coppice. See COPSE.

Cop'pinger, John Joseph, American military officer: b. Ireland 11 Oct. 1834. After obtaining a military education in Ireland he went to Rome, serving in the papal army as aide-de-camp. He came to the United States in 1861 and was given a commission in the Union army, rising to the rank of brigadier-general in the regular army in 1895. In the war with Spain, as major-general of volunteers, he commanded the 4th Army Corps in Porto Rico. He married Alica, daughter of the late James G. Blaine (q.v.). He was retired in 1898.

Copra, the dried kernel of the cocoa-nut, from which the oil has not yet been expressed, a considerable article of commerce in some tropical regions. Samoa and the Fiji Islands export more than 10,000 tons annually, Tahiti about 2,000, and Ceylon 3,000 tons. From it cocoanut oil and cocoa butter are manufactured, and the residuum after expression is an excellent fodder, with many of the nutritive properties of cottonseed-oil cake.

Coprolites, the term originally applied to the fossil excrements of extinct animals, especially fishes and reptiles, found most abundantly in the lias, greensand, and Suffolk crag. They consist chiefly of phosphates of calcium (from 50 to 75 per cent) and magnesium, and the carbonates of the same metals, and organic matter, and as the fertilizing properties of these are well known, coprolites have been largely used as a manure. For this purpose they are reduced to powder and used as ground bones, or treated with sulphuric acid, so as to form superphosphate of lime. To the scientist these remains have a definite value as indicating the prey of the animal in question and the nature of its intestinal structure.

Copse, kŏps, a cultivated wood, where the trees are cut periodically, before they attain timber size, each succeeding crop being cut from the stumps of the first growth. A copse or coppice is sometimes used as an ornamental growth, where large trees would not be desirable, but their chief use is as a source of profit. When cultivated under the rules of scientific forestry, they may be made a very valuable adjunct to the farm lands. The practice is not common in America, where the idea of profit from woodland is that the land must be allowed to grow up to timber, and then be entirely denuded. In Europe, particularly in England, the most valuable tree thus employed is the oak, which is cut at intervals varying, according to soil and climate, from 12 to 30 years; and after paying all expenses it often yields from $150 to $250 per acre in bark used for tanning, and in wood convertible into wheel-spokes, or applicable to other purposes. The stems, cut over near the ground, are carefully dressed and rounded, so as to prevent them from rotting; in a short time a number of shoots appear, all of which are thinned away except three or four of the most promising, which are left to grow till they again become fit for another cutting. When plantations are extensive, the method usually followed is not to allow all the copse to come to maturity at the same time, but to divide it into a number of sections and to cut one of them annually, so as to yield a revenue with as much regularity, and not unfrequently to as large an amount, as an equal quantity of land under cultivation. For instance, a copse of 100 acres, on the assumption that it may be profitably cut after 20 years' growth, is divided into 20 sections of five acres each. By cutting only one of these sections annually a perpetual succession of cuttings is obtained, yielding, on the most moderate calculation, a clear income of at least $500 per annum. The proprietors of many of the rocky glens of Great Britain, by pursuing this method, have materially increased the value of their estates. The other kinds of wood commonly used for copse are chestnut, which, from its durability, even when partly inserted in the ground, is valuable for posts, etc.; ash, preferred for all purposes where strength and elasticity are required; and hazel, admirably adapted for barrel hoops, and in great demand for crates in the vicinity of potteries. The willow, well known for its uses in basket-making, being cut down regularly after every year's growth, scarcely falls under the head of copse. In some continental countries the copse is the source of the whole fuel supply.

Coptic Languages, the language formerly spoken by the Copts or Egyptian Christians, and regarded as the direct descendant of the ancient sacred language of the Egyptians. As such it has afforded to Champollion, Dr. Young, and others the key to the interpretation of the Egyptian hieroglyphic inscriptions. At the time of the introduction of Christianity among the Copts the hieroglyphic, hieratic, and demotic modes of writing previously in use in Egypt were abandoned, and the Greek alphabet was adopted, with the addition of six characters of the demotic alphabet, which were retained because the equivalents to them were wanting in the Greek alphabet. These six letters represented *kh, h, f,* the English *j,* and two forms of *sh.* By the time that this change was made the Coptic language was no longer the same with the ancient sacred language, but had adopted a number of words from the vernacular language, which was spoken in Egypt alongside of the former, beside a large number of others from the Greek, the Latin, the Arabic, and other sources. It still remained, however, essentially Egyptian. The Coptic language is monosyllabic in character. All its radical forms are monosyllables, and whenever a polysyllabic word is met with it may be at once affirmed that the word is either a derivative or a compound. As a rule the radicals are capable of certain modifications of form, which always express a modification also of the sense. The meaning of the radical monosyllables is in fact changed by the juxtaposition of other monosyllables, which are the usual signs of genders, numbers, persons, moods, and tenses. The feminine is sometimes formed by a modification of the vowel of the masculine. In the Coptic root syllables there are often final consonants which do not form part of the root. These are called paragogic letters, and can only be explained as instances of the caprice of pronunciation, or as being originally part of the root both in spelling and pronunciation, although in course of time they have been dropped so far as the pronunciation is concerned. According to the German philologist, Schwartze, the Coptic may be taken as forming a family of languages analogous to the Semitic in its grammar, and allied to the Indo-European languages in its roots. This opinion is supported by various other philologists, such as Bunsen, Meier, and Bötticher, but it is contested by others, among them Pott, Ewald, Wenrich, and Renan. The Coptic language is divided into three dialects — the Theban, which was spoken in Upper Egypt, and which is the best preserved of the three; the Memphitic, or Coptic, strictly so called, which was spoken in Lower Egypt; and the Bashmuric, which was spoken in the Delta. Of the last the literary remains are very scanty, but it is that which comes nearest to the hieroglyphic language of the ancient Egyptians. After the Arabian conquest of Egypt the Coptic language gradually ceased to be spoken, and as early as the 10th century it was no longer in use in Lower Egypt, except in their church liturgies; in Upper Egypt, however, it maintained itself for some centuries longer, but here also it was at last obliged to give way to the Arabic. The theological writings in use among the Coptic Christians, however, are still written in the Coptic language, but an Arabic translation always accompanies them. In the schools the children learn the Gospels and the epistles of the New Testament in Coptic as well as Arabic, but they are no longer taught the former language grammatically. In the various libraries of Europe there are numerous Coptic manuscripts, but most of them are of little interest. The Coptic literature is almost entirely of a religious character, the works written in it comprising portions of the Old Testament, the Acts, sermons and homilies, martyrologies, etc. Translations of the Pentateuch and some other books of the Old Testament and of the Gospels into Coptic have been published at Rome. Materials for the study of the Coptic language will be found in the grammars of Schwartze (Berlin 1850), Uhlemann (Leipsic 1854), and Stern (Leipsic 1880), and the dictionaries of Peyron (Turin 1835, still considered the best) and Parthey (Berlin 1844). Consult: Loret, 'Manuel de la Langue Égyptienne.'

Coptine, a colorless alkaloid which is found together with berberine in the root of *Coptis trifolia.* Coptine dissolves in sulphuric acid, the solution becoming purple-red when heated; it gives a crystalline precipitate with a solution of mercuric potassium iodide.

Cop'tis, a genus of low herbs of the crowfoot family (*Ranunculaceæ*). It comprises about nine species occurring in the cooler parts of the northern temperate zone. Four species are found in America, three of them on the Pacific coast. *C. trifolia,* gold-thread, or canker-root, grows in damp woods and bogs from Newfoundland to Maryland, and westward and north to Minnesota, British Columbia, and Alaska. In the Adirondacks its evergreen leaves are found at an elevation of 3,500 feet. Its common name of canker-root is given to it because of its use in household medicine as a cure for cankerous affections of the mouth in children. A yellow dye is extracted from the root-stock. *C. teeta* is used in India as a tonic.

Copts, a name given to the schismatic Christians of Egypt who are of the Monophysite sect, similar in belief with the Jacobites of Asia. The Monophysites and Jacobites are followers of Dioscorus, Patriarch of Alexandria, who was deposed by the council of Chalcedon in 451, because he maintained there was only one nature in Christ. The Copts were of pure Egyptian blood, and at first were more numerous than their adversaries, the Melkites, who were Greeks in origin and believers in Christ as taught by the Church. Officials who were considered orthodox were sent from Constantinople to govern Egypt, and many of the Copts fled to Upper Egypt and some went to the Arabs. So incensed were they with their rulers that when an opportunity occurred, they betrayed their country to the Saracens, who drove the Greeks and Romans out of the land. But the Copts soon found that their privileges would be of little avail, and their wealth, numbers, and respectability rapidly declined, and though rarely intermarrying with their conquerors, and preserving their features, manners, and religion unaltered, they soon lost their language, which had resisted the influence of a Grecian court for so many ages. In person and features the Copts differ much from the other natives of Egypt, and are evidently a distinct race. According to the younger Champollion they are the result of a mixture of all the different races that have

ruled over Egypt. Reduced by a long course of oppression and misrule to a state of almost degradation, their number and national character have declined; so at the highest calculation they do not now amount to more then between 150,000 and 160,000, or one tenth of the population, although at the time of the Saracen invasion their number is said to have reached 600,000. Their costume resembles that of the Moslems, but they are in the habit of wearing a black turban for distinction's sake. They also commonly wear a black or dark-colored outer robe. In their general customs there is little to distinguish them from the other inhabitants of the country. They are chiefly employed as clerks, secretaries, etc. The women go out with veiled faces, like the other females of the country. They have numerous schools for their male children, but very few of the females are taught to read. In doctrine they agree almost wholly with the Roman Catholic Church, except on the one point which caused the separation,—the two natures in Christ. They celebrate Mass in the old Coptic language, as with them now the Arabic is the common tongue. Their supreme head is the Monophysite Patriarch of Alexandria, who is chosen from among the monks; then come the bishops, priests, deacons, inferior clergy, and monks. The priests may be married according to the Eastern discipline, and as they receive but little by way of support from their congregations, they are generally engaged in the ordinary occupations of the place in which they live (see JACOBITE CHRISTIANS; MELKITES). They have four seasons of fasting, all of which are scrupulously observed. Their Lent begins nine days earlier than that observed by the Roman Catholic Church. The doctrine of the sacraments does not vary from that of the Latin Church, but they have a peculiar ritual in the administration of the sacrament of extreme unction, which they give with the sacrament of penance, even when there is no bodily illness, to heal the disease of the soul. The curious custom exists of blessing the bathing water stored in large tanks; and to appease or please the Mohammedans, they have adopted circumcision. Within recent years a large body of the Copts made corporate reunion with the Roman Catholic Church, and there is a Catholic Vicar Apostolic of the Coptic rite for the Copts of Egypt.

Copway, George, native name, Kah-ge-ga-gaw-bowh; Indian journalist: b. Michigan 1818; d. about 1869. He belonged to the Ojibway tribe and was settled in New York. He wrote: 'Recollections of a Forest Life'; 'The Ojibway Conquest,' a poem; 'Running Sketches of Men and Places in Europe,' etc.

Copy (Lat. *copia*, "abundance"). (1) In ancient times, when the art of printing in its improved form was unknown, the copyist was a much esteemed person, and manuscript was multiplied by the laborious process of writing by hand. Some of the Roman slaves were copyists. From the early centuries of Christianity through the Middle Ages, and until the art of printing became popular, there were in each monastery certain monks who were copyists. Their whole time was occupied with transcribing manuscripts of the ancient classics, the writings of the fathers and doctors; but their chief care was the making copies of the Bible. Often days were spent upon ornamenting an initial letter or in decorating the names of the Deity. The preservation of the Bible in its present form, and of ancient classics in general, is due to the faithful work of the old copyists. Copies of books in those days were of great value, often they were carried under guard from place to place when the owner was traveling, and the copy of the Bible was usually chained in the parish church. (2) The matter, whether in print or manuscript, sent to the printer to be set up in type. (3) An exact reproduction of a work of art made by one other than the original artist; a copy made by the original artist is called a replica.

Copyhold, in English law, a tenure of estate by copy of court roll, or a tenure for which the tenant has nothing to show except the rolls made by the steward of the lord's court. Copyhold property cannot be now created, for the foundation on which it rests is, that the property has been possessed time out of mind, by copy of court roll, and that the tenements are within the manor. Copyhold does not exist in the United States. Consult Scriven, 'Treatise on Copyhold, Customary Freehold,' etc. (7 ed. 1896).

Copying, a term in general use for a great many different processes, which may be described generally as the reproduction, usually either on an enlarged or reduced scale, of any drawing, map, or other work of art. A few of the methods employed may be shortly described. If the copy is to be the same size as the original, the easiest way is to trace it. A piece of tracing-paper is put over the drawing, and the principal lines gone over with pencil. The back of the tracing is then rubbed with black lead or ruddle, and put on the paper on which the copy is to be made; the traced lines are gone over with a hard point, and thus indicated on the paper. Guided by the traced lines, the copy can then be drawn in. When the copy is required of a different size from the original, the simplest way is to sketch it by hand and eye, but where more mechanical accuracy is required, the method of squares is very useful. The original is covered with squares of any convenient size by pencil lines or threads or by tracing paper ruled off in squares; a piece of paper for the copy is prepared with a corresponding number of squares, of a smaller or larger size, according as the copy is wanted smaller or larger. These squares must bear the same proportion to the squares on the original as the copy is to bear to the original. It is then a comparatively easy matter to copy in each square the part of the original in the corresponding square. To avoid confusion if the squares are small, it is well to number them along each side of the drawing. Any drawing consisting principally of straight lines, such as a plan, can be conveniently reduced by constructing a scale to suit the reduced size required. The lines of the original are measured by its scale, and the same proportion of the smaller scale gives the necessary measurement. The pantograph is another means of making a reduction or enlargement, but is very seldom used now. It is only accurate in a general way. Perhaps the simplest and most exact method is to get the original photographed to the required size; the copy can then be traced on to clean paper as already described.

The copying of letters and other documents for commercial purposes is usually done by means of the ordinary copying-press, which is so familiar in every counting-house as to need no detailed description. A letter written with specially prepared ink is transferred to another piece of paper by means of damp and pressure. Common ink thickened with a little sugar will serve as copying ink. Many modifications of this arrangement have been devised for producing a number of copies of circulars, etc., from one written copy, and are known as "graphs." A document written with the ink prepared for the purpose is transferred by pressure with the hand to a gelatinous slab, from which as many as 50 or 60 copies, more or less distinct, can be retransferred by rubbing with the hand. A very useful method of manifold writing is largely employed in telegraphic news work, and for duplicating invoices by retail tradesmen. Carbonized paper is put between two, three, or more sheets of thin paper, and thus whatever is written on the top sheet with a hardish pencil is duplicated on the others. When an indefinite number of copies of any drawing or other subject is required, there are many printing processes which may be employed. Letters or circulars, if written with lithographic ink, can be transferred to stone, and any number printed. Engineers' or architects' drawings, or any other drawing executed in line, can be very successfully reproduced in any size by the photo-lithographic process. If required for block or letterpress printing, then any of the zincotype processes may be employed. By this process, also, plates to reprint steel-engravings can be produced from any printed engraving. For reproducing drawings executed otherwise than in line, photographs from nature, or paintings, there are many other processes.

Copying Machine, any one of a number of contrivances by which one or more copies of a letter or other document may be made. Perhaps the best known is the copying-press. The letter is written with "copying ink," a writing fluid containing some gummy substance which prevents the ink from soaking into the paper. A sheet of bibulous tissue paper moistened with water to a certain degree is laid on the face of the writing, a sheet of oiled paper is laid on the tissue paper, and the letter is placed between boards and put into a press, the platen of which is screwed down tightly. A few seconds' contact of the damp tissue paper with the writing transfers sufficient of the ink from the original to the tissue to make a perfect copy. A number of letters similarly treated may be copied by one operation of the press, and by the use of very thin tissue and longer impression three or four good copies of a letter may be taken. Among copying processes are many that are perhaps rather methods of reproduction in bulk instead of copying in a more limited way, being somewhat akin to printing. Among these are lithography (q.v.) and the mimeographic process. See MIMEOGRAPH.

Copyright, the exclusive right of property in any intellectual production; the protection afforded by the law for a limited number of years to the originator of any written or printed composition or work of art, or to his heirs and assigns, whereby persons unauthorized are prevented from multiplying and selling copies, or, in case of dramatic works, from representing them on the stage. Such rights were claimed by authors before the introduction of printing. After the invention of the printing press, the right to publish books became the subject of licenses and patents. In Chambers' 'Domestic Annals of Scotland,' under date of 9 Nov. 1699, may be seen a warrant of the Privy Council authorizing George Mossman, stationer in Edinburgh,—

—"to print and sell the works of the learned Mr. George Buchanan, in one volume in folio, or by parts in lesser volumes, and forbidding all others to print, import, or sell the whole or any part of the said Mr. George Buchanan's works, in any volume or character, for the space of 19 years."

Similar privileges were granted in England; but all such monopolies were regarded with suspicion by common lawyers. The common law affords a certain measure of protection to works unpublished or published only for a limited purpose. The writer of a letter, for example, transfers his property in it to the receiver; but the receiver has no right to print it for sale or distribution without the writer's consent. The copyright in published works is the creation of statute; the first copyright act was passed in 1709; and by virtue of its provisions authors acquired the sole liberty of printing their books during a term of 14 years from first publication, and, if the author should be living at the end of that time, during a further term of 14 years.

While this act was in force, Thomson sold the copyright of his poems to Millar, a London bookseller. Millar claimed the right to prevent the issue of reprints by Donaldson (of Edinburgh) and others, even after the statutory term had expired, on the ground that an author had, at common law, the sole right of printing his works. Out of this dispute arose the famous cases of Millar *v.* Taylor, and Donaldson *v.* Beckett, which led to a remarkable difference of opinion among the judges. The House of Lords decided that if any common-law right existed it had been taken away by statute.

At the union with Ireland, the copyright act was extended to that country, and the trade in cheap editions printed in Dublin and secretly imported into Great Britain came to an end. In 1814 the term of copyright was extended to 28 years, and the residue of the author's life if he were living at the end of the term. The impetus given to literature at the beginning of the 19th century, and especially the popularity attained by the works of Scott and Byron, greatly increased the market value of copyright, and ultimately led to further legislation in the interest of authors and publishers. The basis of the existing law is the copyright act of 1842, commonly known as Talfourd's Act, or Lord Mahon's Act. Macaulay's speech in the House of Commons on the second reading of this measure is one of his most successful parliamentary efforts. In Great Britain the term of copyright in a book is 42 years, or the life of the author and seven years, whichever of the two terms is the longer. No copyright can be enjoyed in seditious or immoral publications, or in books first published out of the United Kingdom. Articles contributed to encyclopædias and periodicals and books published in parts or series belong to the proprietor; but he may not publish them separately without the writer's consent, and after 28 years the copy-

right reverts to the author. Dramas and musical pieces, if first published in book-form, are subject to the same rules as books; but if they are performed in public before appearing in print the author retains the sole right of permitting them to be represented during the term of copyright; and this right is distinct from the copyright he acquires if his drama or piece is published as a book. By an act of 1882 the proprietor of a piece of music, desiring to reserve the right of performance, must give notice to that effect on the cover. Verses may not be taken from a copyright work and set to music for sale, without permission. A novel may be dramatized without the author's permission; but if copies of the drama are published containing passages borrowed in substance from the novel, the author of the adaptation is liable to an action. The right to dramatize can be exercised only with precautions which must greatly restrict it in practice.

Copyright in engravings, maps, etc., is secured by several acts; the term is 28 years. Each plate and print must bear the name of the proprietor. Copyright in paintings, drawings, and photographs is secured to the artist during his life and seven years after, by an act of 1862. In 1874 the Canadian Copyright Act enabled a British author to obtain copyright in Canada for 28 years, provided his work be published in the colony. This right is concurrent with and in addition to the rights given by the imperial act of 1842.

Section 4,952 of the Revised Statutes of the United States, in force 1 Dec. 1873, as amended by the act of 18 June 1874, as amended by the act of 3 March 1891, provides that the author, inventor, designer, or proprietor of any book, map, chart, dramatic or musical composition, engraving, cut, print, or photograph, or negative thereof, or of a painting, drawing, chromo, statuary, and of models or designs intended to be perfected as works of the fine arts, and the executors, administrators, or assigns of any such person, shall, upon complying with the provisions of this chapter, have the sole liberty of printing, reprinting, publishing, completing, copying, executing, finishing, and vending the same; and, in the case of a dramatic composition, of publicly performing or representing it, or causing it to be performed or represented by others. And authors or their assigns shall have exclusive right to dramatize or translate any of their works for which copyright shall have been obtained under the laws of the United States.

A printed copy of the title of the book, map, chart, dramatic or musical composition, engraving, cut, print, photograph, or chromo, or a description of the painting, drawing, statue, statuary, or model or design for a work of the fine arts, for which copyright is desired, must be delivered to the librarian of Congress or deposited in the mail, within the United States, prepaid, addressed "Librarian of Congress, Washington, D. C." This must be done on or before day of publication in this or any foreign country. Not later than the day of publication in this country or abroad, two complete copies of the best edition of each book or other article must be delivered or deposited in the mail within the United States, addressed "Librarian of Congress, Washington, D. C.," to perfect the copyright. The freight or postage must be prepaid or the publications enclosed in parcels covered by printed penalty labels, furnished by the librarian, in which case they go free by mail (not express), without limit of weight, according to the rulings of the post-office department. Books must be printed from type set in the United States, or plates made therefrom; photographs from negatives made in the United States; chromos and lithographs from drawings on stone or transfers therefrom made in the United States. Without the deposit of copies above required, the copyright is void and a penalty of $25 is incurred. The law requires one copy of each new edition wherein any substantial changes are made to be deposited with the librarian of Congress.

No copyright is valid unless notice is given by inserting in every copy published, on the title-page, or the page following if it be a book; or if a map, chart, musical composition, print, cut, engraving, photograph, painting, drawing, chromo, statue, statuary, or model or design intended to be perfected as a work of the fine arts, by inscribing on some portion thereof, or on the substance on which the same is mounted, the following words, "Entered according to Act of Congress in the year ——, by ————————, in the office of the librarian of Congress, at Washington," or, at the option of the person entering the copyright, the words: "Copyright, 19—, by————————." The copyright law secures to authors and their assigns the exclusive right to translate or to dramatize any of their works; no notice is required to enforce this right. The original term of copyright runs for 28 years. Within six months before the end of that time, the author or designer, or his widow or children, may secure a renewal for the further term of 14 years, making 42 in all. In the case of books published in more than one volume, or of periodicals published in numbers, or of engravings, photographs, or other articles published with variations, a copyright must be entered for each volume or part of a book, or number of a periodical, or variety as to style, title, or inscription, of any other article. To complete the copyright on a book published serially in a periodical, two copies of each serial part, as well as of the complete work (if published separately), should be deposited.

To secure copyright for a painting, statue, or model, or design intended to be perfected as a work of the fine arts, a definite title and description must accompany the application for copyright, and a mounted photograph of the same, as large as "cabinet" size, mailed to the librarian of Congress not later than the day of publication of the work or design. The fine arts, for copyright purposes, include only painting and sculpture, and articles of merely ornamental and decorative art should be sent to the patent office; as subjects for design patents. Copyrights are not granted on trademarks or on names of companies, libraries, or articles, or on an idea or device, or on prints or labels intended to be used for any article of manufacture. If protection for such names or labels is desired, application must be made to the patent office.

Until 1891 copyright could be acquired only by a citizen of, or permanent resident in, the United States. British authors had much reason to complain of this state of the law; and American authors were injured by having to compete with cheap unauthorized reprints of

British works. There was at one time an understanding that the American publisher who first placed a British work on the market obtained copyright by courtesy; and considerable sums were paid for "advance sheets" in order to obtain this advantage, but the "courtesy of the trade" came to be disregarded. In December 1887, the convention of Berne brought nearly all the States of Europe into copyright relations with one another. This was the most important step ever taken in the history of the world's literary dealings, for it secured an almost universal recognition of the rights of authors. The rights of citizens or subjects of a foreign nation to copyright in the United States extend by presidential proclamations to Great Britain, France, Belgium, Switzerland, Germany, Italy, Spain, Denmark, and Portugal, and Americans can secure copyright in those countries. For this direct arrangements must be made abroad. For an American citizen to secure copyright in Great Britain the title should be entered at Stationers' Hall, London, the fee for which is five shillings sterling, and five shillings additional if a certified copy of entry is required. The work must be published in Great Britain or in her dominions simultaneously with its publication in the United States, and five copies of the publication are required, one for the British Museum and four on demand of the Company of Stationers for four other libraries. Copyright may be secured in France by a foreigner by depositing two copies of the publication at the ministry of the interior at Paris. No fee or entry title required. To secure copyright in Belgium a foreigner may register his work at the department of agriculture, industry and public works at Brussels. In Switzerland, register of title at the department of commerce and industry at Berne is optional, not obligatory; fee, two francs. If registered, deposit of one copy is required. Copyright in Canada is to be registered with the minister of agriculture at Ottawa; fee, $1 for registry and 50 cents for certificate, and the work must be published in Canada and two copies deposited. In Greece the period during which an author can hold a copyright is restricted to 15 years. The Swiss grant copyright during the life of the author or his heirs during 30 years from the date of publication of his work. In Brazil the author enjoys a copyright for life, and it is extended for 10 years after his death. In Venezuela the copyright endures for the life of the author and 14 years after his death. In Holland and Belgium the copyright lasts during the life of the author and during 20 years after his death. In Germany, Austria, Hungary, and Portugal copyright endures during the life of the author and during 30 years after his death. The duration of copyright in Italy is regulated in a peculiar manner. It endures for the life of the author and 40 years after his death, or for 80 years after the publication of the work, the term of years being divided into two periods of 40 years each. If the author dies within the first period of 40 years the remainder of the term is enjoyed by his heirs or assigns. The second period of 40 years begins at the death of the author, if he has died after the first period of 40 years has elapsed; or if he has died before them, at the end of the first period of 40 years. During the second period any one is at liberty to republish the work on payment to the owner of the copyright of a royalty of 5 per cent on the price, which must be marked on the book. France, Norway, Sweden, and Denmark accord a copyright during the life of the author and 50 years after his death. Russia not only gives copyrights for life and 50 years after death, but also for 10 additional years if an edition of the work is published within five years from the end of the first copyright term. The law of Spain accords a copyright during the life of the author and for 80 years thereafter. Only in Mexico is copyright perpetual, but at the present time an effort is being made to have copyrights perpetual in various countries. Consult Drone, 'The Law of Property in Intellectual Productions'; Putnam, 'The Question of Copyright.'

GEORGE HAVEN PUTNAM.

Copyright, Canadian. The double relation of Canada, as at the same time a self-governing nation, and also a part of the British Empire, produces some slight complications in its copyright law. By the British North America Act of 1865, constituting the Dominion, the power of copyright legislation was assigned to the Federal authority. The Canadian Parliament passed a Domestic Copyright Act in 1875, revised it in 1886, and amended it in 1889 by an act which was suspended by the Imperial Parliament, pending discussion of the protection of British authors. Finally in 1895 a Canadian act satisfactory to both British authors and the Canadian printers and publishers was agreed on and passed. The Imperial Copyright Act of 1842 applies generally to Canada, subject to the present Canadian legislation. The (Imperial) Foreign Reprints Act of five years later, which allowed the importation of foreign reprints of British copyright works on payment of a 12½ per cent royalty duty, used to be a source of complication with the Canadian authorities but is now suspended by Order-in-Council.

The difficulties have chiefly arisen from the importation into Canada from the United States of reprints of British works sold at low prices, and which it has been practically almost impossible to restrain. When these were so imported by American publishers under agreement with the British author, the Canadian printer and publisher saw themselves constantly deprived of business which they considered should be theirs, as no reciprocity was permitted them by the United States. Their mouthpiece was the Canadian Copyright Association and their agitation was continuous. The refusal of the United States to enter the Berne Convention was an important incident in the history of the trouble, although more recent United States legislation protects the British author to a certain extent. The Canadian author also has found it necessary to watch copyright legislation and raise some complaints. At present any author domiciled in the Empire, or in any country having an international copyright treaty with the United Kingdom, may obtain copyright in Canada for 28 years (renewable for 14 years by the author, his widow or children) of any book, map, chart, musical composition, or any original painting, drawing, statue, sculpture or photograph, any print or engraving of an original design, or any translation of a literary work; but no exclusive right can be obtained to illustrate a piece of scenery or an object. The work

must be printed and published, reprinted and republished or produced or reproduced in Canada. The copyright lapses with the expiration of foreign copyright. British copyrighted works may be copyrighted when printed and published, or reprinted or republished in Canada, and may also be imported notwithstanding Canadian copyright. Foreign reprints of British copyrighted works may be imported before the registration of Canadian copyright for either sale or private use. Works published in separate articles of a periodical may be temporarily copyrighted, but the complete work must also be registered when published. Anonymous works may be registered in the publisher's name. The registration is granted on delivery of three copies of the work at the Department of Agriculture (Copyright Branch), Ottawa, immediately on publication in Canada, and the issued work is to bear copyright notice in due form. An interim copyright may be obtained, but becomes void unless the work is printed in Canada within one month after first publication elsewhere. If not so printed, the applicant is liable to a penalty of $100. All communications are addressed to "The Minister of Agriculture (Copyright Branch), Ottawa," from whom copies of the act and regulations may be obtained on request.

Any publication of an original manuscript, without consent of author or proprietor entrains liability for damages, unless the work be already printed in Canada or elsewhere. If the copyright edition is out of print the minister may, after a complaint made to the proprietor, and his neglecting to provide a remedy, grant licenses to others to publish, and may fix the royalty.

Foreign magazines and newspapers, containing British copyright works, may be imported, if the publication is with the author's consent, or under the copyright law of the country from which they come. Volumes of collections containing in part literary matter or music copyrighted in Canada, cannot be imported except from the United Kingdom.

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Fellow Royal Society, Canada.

Coquelin, Benoit Constant, bĕ-nwä kôn-stän kōk-läñ, French actor: b. Boulogne 23 Jan. 1841. He early showed such talent that he was admitted to the Paris Conservatoire in 1859, the following year took the second prize for comedy, and made his début on the stage of the Theâtre Français, 7 Dec. 1860, as Gros-René in the 'Amourous Veration.' Later he appeared with great success in 'Le Marriage de Figaro,' 'Le maladie imaginaire,' 'Le misanthrope,' 'Le barbier de Séville,' and other pieces in the classical repertoire. His versatility was considered remarkable, as he was no less effective in modern plays, and he speedily became a popular favorite. He was elected a sociétaire in the Theâtre Français in 1864, but in 1886 he retired and made an extensive tour abroad. He made his first visit to America in 1888. About the end of 1889 he rejoined the Theâtre Français company as a salaried member and remained with that organization until 1892. In 1893–4 he again appeared in the United States. Upon his return to Paris he formed an engagement with the Renaissance Theatre, which led to a lawsuit with the Comédie Française in which Coquelin was condemned to pay damages. In 1900–01 he visited America again, in company with Sarah Bernhardt (q. v.), to whose Duke de Reichstadt he played Flambeau in Rostand's 'L'Aiglon.' Among the many characters created by M. Coquelin in later years are those of Labussière in 'Thermidor,' Cyrano de Bergerac in Rostand's play of that name, and Napoleon in 'More than Queen.' Together with his high rank as a comedian M. Coquelin has become celebrated as an author and lecturer, among his publications being 'L'Art et le comédien' (1880), which has been translated into German and into English (as 'The Actor and his Art'); 'Les comédiens, par un comédien' (1882), and 'L'Arnolphe de Molière' (1882).

Coquelin, Ernest Alexandre Honoré, ėr-nā ä-lĕks-ändr ō-nō-rā, French actor; brother of Benoit Coquelin: b. Boulogne 16 May 1848. He was educated at the high school of his native city and was for a time in the employ of the Northern Railway, but following in the footsteps of his brother went to Paris in 1864 and entered the Conservatoire, to make a career upon the stage. He was graduated three years later with the first prize in comedy and made his début at the Odéon. In 1868 he became associated with his brother at the Theâtre Français, and continued there until 1875, playing in all the well-known classical comedies. He took an engagement at the Variétiés in 1875, but returned to the Theâtre Français in the following year, shortly after becoming a member of the company. M. Coquelin, Cadet, as he is called, to distinguish him from his greater brother, is the author of numerous monologues, to the success of which he owes most of his reputation, and his rendering of them has gained him great popularity in Paris.

Coquelin, Jean, zhŏñ, French actor: b. 1 Dec. 1865. He is a son of B. C. Coquelin (q.v.), and adopting his father's roles appeared at the Comédie Francaise for the first time, 20 Nov. 1890.

Coquerel, Athanase Josué, ä-ta-näz zhō-sü kō-kĕ-rĕl, French Protestant clergyman: b. Amsterdam 16 June 1820; d. Fismes, Marne, France, 24 July 1875. He was a son of A. L. C. Coquerel, and was the author of 'Jean Calas et sa famille' (1858); 'Libres études' (1867), etc. He was widely known as an eloquent preacher, and was long a leader of the liberal Protestant party in France.

Coquerel, Charles Augustin, shärl ô-güs-tăñ, French theologian: b. Paris 17 April 1797; d. there 1 Feb. 1851. He was a brother of A. L. C. Coquerel, and among his writings is 'L'Histoire des eglises du desert' (1841).

Coquilla Nut (Sp. *coquillo,* "little cocoanut"), the seed of the piassava or piacaba palm, *Attalea funifera,* one of the cocoanut group, a native of Brazil. The nuts are three or four inches long, oval, of a rich brown color and very hard, and are used in turnery for making umbrella handles, etc.

Coquimbo, kō-kēm'bō, Chile, a province situated in the northern part of the republic, between the provinces of Atacama and Aconcagua. Area 12,896 square miles. It is divided into the departments of Serena, Elqui, Coquimbo, Illapel,

Ovalle, and Combarbalá. The principal towns are: La Serena, the capital (pop. 16,500); Coquimbo, the principal seaport of the province, which is one half hour by rail from the capital, and has 10,000 inhabitants; Ovalle (5,500); Elqui (2,500); Illapel and Combarbalá. Gold, silver, copper, iron, quicksilver, lapislazuli, and lime are found. There are four large copper-smelting establishments, and several others for silver and gold ore. Natural pasturage is abundant. Agricultural products in excess of the needs of the province are exported in considerable quantities. Vineyards are located near the mountain range, and wines and brandies are produced. Two lines of railway belonging to the government and one belonging to a private company are in operation; the total length of the government lines being about 200 miles. There are telegraph and telephone services throughout the province, and at La Serena and Coquimbo are offices of the submarine cable. Pop. 175,000.

Coquimbo, Chile, a seaport. See COQUIMBO, a province.

Coquimbo. See BURROWING OWL.

Coquina, kō-kē'na, a porous rock found in Florida, where it is used for building purposes. It is composed of the broken shells of sea-animals, and coral cemented together.

Cor Anglais, kor än-glā (Fr. "English horn"), a wind instrument of the reed kind, similar to the oboe, and possessing a compass of like extent but of lower pitch. Its compass is from E in the bass to B flat above the treble staff. In Bach's works it appears as the Oboe di Caccia. Its effective wailing tone has caused it to be used by modern operatic composers.

Coraciiformes. See PICARIÆ.

Coracle, kŏr'a-kl, or **Currach** (Ir. *curach;* W. *corwe,* a kind of ancient boat, constructed with a frame or body of wicker-work, and still in use among Welsh fishermen and on the Irish lakes. It is covered by skins, oil-cloth, etc., which are removed when out of use. It is of an oval form, and generally contains but one man, who, on reaching the shore, shoulders his coracle, and deposits it in a place of safety, or carries it perhaps where he may again make use of it. Cæsar (De Bello Civili, i. 54) describes coracles which he made after the British model for use in Spain. The coracle or currach in mentioned in the lives of St. Patrick, St. Columba, and in accounts of travels made by Scots and Picts.

Coracoid, kŏr'a-koid (Gr. "crow-shaped," that is like a crow's bill), an important paired-bone in the breast-girdle, forming along with the scapula, the articulation for the forelimb, and always lying ventrally. In the lower fishes the entire girdle is cartilaginous. In the bony fishes distinct coracoids first appear. They are well seen in *Amphibia* and in all reptiles except snakes, and are very large and strong in birds; but they become mere processes of the scapula in mammals. They very often exhibit a special anterior portion known as the precoracoid.

Coral and Coral Islands, the solid support or skeleton of the coral polyps (see POLYPS). It was formerly supposed that the coral was a calcified portion of the soft parts of the animal, but this has been disproved. Recently Bourne has proved by the examination of both alcyonarian and madreporarian corals that the skeleton is formed as a secretion by certain cells and that there is no deposition of crystalline carbonate of lime in the actual cells. The calcareous septa or partitions are deposited by the soft septa of the animal in the radial chambers. The coral particles begin to be deposited in the embryo polyp before it becomes fixed to the bottom. In the very young polyp of the Mediterranean Astroides, as soon as it becomes stationary 12 calcareous partitions are deposited, and these enlarge and finally become jointed to the external walls (theca) of the coral, forming a groundwork or pedestal, on which the young polyp rests, as if on a limestone foundation. If isolated needles or rods of lime are distributed beneath the outer layers of the polyp-stock, the latter becomes horny or leathery and more or less flexible, as in the alcyonarian polyps. The entire skeletal mass is called the corallium or coral-stock. In the common red coral (*Corallium rubrum*) of the Mediterranean, the solid unjointed coral-stock has a thin cortical layer of spicules in which the polyps are retractile.

Coral-like masses, encrusting reefs, are also formed by the animals of the hydroid millepore, which may be distinguished by the multitude of minute cells or openings, much smaller than those of any genuine coral polyp. (See MILLEPORE.)

The simpler, most primitive corals, are cup-shaped, forming a single calicle or corallite, containing but one polyp, as in the early Palæozoic cup-corals, and the existing species of Flabellum, *Caryophyllia,* and *Deltocyathus,* which live buried in the mud in deep cold water in all seas, from Greenland to the tropics.

Microscopic Structure of Coral.— There are two kinds. In the aporose or poreless corals such as Flabellum, Astræa, and the like, the coral-stock is throughout its mass solid and stony. In the perforate kinds, such as Madrepora, all parts of the corallium including the connecting cœnenchym, or common calcareous stock or stem, has a structure like a meshwork, consisting of delicate rods of carbonate of lime so united as to leave interstices, which in the living coral are traversed by a network of interlacing tubes, representing the cœnosarc.

Rate of Growth of Corals.— Little is known regarding the rapidity of growth in corals. A specimen of *Mæandrina labyrinthica,* measuring a foot in diameter and four inches thick in the most convex part, was taken from a block of concrete at Fort Jefferson, Tortugas, which had been in the water only 20 years. Hunt calculated that the average growth of a Mæandrina observed by him at Key West was half an inch a year. Verrill states that a Madrepora found growing on the wreck of the ship Severn grew to a height of 16 feet in 64 years, or at the rate of three inches a year. See POLYPS; RED CORAL.

Coral Islands.— The reef-building corals are the *Madrepora* and *Mæandrina,* the latter dome-shaped and massive. They are confined to waters in which through the coldest winter months the temperature does not fall below 68° F., though usually the water is warmer than this, the mean annual temperature of the north Pacific being about 73.5° F., and of the south Pacific 70° F. Coral reefs are abundant in the West Indies and occur on the coast of Brazil

as far south as Cape Frio, but still more so on the central Pacific. None occur on the western coasts of Europe and Africa and the two Americas. In depth reef-building species do not occur below 15 to 20 fathoms. Coral reefs are divided into fringing, barrier, and circular reefs, or atolls; the latter are rarely regular in shape, but vary greatly in outline. Contrary to the views of Darwin and Dana, it has been found by A. Agassiz that modern coral reefs form as a rule but a thin crust, those of Florida not more than from 50 to 75 feet in thickness; yet Tertiary reefs and those geologically older may be much thicker. According to Darwin and Dana atolls were supposed to have been formed on submarine banks over a subsiding sea-bottom, but owing to the observation of Semper, Agassiz, and others, it is now evident that they may be deposited under any conditions, whether the sea-bottom be stationary, rising, or subsiding. We will, however, have to hold on to the Darwin subsidence theory to account for coral reefs over about 100 feet in thickness. From his prolonged explorations in the West Indies and the Pacific Ocean, A. Agassiz concludes that the barrier reefs of Fiji, the Hawaiian Islands, and the West Indies usually flank volcanic islands and are underlaid by volcanic rocks. Those of New Caledonia, Australia, Florida, Honduras, and the Bahamas are underlaid by outliers of the adjoining land-masses, which crop out as islands and islets in the outer edge of the barrier reefs. Some of the barrier reefs of the Society, Fiji, and of the Carolines, show that the wide and deep lagoons, separating them from the main islands, have been formed by erosion, from a broad, fringing reef-flat.

The reef-flats and outer reefs flanking elevated islands are partly barrier and partly fringing reefs. We may, says Agassiz, trace the passage of elevated plateaus like Guam, Tonga, and some of the Fiji islands, which are partly volcanic and partly limestone, to atolls where only a small islet or a larger island of either limestone or volcanic rock is left to indicate its origin. Atolls also may be formed upon the denuded rim of a volcanic crater, as in certain of the Fijis (Totoya and Trombia), and as in some of the volcanoes east of Tonga.

As to the origin of atolls by subsidence, we really have few data to support the Darwinian theory. Agassiz claims that throughout the Pacific, Indian Ocean, and West Indies "the most positive evidence exists of a moderate, recent elevation of the coral reefs." This is shown by the ridges, pinnacles, and undermined masses of modern or Tertiary limestones left to attest it. The existence of honeycombed pinnacles of limestone within the lagoons of atolls, as shoals, islands, or islets, shows the extent of the solvent action of the sea upon land areas having formerly a greater extension than at the present day. The Maldivian plateau with its thousands of small atolls, rings, or lagoon reefs, rising from a depth varying from 20 to 30 fathoms is overwhelming testimony, says Agassiz, that atolls may rise from a plateau of suitable depth, wherever and however it may have been formed, and whatever may be its geological structure. Indeed he says that many of the atolls in the Pacific are merely shallow sinks, formed by high sandbanks, thrown up around a central area.

The great coral-reef regions are within the limits of the trades and monsoons and areas of elevation, with the exception of the Ellice and Marshall islands and some equatorial islands. In the regions examined by Agassiz the modern reef-rock is of very moderate thickness, being within the limit of depth at which reef-builders begin to grow and within which the land rims of atolls or of barrier reefs are affected by mechanical causes.

Why no coral reefs exist on the western coasts of the two Americas, and their absence at other points, is explained by Agassiz as due to the steepness of their shores and to the absence or to the crumbling nature of their submarine foundations or platforms. Coral reefs also cannot grow off the steep cliff-surfaces of elevated, coraliferous limestone islands.

The proof of the supposed great thickness of coral reefs, to account for which Darwin invoked subsidence, will be ascertained by boring. Thus far the evidence tends to show that the coral beds are not continuous. At Honolulu they contained several beds of volcanic ash, etc. In the Fiji Islands, shell limestones were interstratified with coral rock. The great areas of subsidences postulated by Darwin and by Dana, have been shown to be areas of elevation. The deepest depressions or "deeps" in the Pacific, judging by the Challenger maps, are in regions where there are no coral reefs or atolls. In the present stage of our knowledge, the subsidence theory to account for atolls is only needed where the coral reef-rock is over about 100 feet in thickness.

The literature of the subject is extensive. The classic works are J. D. Dana's magnificent folio in the series of reports of the Wilkes Exploring Expedition, and his more popular volume, 'Corals and Coral Islands' (revised edition, New York 1890); and Darwin's 'Structure and Distribution of Coral Islands' (London, 3d edition, with notes by Bonney, New York 1899). Murray's papers of corals and reef-structures in the 'Proceedings' of the Royal Society of Edinburgh, Vols. X. (1880) and XVII. (1891) are highly important. The Agassizs, father and son, directed much attention to this subject, and Alexander Agassiz in particular has added greatly to information in his 'Visit to the Great Barrier Reef of Australia' (Cambridge, Mass., 1898). The illustrated works of Saville Kent on the Australian reefs should also be remembered, as well as Heilprin's on those of Bermuda. For structure and classification consult Bourne's account of the Anthozoa in Lankester's 'Treatise on Zoology' (London 1900); and for fossil corals consult Zittell-Eastman, 'Text-book of Palæontology' (New York 1900), and the great 'Monographie des Polypiers fossiles des terrains Paléozoiques' of Milne-Edwards and Haime, issued in Paris in 1851.

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Coral Fishes, a name given to several fishes of different genera belonging to the *Chætodontidæ*. They are found in all tropical seas, especially about coral reefs, and are all brilliantly colored. The most important is the *Holacanthus imperator*, the "emperor of Japan," which measures about 15 inches in length and is the most esteemed of all the Indo-Pacific fishes.

Coral Islands. See CORAL.

Coral Sea, part of the Pacific Ocean northeast of Australia and between it and the New Hebrides. The numerous coral islands fringing the northeast of Australia and other islands washed by this sea give it its name. In 1874 the Challenger, when making soundings in these waters, found the Coral Sea, in some places, to be 14,700 feet deep.

Coral Snake, a small venomous colubroid snake of the same family (*Elapidæ*) as the cobra. The typical genus (*Elaps*) is a strictly American one. The usual color is rich red with black and yellow transverse bands, making these among the most brilliantly colored of snakes. Owing to the position of the poison-fangs and the small size of the mouth they are, although venomous, usually unable to injure man. One species, the harlequin or bead snake (*E. fulvius*), occurs in the southern United States as far north at least as Virginia. It is a beautiful snake, about two feet or more long, and practically is little to be feared. Most of the remaining species, including the typical *E. corallinus*, are confined to tropical South America and the West Indies.

Coral Tree, a leguminous plant of the genus *Erythrina*, which has about 25 species. They are shrubs or trees with trifoliate leaves and spikes of scarlet flowers. The long pods enclose bright red seeds. They are mostly tropical, natives of America, Africa, and India. One species (*E. herbacea*) is common throughout the southeastern United States, and two more are found in Florida. The plants are much cultivated in greenhouses. An Indian species (*E. indica*) is said to have been stolen by Krishna, the Hindu deity, from the gardens of paradise. This is a spiny species, and is planted for hedges. This species, and (*E. caffra*) (the kaffir-boom of Africa) furnishes soft light wood valuable for industrial purposes.

Coralline, kŏr'ą-līn, a term popularly applied to sea-weeds with rigid calcareous fronds and also to certain of the zoophytes. The coralline algæ are purple and gradually grow paler and whiter as the season advances. Their habitat is commonly pebbly rocks, to which they cling fast. *Corallina officinalis,* has been employed as a vermifuge.

Coralline, or **Pæonine,** an orange-red color prepared by the action of ammonia, at about 300° F., upon rosolic acid, or upon the washed residue of the action of a mixture of sulphuric, oxalic, and carbolic acids. It differs from magenta in both its tint and its permanency, not being affected by light or by alkalies; but, on the other hand, fabrics dyed with it are readily turned yellow by acids. It is insoluble in water, but dissolves in alcohol with a very rich color. This solution, mixed with soda and a large quantity of water, and tartaric acid added, is employed for dyeing silk. It is also printed upon cotton by means of albumen. The use of this dye has been much restricted on account of its alleged poisonous properties. Certain toxicologists had observed that stockings colored with coralline produced a vesicular eruption which gradually became purulent, and which was attended with febrile and other symptoms. When the dye was dissolved out and administered to small animals it proved fatal to them. Other chemists, however, failed to get this action with coralline, so that it is likely that in some cases deleterious substances are mixed with coralline, or that coralline may differ if prepared in different ways, or that different substances pass under the name.

Co'ram, Thomas, English philanthropist: b. Lyme Regis, Dorsetshire, about 1668; d. London 29 March 1751. He was bred a seaman, and rose to be a merchant captain. In 1694 he settled in Taunton, Mass., and engaged in benevolent work of various kinds. A few years after he returned to sea, and settled in London, after suffering shipwreck off Cuxhaven in 1719. In London he interested himself in the settlement of Georgia, and in planting English artisans in Nova Scotia; but soon began his long agitation for the foundation of a foundling hospital in London, which was at length opened in 1740. Coram's portrait was painted by Hogarth, a warm patron of his scheme. More thoughtful for others than for himself, Coram fell into poverty, from which he was relieved in 1745 by an annuity contributed by his friends.

Coranach, kŏr'ą-năk, or **Coronach,** a dirge or lamentation for the dead formerly customary among the Celts of Scotland and Ireland. The coranach is commonly known in Ireland as the caóine (Br. keen) a song of mourning for the dead. This funeral song, or dirge, was usually sung by professionals who had power to improvise and who told of the pedigree, worth, deeds, and death of the deceased. In Scotland the weird, mournful notes of the bagpipes added sadness. The custom of having the caóine or coranach at wakes and funerals has fallen into disuse in both Ireland and Scotland. Frequent mention of the custom may be found in the writings of Sir Walter Scott, Lover, Davis, and other writers. Consult: Crofton Crocker, 'Researches in the South of Ireland.'

Corandagos (kō-rān-dā'gōs) **Islands,** Philippines, a group of islands lying off the northeastern coast of Palawan. The group consists of two islands, Corandagas and Dalangamen, and three islets. The inhabitants, of Malayan race, are mostly engaged in fishing and in the search for edible birds' nests. Pop. about 300.

Corato, kō-rā'tō, Italy, a city in Apulia, about 50 miles southeast of Foggia. The modern city is of little importance, the chief industries being cattle raising and the manufacture of leather and tartar. Near the city are the ruins of the famous Castel del Monte, built by Frederick II., which is one of the most beautiful of the architectural remains of the Middle Ages in Italy. The general plan is a vast octagon, with eight hexagonal towers. The windows are pointed and round arched, and the vaulted halls are supported by triple shafts of marble. It is the chief attraction of the city. Pop. 42,000.

Corban, kôr'băn, a Hebrew word occurring in the Greek of the New Testament (Mark vii. 11), where it is translated a "gift." It designates an oblation to God, and has reference to a Talmudic formula, by which, under pretence of dedicating anything, as his property, to God, a person might prohibit the use of it from the party to whom it was thus made corban. It is used also by the Jews to signify a thing given to the Deity.

Corbaux, Marie Françoise Catherine Doetter, commonly known as FANNY CORBAUX, Eng-

lish artist and biblical scholar: b. 1812; d. Brighton, England, 1 Feb. 1883. When she was about 15 her father suddenly became poor, and without having received any but the most superficial instructions in drawing, she determined to support herself and him by painting. In the same year she received two silver medals for water-color drawings, and within the next three years another silver medal and the gold medal of the Society of Arts. She had been all the time her own instructor. After that she painted small pictures in oil and water colors, but confined herself chiefly to portraits. She designed illustrations for Moore's 'Pearls of the East,' etc., and wrote: 'Letters on the Physical Geography of the Exodus,' the introduction to Heath's 'Exodus Papyri,' and various articles for the 'Journal of Sacred Literature.'

Corbeil, kôr-bā-yė, France, a town in the department of Seine-et-Oise, at the junction of the Essenne with the Seine, 25 miles southeast of Paris. It has various manufactures, chiefly of paper, clocks, cotton and linen; and there are large grain-mills and a copper-foundry in the town. Pop. about 10,000.

Corbel, kôr'bĕl, in architecture, a piece of stone, wood, or iron projecting from the vertical face of a wall, to support some superincumbent object. Corbels are of a great variety of forms, and are ornamented in many ways. They are of frequent occurrence in pointed architecture, forming the supports of the beams of floors and of roofs, the machicolations of a fortress, the labels of doors and windows, etc. A cornice supported by a series of corbels is styled a corbel table.

Corbet, Richard, English bishop and poet: b. Elwell, Surrey, 1582; d. Norwich, England, 28 July 1635. He became bishop of Oxford in 1624 and of Norwich 1632. He was a warm friend of Ben Jonson. He wrote: 'Journey into France' (1613); 'Poetica Stromata' (1648). His best-known verses are his 'Farewell to the Fairies.'

Corbett, Henry Winslow, American banker and politician; b. Westborough, Mass., 18 Feb. 1827; d. Portland, Ore., 1 April 1903. He entered mercantile life in Cambridge, N. Y., and was similarly engaged in New York 1840–50. Removing to Oregon in 1851 he was a merchant in Portland till 1867 and subsequently a banker of prominence. He was active in founding the Republican party in Oregon and was a delegate to the convention which in 1860 nominated Lincoln for the presidency. He was a United States senator 1867–73 and a candidate for the same position in 1897. He contributed frequently to benevolent objects and bequeathed nearly $200,000 to educational and charitable institutions in Portland.

Corbett, Julian Stafford, English lawyer and author: b. Surrey 12 Nov. 1854. He was educated at Marlborough and Cambridge and was called to the bar in the Middle Temple in 1877. He practised his profession until 1882 and has since given his attention to literary pursuits. Beside the romances 'The Fall of Asgard'; 'For God and Gold'; 'Kophetua XIII.'; he has published 'A Business in Great Waters'; lives of Monk and Drake in 'English Men of Action' series: 'Drake and the Tudor Navy'; 'The Successors of Drake.'

Corbie (kôr'bĭ) **Steps,** or **Crow Steps,** steps into which the sides of gables from the eaves to the apex are broken. They form a common feature in Scottish architecture, into which they were probably introduced from France. They are also to be seen in many old houses in Holland, Flanders, etc.

Corbière, Edouard, ā-doo-ār' kôr-bē-ā, French poet and novelist: b. Brest 1793; d. Morlaix 20 Oct. 1875. He published 'The Banian' (1835); 'The Slave'; and other sea tales.

Cor'bin, Caroline Fairfield, American writer: b. Pomfret, Conn., 9 Nov. 1835; married C. K. Corbin, of Chicago, 1861. She has published: 'Our Bible Class and the Good that Came of It' (1860); 'Rebecca, or Woman's Secret' (1866); 'His Marriage Vow' (1874); 'Belle and the Boys' (1879); 'Letters from a Chimney Corner' (1886); 'A Woman's Philosophy of Love' (1892).

Corbin, Henry Clark, American soldier: b. Clermont County, Ohio, 15 Sept. 1842. He was educated in the common school, studied law, and entered the Union army as second lieutenant in the 83d Ohio Volunteer Infantry, 28 July 1862; but before the organization was completed he was assigned to the 79th Ohio Volunteer Infantry (serving therein as second and first lieutenant, respectively, until 14 Nov. 1863, when he was appointed major of the 14th U. S. Colored Infantry. In the following year (4 March 1864) he was promoted to lieutenant-colonel, and 23 Sept. 1865, made colonel of the 14th U. S. Colored Infantry. He was honorably discharged from the volunteer service 26 March 1866, with the brevet of brigadier-general, which honorary rank was bestowed upon him in recognition of meritorious services. In 1866, upon the muster-out of the volunteer army, and upon the recommendation of his military commanders, he was commissioned (11 May 1866) second lieutenant in the regular army. He was appointed to a captaincy of the line 31 Dec. 1866, and from that year to 1876 he was continually in command of his company on the Western frontier in campaigns against hostile Indians.

He was appointed to the adjutant-general's department 16 June 1880, and served therein nine years in the grade of major, seven years in the grade of lieutenant-colonel, and two years in the grade of colonel; and was, when appointed brigadier-general and adjutant-general of the army (25 Feb. 1898), the senior in the corps; having served on the staffs of Gens. Hunt, Schofield, Terry, Crook, Miles (with whom he participated in the Sioux Indian campaign), McCook, Ruger, Merritt, and in 1891 conducted a successful campaign against the Moqui Indians in Arizona Territory.

During the Spanish-American war Gen. Corbin was brought into close relations with President McKinley and was by him consulted upon all questions of policy relating to military affairs; and in addition to his duties as adjutant-general of the army he superintended the organization of 250,000 soldiers, and within six months the muster-out of 100,000. Subsequently 35,000 additional volunteer forces were mustered, equipped, and made effective for the Philippine service, and they in turn disbanded — the regular army having been increased during this period to three-fold its former strength. In recognition

HENRY CLARK CORBIN.

MAJOR-GENERAL U. S. A.

of his services and of the part which he took in the war, the Congress of the United States conferred upon him the rank of major-general in the army of the United States.

Corbin, John, American writer, son of Caroline F. Corbin (q.v.): b. Chicago, Ill., 2 May 1870. He was educated at Harvard, and Balliol College, Oxford, and has since filled various editorial positions in New York. Since 1902 he has been dramatic critic for the New York *Times*. He has published: 'The Elizabethan Hamlet' (1895); 'Schoolboy Life in England' (1895); 'An American at Oxford' (1902); 'A New Portrait of Shakespeare' (1902).

Corbould, kôr'bōld, **Edward Henry,** English historical artist: b. London 5 Dec. 1815. He is a member of the Institute of Painters in Water Colors and was teacher of drawing and painting to the children of Queen Victoria, 1851–72. Among important paintings by him are: 'Marriage of Nigel Bruce and Agnes of Buchan' (1870); 'Queen Victoria' (1871); 'Canterbury Pilgrims' (1874); 'Iris' (1878).

Corchorus, kôr'kō-rŭs, a genus of the linden family (*Tiliaceæ*). There are about 35 species, mostly herbs or small shrubs, natives of Europe and Asia, and diffused in warm and tropical regions. The leaves of *C. olitorious* are used in Egypt and adjacent countries as a pot herb. From the fact that the Jews thus employ them they are sometimes called Jews' mallow. More important, however, is *C. capsularis,* which has long been cultivated for its fibre in China for Chinese hemp, also in India and other eastern countries for making fish lines and nets, gunny bags, rice bags, and "tat," a coarse kind of linen. This and the former species have much more recently been used to furnish jute (q.v.). The negroes in the West Indies use *C. siliquosus* to make coarse brooms, and an infusion of its leaves as a substitute for tea. The Japanese shrub, erroneously called *C. japonicus* by gardeners, is a common garden plant on account of its pretty double yellow flowers.

Cor'coran, Michael, American soldier: b. Carrowkeel, Sligo, Ireland, 21 Sept. 1827; d. 22 Dec. 1863. He received a good education, and came to the United States in 1849. He entered the 69th Regiment, New York, as a private and rose through its grades to the colonelcy. He was court-martialed for refusing to parade his troops in honor of the Prince of Wales in 1860; but before the case was decided the Civil War broke out. He commanded his regiment at Bull Run, was wounded, captured, exchanged in 1862, and organized the Corcoran Legion in 1863, with which he held the enemy in check at Norfolk. He was commissioned a brigadier-general and transferred to the Army of the Potomac. He was killed by the fall of his horse near Fairfax Court House.

Corcoran, William Wilson, American banker and philanthropist: b. Georgetown, D. C., 27 Dec. 1798; d. Washington, D. C., 24 Feb. 1888. He was educated at Georgetown College and established himself in the banking business in Washington in 1837. He became very wealthy and was widely known for his charities and gifts to the public. In 1847 he gave the Oak Grove Cemetery property to Georgetown, founded the Louise Home for Indigent Women in Washington in 1870, and gave to the city of Washington the famous art collection known as the Corcoran Art Gallery. This he endowed munificently and it is now housed in a marble building designed by Ernest Flagg and erected 1894–7.

Corcoran Art Gallery. See CORCORAN, WILLIAM WILSON.

Corcyra, kôr-sī'ra. See CORFU.

Cord-grass, or **Marsh-grass** (*Spartina*), a genus of perennial grasses containing several species, widely dispersed in America, Europe, and Africa. They are often maritime; with creeping rootstocks, simple stems, and long tough leaves. The spikelets carry one flower, which has unequal glumes. Fresh-water cord-grass (*S. cynosuroides*) is found along river banks, lake shores, and brackish coast marshes over the northern part of the United States. It is grown for binding sand and river banks, and when cut early makes fair but coarse hay. It has been used successfully for making twine and paper. It is also used for thatch, and is in bloom from July to October. Fox-grass (*S. patens*) is rather slender and somewhat wiry, and is abundant on salt marshes; with black grass (*Juncus gerardi*) it furnishes most of the salt hay these meadows produce. It blooms from June to September. It is used for packing glassware, etc. Creek-sedge, thatch, or salt marsh-grass (*S. stricta*) grows along ditches and creeks of the Atlantic and Pacific coasts. It flowers from July to October, and is used for making ropes. When young it is eaten by stock.

Cordage. The word "cordage" is used in a comprehensive sense to include all sizes and varieties of the article from binder twine to a cable 15 inches in circumference, though strictly speaking the term is hardly applicable to a rope that is less than half an inch in diameter.

The materials employed for rope making are various, embracing hemp, flax, manila, sisal, jute, and other vegetable fibres. Sisal from Yucatan and East Indian jute are largely used for the manufacture of cheaper grades of rope and for binder twine. Russian and American hemp are preferred for standing rigging, owing to their ability to absorb a great amount of tar. Manila hemp is more extensively used in the manufacture of cordage than any other material, as its great pliancy and strength adapt it to a multitude of uses. Manila hemp is obtained from a species of wild plantain belonging to the banana family and is a native of the Philippine Islands. Its stem has a height of from 15 to 20 feet, is of a dark-green color and very smooth on the surface. The fibre is round, silky-looking, white, lustrous, easily separated, stiff, very tenacious, and very light. Although not in itself very large, the fibre is composed of very fine and much elongated bast-cells. The length of the cells is about a quarter of an inch, and they are not, as commonly supposed, held together by an intercellular tissue or mucilaginous substance. The characteristic roughness possessed by manila fibre is due entirely to mechanical causes, such as, for instance, the laceration of a cell in the separation from the leaf-stalk, or the subsequent opening out of the ends of the cells. While the fibres are weak transversely, they have great strength in the direction of their length. The

tensile strength of manila fibres will average over 30,000 pounds per square inch of section. The plantain is cut near the roots when from two to four years old, and the leaves cut off just below their expansion. The outer leaf is then stripped off, and the fibrous coats are left for a day or two in the shade to dry, and then divided lengthwise into strips three inches wide. They are then scraped by an instrument made of bamboo until only the fibres remain. Bundles of fibres are shaken into separate threads, after which they are washed, dried, and separated according to quality and shipped in bales. From 150 to 200 trees are required to produce 140 pounds of fibre.

Sisal hemp is the product of the agave, a large genus of fleshy-leaved plants found chiefly in Mexico and Yucatan. The fibre is yellowish-white, straight, smooth, and clean, and is about 25 per cent weaker than manila fibre. Much of the sisal hemp is prepared for export to the United States by machinery. Its consumption is fully as large as that of manila, and it is chiefly used for binder twines.

The preliminary treatment of the fibre after it arrives at the cordage mill is approximately the same whether it be manila or sisal, so that a description of the process on one fibre will practically answer for the other. In one of the largest plants in the United States, taken as an example, there are a number of buildings devoted to the manufacture of various classes of cordage, and the ropewalk is two blocks in length. The binder twine-mill is separate and is not run at all times of the year, as the work ceases in the spring, when the orders for twine have been filled; the rest of the plant runs throughout the year. The bales of manila hemp, averaging about 270 pounds each, are opened in the basement of the manila twine-mill, and after the material has been lightly shaken apart it is placed in layers which are sprinkled lightly with oil to soften and lubricate the fibres previous to their passage through the machinery. The first mechanical operation consists in passing the hemp over roughing cylinders bristling with sharp steel prongs or teeth, which straighten out the fibres and remove the tow and fine broken particles, dirt, or other foreign substances. It then passes to the breakers, which are large frames about 25 feet long, consisting of two endless chains studded with steel pins. The first chain runs slowly and feeds the fibres to the second, which runs much faster, the effect being to comb or straighten out the fibres and draw them into a "sliver" or ribbon. The hemp is then hoisted on elevators to the top of the building. Following this operation comes the passage of the hemp through the spreaders and drawing-frames. These machines are similar to the breakers, but are smaller and furnished with steel pins and teeth of gradually increasing fineness, which still further comb and straighten out the fibres, a number of slivers being put together behind each machine and drawn down to one sliver again at the end of each machine. This drawing is repeated a number of times with machines of various degrees of fineness, in order to make the sliver even, without which it would be impossible to spin fine, even yarn. The process is completed in a very fine drawing-frame called a "finisher," and from this the material finally emerges in complete readiness for spinning, having been drawn into slivers, or small, soft ribbons, in readiness for the spinning-frames.

The small sliver is fed from one of the cans of the spinning jenny over the endless belt provided with needles, as in the breakers, spreaders, and finishers. These needles carrying the fibre move toward a conductor or "nipper," carrying the sliver with it. The sliver is by this time exceedingly small, and is capable of passing through a small hole in the face-plate of the nipper, where it is compacted in passing through the orifice. A jaw is controlled by a spring which can be regulated so as to adjust the size of the feed. As it leaves this part of the machine the twisting begins. The speed is 1,500 revolutions per minute. The yarn is twisted in a direction called right-handed, and feeds through a pulley by passing through the head-block and moving face-plate, and is finally warped around grooved pulleys in order to give the necessary strain to pull the compacted fibres through the nipper. It is then wound on a bobbin to the amount of about 1,000 yards. A special mechanism traverses the bobbin in order that the yarn may be evenly wound. The attendants see that the sliver is regularly supplied and that any accidental breakages in the thread are repaired. The yarn is placed in small cars and sent to the various rope-making departments. If a rope is to be tarred, the yarns are run through copper tanks filled with heated tar. The yarns enter through holes in an iron plate and are drawn through the tank by machinery. As the yarns emerge, the superfluous tar is removed by means of pressing-rollers, and the yarn is wound on bobbins. If the yarn is to be used for binder twine, the sisal hemp is spun finer than manila, and after being spun the yarn, which is now on bobbins, is carried to the twine balling and packing room, where balling machines wind the yarn into balls of proper size.

Rope making is accomplished in various ways and is all done by machinery. The yarn is twisted into strands by means of machines called "formers," and the strands are twisted into rope by means of machines called "layers." If the rope is to be of moderate size, not exceeding an inch in diameter, the formers and layers are combined in one machine. The large machines are very impressive on account of their great size and the rapidity with which the finished product is turned out. In the Farmer machine there are many bobbins, which are arranged in three frames, each of which revolves independently around its own axis, and they are all carried around while in motion by a large frame which supports all three smaller frames. The threads from the various bobbins are passed through apertures in an iron plate, and the motion of each small frame serves to twist the yarn drawn from the bobbins into a strand. The three strands pass upward through a "top" at the upper portion of the machine. As the strands come together they are twisted to form a rope by the movement of the entire machine carrying the three sets of bobbins, which are each rotating separately. The result is a finished rope. The new rope is rotated around several pulleys in order that the proper pull may be obtained to draw the rope tightly through the "top," and it is then wound on one of the reels. This rope can, of course, be used for any purpose and can be made of large size. For well-drilling and other purposes where rope of great

strength but little flexibility is required, cables are used. Cables vary from 1,400 feet in length up, and usually measure from 1⅞ to 2½ inches in diameter. They are composed of three manila ropes instead of strands, and the ropes are twisted together with a very hard "lay," so that they will not untwist when used for drilling, and so that they will resist wear in the continuous rubbing against the side of the casing and the walls of the well. Owing to their length and construction, cables are always made on machines and not in a ropewalk. On one of the machines in the factory under consideration it is possible to make cables 15 inches in circumference. The reel containing the rope that has just been made is now placed on a cable-making machine. The principle of cable making is the same as rope making, only that actual ropes are used instead of strands. Each reel is turned around on a horizontal plane by means of gears, while it is paying out its rope. The entire machine carrying the three reels is turned simultaneously on a horizontal plane, the ropes are rove around various pulleys, and finally, as they pass through a "top" at the upper part of the machine, they are twisted together to form the cable, and then, after being rove around grooved sheaves to obtain the necessary pull, are reeled up by a power reel. When a sufficient length of cable is obtained, it is ready for shipment. In this plant there is a large horizontal rope and drilling cable-laying machine, but the principle does not differ materially from the vertical machine.

Ropes of considerable size, towing lines, and ships' cables of the largest dimensions are made on the ropewalk, which is 1,100 feet long and passes under one cross street. The yarn is rewound on larger bobbins, and the number used depends on the size of the rope. These bobbins are put on a framework of wood located near one end of the ropewalk, and the ends of the yarn are passed through holes in an iron gauge-plate, known as the face-plate. It then passes through cast-iron tubes, and the yarn is fastened on hooks of the forming machine, which consists of a truck which travels on a track the entire length of the walk. There are as many hooks as there are strands. As the former moves away from the face-plate it draws the yarn with it, and at the same time each hook revolves by means of gears, twisting the yarn left-handed into a strand. The machine is actuated by a cable which lies along the floor of the ropewalk. The cable passes over a large wheel at the left and serves to operate the mechanism which turns the hooks, and at the same time winds up a cable attached to the end of a ropewalk, thus making its motion positive. When the forming machine has reached the upper end of the ropewalk, the strands, each 1,100 feet in length, are completed. They are now taken and laid over on the other side of the walk, and the strands are then ready to be "laid" or made into rope. Two laying-machines are required, one at each end of the walk, and are known as the "upper" and "lower" machines. They also give the rope what is known as a fore turn and an aft turn. As many of these strands as are required for the rope are stretched to full length and are attached to hooks on the laying-machine. The upper machine has several hooks, but only one is used. All the strands are fastened to this hook, and they turn left-handed in laying, and the lower machine has as many hooks as there are likely to be strands, and operates in the opposite direction. The strands are meantime placed in the grooves of a conical wooden block called a "top," through which is passed an iron bar which is fastened to an upright post of a car called a "top sled." Pieces of rope called "tails" are fastened on the bar and wound around the rope to be laid. They help regulate the lay and assist in giving the rope a finish-gloss. The top having been mitred between the strands as closely as possible to the top, the sled is gradually forced along as the twisting proceeds in a right-handed direction. The lower machine keeps all the strands from untwisting. The top sled finally arrives at the lower end of the walk, with the full length of the completed rope behind it. It is then compactly coiled by a reeling machine, covered with burlap, and shipped to its destination.

Cordage Industry. The infancy of this industry was marked by great feebleness, but perhaps not more so than the average of American manufactures. Rope making formed one of the principal branches of business from the early days of the colonies, and a ropewalk appears to have been first set up in 1642, in Boston, Mass., 12 years after the town was founded. Prior to that time nearly every kind of rigging and tackle for vessels was brought from England.

With the building of the first ship in Boston, the Trial, of 160 tons, and probably on account of its construction, John Harrison, a rope-maker, was invited to Boston from Salisbury, "on mocon of some gentlemen of this town," and he set up his ropewalk or "rope-field," 10 feet 10 inches wide, on the land adjoining his house on Purchase Street, at the foot of Summer Street. The work was done in the open field. Posts were set in the ground firmly enough to permit the suspension of cords and rope of no inconsiderable circumference.

Harrison was granted a monopoly of the business until 1663, when permission was granted to John Heyman to "set up his posts," but with "libertie onely to make fishing lines"; but even this license was found so to interfere with Harrison — who was now advanced in years and had a family of 11 persons — that it caused him to fear that he could not support them, and Heyman's permit was accordingly withdrawn. An additional argument employed to bring about this revocation was the scarcity of hemp. After Harrison's death ropewalks multiplied in number, and at the West and North Ends of the town in 60 years there were 14 ropewalks. In 1793 the industry was thriving, no doubt greatly fostered by a bounty granted by the general court.

In a great fire, 30 July 1794, seven ropewalks were destroyed; and the selectmen provided that no more should be constructed in the heart of the town, and tendered the use of the low land west of the Common, where six others were at once constructed, 20 to 24 feet wide and 900 feet in length. These were also destroyed by fire in 1806. Five were rebuilt, and were all once more burned in 1819. The elder Quincy, in the first year of his mayoralty, with his usual energy and sagacity, promptly removed all of these, with marked improvement to the neighborhood. It is with a smile that we read that "in the Federal procession of 1788 the men em-

ployed in this industry outnumbered any other class of mechanics in Boston," and that in 1794 "over 50 men were employed in this branch alone." The work in the old ropewalks, although done mostly by hand, was in some cases supplemented by horse or water power. The workmen resented the employment of any hands who had not served a regular apprenticeship at the trade, and there was bitter opposition to the introduction of machinery.

Besides the ropewalks previously mentioned, Nantucket had, in the height of her prosperity, three, none of which now exists. Newburyport had a good-sized ropewalk for those days. There was one at Castine, Me. One was on Broadway, New York, before the Revolution, and others were found in other parts of the country. Early in the century Samuel Pearson owned and operated one in Portland, Me. His two sons, Samuel and George C. Pearson, having learned the trade with their father, were afterward interested in steam plants at and near Boston. Still later they started the Suffolk Cordage Company, which grew into the Pearson Cordage Company, now one of the largest mills in the country.

Shortly after the death of his father (Samuel), Charles H. Pearson, who had been identified with him and the other son, became connected with the Boston Cordage Company, and still later with the Standard Cordage Company. Samuel Pearson had made many inventions in rope-machines and in regulators for spinning.

Mr. A. L. Tubbs, of California, bought most of the machinery in one of the old Boston mills and shipped it to California. He started the business on the Pacific coast, and at the present day controls the two or three factories now located there.

Up to about 1850 it was the custom to import spun yarns to be made into cordage. These yarns were chiefly spun by Russian serfs, and could be furnished for less money than similar ones made here; but the introduction of improved machinery gradually cut off these importations, and hardly any spun yarns were bought after 1865.

The period between 1830 and 1850 witnessed the starting of what may be termed the modern factory, in distinction from the crude and primitive mode of manufacture before existing. The difference between the two methods was this: In the old-fashioned ropewalk the twisting of fibres was done by a man, walking backward down the walk, spinning from the hemp round his waist, the twist being imparted from a wheel turned by a boy. The possible length of the rope could thus be no greater than the length of the building or ground. Longfellow describes the method in his poem, 'The Ropewalk.'

In the modern factory the twist is imparted by rapidly rotating machinery similar to that used in cotton and woolen mills, making it possible to spin a rope of several thousand feet in length on an upright apparatus occupying but a few square feet. For some purposes, however, the ropewalk rope, as it is called, is still held to be superior to that manufactured by the other process. When rope was made without use of the ropewalk it was the custom to call it "patent cordage," to distinguish it from the old style of ropewalk rope, and the name is still used by some firms.

The inventions and patents of most consequence and in most general use are those of John Good, of New York, whose spreaders and breakers did away with the use of lappers, and whose nipper and regulator on spinning-machines gave universal satisfaction, although with the perfecting of "preparation machinery" the use of a regulator has in many instances been discontinued.

The era of the largest mills commenced in 1878, after the invention of the self-binding harvester. Among the factories started during the period alluded to were: Sewall, Day & Company, of Boston (1835); Pearson Cordage Company, of Boston; J. Nickerson & Company, of Boston; Weaver, Fitler & Company, of Philadelphia (afterward and at the present day Edwin H. Fitler & Company); Plymouth Cordage Company, of Plymouth, Mass.; Hingham Cordage Company, of Hingham, Mass.; New Bedford Cordage Company, of New Bedford, Mass. (1842); Baumgardner, Woodward & Company, of Philadelphia; J. T. Donnell & Company, of Bath, Me.; William Wall & Sons, of New York; Lawrence Waterbury & Company, of New York; Tucker, Carter & Company, of New York; Elizabethport Steam Cordage Company, of New York; Thomas Jackson & Son, of Easton, Pa.; J. Rinek's Sons, of Easton, Pa.; and John Bonte's Sons, of Cincinnati.

The demand for cordage in those days being largely for export and the use of ships, it will be noticed that the manufacture was mainly confined to Atlantic seaports. In later times, with the decline of American shipping, the substitution of wire for hemp standing rigging, and especially after the great demand for binder twine, all this was changed, and factories rapidly multiplied in the West,— Peoria, Miamisburg, Akron, and Xenia taking an important part in the business.

As late as the year 1843 the total quantity of manila hemp manufactured in the United States was only 27,820 bales or 7,511,400 pounds. This amount of hemp could, in 1895, easily be brought from Manila in three sailing-ships or in two steamers — the latter capable of making the voyage in 50 or 60 days by way of the Suez Canal to New York, Boston, or Philadelphia. Moreover, one of half a dozen of the larger mills in the country could now manufacture the whole quantity of manila hemp used in the year 1843 in the space of 50 days, by running day and night.

In 1863 the business had increased to five times its size in 1843. With the Civil War came a great demand for cordage; and as hemps rapidly advanced in price, in common with all other staples, it was an era of great prosperity for the cordage industry. Orders were so numerous that it was deemed a favor to a customer to supply him; and it is within the knowledge of the writer that the profits of one eastern factory during that epoch amounted in one year to $520,000, nor was its experience at all exceptional.

It was in 1860 that the first importations of sisal hemp were made. Commencing with the manufacture of about 200 tons in that year, its use rapidly extended, and in a few years it became an important factor in the trade. In 10 years its importation amounted to 3,500 tons, in 20 years to 13,000 tons, in 30 years to 34,000 tons, and in 35 years to 50,000 tons.

With the extension of the business and the

increase of factories, both in number and importance, there was found to be a necessity for some regulation of the prices of cordage. The first agreement between the cordage manufacturers was entered into on 23 Feb. 1861, the object being to correct certain abuses which had prevailed among firms engaged in the trade. Weekly meetings were held by the manufacturers in their respective cities, and opportunity afforded for any complaints or any suggestion about the condition of trade and the regulation of prices. Various amendments were from time to time made in this agreement of 1861, but in July 1874 a careful revision was made, and the manufacturers pledged themselves, "as men of honor and integrity," to the true and faithful observance of the rules. A stronger agreement was made in April 1875; but complaints of underselling, answered with various excuses, were frequent, and, there being no pecuniary penalty, the ingenuity of the manufacturers finally hit upon what was known as the "pool system." This went into operation on 1 Jan. 1878. The business was divided among the manufacturers in proportions which seemed just, and when the business of one concern exceeded during any month the proportion which its share bore to the total business done according to the returns, it would pay in so much per pound on the excess. In case a concern fell short it would be a recipient to that extent.

It was supposed that this arrangement would act as a preventive to the cutting of prices, and it undoubtedly had that effect to some extent. The novelty of the plan was also in its favor, and on the whole it worked well enough to repay amply the labor expended in securing its adoption. The percentages ranged from 11¼ to 1 per cent.

In 1880 the amount of the pool was reduced from two cents to one cent per pound, and in June of that year to a quarter of a cent; in January 1881 the pool was abolished. In April 1882 it was deemed best to re-establish it, and on the 28th of June the proportions were again agreed upon for three years. At the expiration of that time the new concerns which had grown up were taken into the association, and after much labor, lasting from February to July 1885 a new pool was formed, and the proportions as fixed by the committee were accepted.

In April 1887, before the expiration of the time agreed upon at the formation of the last pool, it was broken up; and the next event of great interest was the formation and incorporation of the National Cordage Company. This was composed of the four leading concerns in New York; and although their circular, dated 1 Aug. 1887, announced that their "large facilities and long-established reputation were a guaranty that they could fulfil all that they promised to do," yet the successful accomplishment of their aims was impossible. The projectors were, no doubt, sanguine enough to believe that it was possible to control the product and prices of manila and sisal hemp, but the attempt was a failure. An effort was made to subsidize the houses and brokers engaged in the trade, but they did not remain subsidized, and the scheme would not work.

In January 1890 the National Cordage Company made an attempt to have all the manufacturers outside of their organization join them. But no one who joined the National knew the terms made with his neighbor, and it was not long before distrust and suspicion ruined the whole project. On 4 May 1893, the National passed into the hands of receivers, although they had paid 8 per cent dividends from 1891 on their preferred, and from 9 to 10½ per cent on their common stock, dividends having been declared on both three days before their failure.

The United States Cordage Company which succeeded the National Cordage Company was unsuccessful in its attempt to monopolize the purchase of raw material.

The factories originally purchased by the National Cordage Company and transmitted to their successors have in some cases been resold to the original owners or their representatives, and in other cases have been offered for sale without finding purchasers. The explanation of this state of things is very simple. When binder twine came in as an appreciable factor in the cordage trade, the manufacturers of harvesting-machines bought their twine of the large cordage companies in constantly increasing quantities. At that period there was some doubt as to whether binder twine made from manila or sisal fibres would be a success. The harvesting-machine concerns were paying a price approximately from three to four cents a pound over the cost of the raw material. This price paid a large margin of profit to the companies manufacturing the twine, and when it became unlikely that any substitute would be found for the purpose, the natural result was that the machine houses began to build plants and commenced making their own twine. Thus the trade was lost to those who had been the pioneers in it and it is safe to say that the twine is now made for one third of what it then cost. It is manifest that there is a very great advantage to the harvest-machine manufacturers in having the twine made on their own ground, thereby facilitating the shipment of it to their customers and without extra handling. This is undoubtedly one great reason for the deterioration in the value of the properties above referred to.

Owing to the unsettled condition of affairs in the Philippine Islands, manila hemp advanced materially, and was sold at one time at 18 cents a pound. This made its use for binder twine almost prohibitory, and also lessened its use for cordage. It also had the effect to create an additional demand for sisal, which carried the price to 12 cents a pound. But prices fell in the fall of 1901, manila was quoted at 10 cents for the best grades, and sisal at

Years	Manila		New Zealand	Sisal		Total Pounds
	Bales	Pounds	Pounds	Bales	Pounds	
1895	404,900	109,323,000	2,000,000	400,028	144,010,080	255,333,080
1896	404,006	109,081,620	2,000,000	359,110	129,279,600	240,361,220
1897	359,000	96,930,000	.....	474,591	170,852,760	267,782,760
1898	487,573	131,644,710	.....	389,125	136,193,750	277,838,460
1899	436,611	117,884,970	.....	490,699	176,651,640	294,536,610
1900	283,000	76,410,000	.....	470,000	169,200,000	245,610,000

7½ cents. The large quantity of these fibres used for harvest twine — approximately 85,000 tons annually — more than compensates for the diminished use of sisal for various purposes, and that of manila owing to the displacement, the world over, of sailing-vessels by steamers.

The table on the preceding page gives the annual consumption during the closing years of the last century, Canada included.

BENJ. C. CLARK,
Pearson Cordage Company.

Cordaitales (from the genus *Cordaites*, named in honor of A. J. Corda), an extinct great group of naked-seeded and therefore gymnospermous plants, resembling in certain respects the cycads, gingko, and the conifers. The *Cordaitales* are the most ancient of well-known seed-plants, and were quite generally distributed over the globe from middle Devonian into Permian time. Their leaves, as in portions of the *Cordaites* shale of New Brunswick, Canada, often occur packed in layers like those of modern forests. The group seems to have culminated in the Upper Carboniferous, where it formed one of the dominant types of the coal-swamp forests. Large and finely silicified trunks are not uncommon in various Palæozoic horizons of the northern central United States and in Canada. Some of the sections of trunks from the Black Shale (Upper Devonian of Indiana) are two or more feet in diameter by 20 feet long, and indicate stately forest trees from 100 to 150 feet high. The most noteworthy cordaitalean specimens are the silicified leaves, stems, and fruits with microscopic structure preserved from the "black flints" of the Coal Measures of Grand Croix, France. The study of this material, together with various trunks, casts, and imprints, has revealed nearly all the critically important structures of these long-extinct plants.

The *Cordaitales* were mostly tall and rather slender trees with smooth columnar shafts branching freely near their summits into a dense crown of lesser branches bearing simple large leaves in great abundance (Figs. 1 and 2). The leaves are usually long, and vary from linear to broadly elliptical forms. They are from 10 or more centimetres to a metre long, and from very narrow to 20 centimetres broad. The general habit of these trees was thus quite different from that of any in the existing flora. The species with shorter leaves may, however, be compared in a general way with such conifers as *Dammara* (the kauri pine of New Zealand), or with some forms of *Podocarpus*.

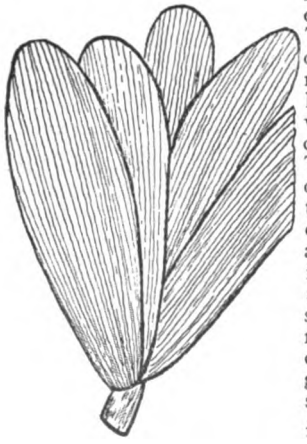


FIG. 2.— *Cordaites lingulatus.* Group of attached leaves. After Grand 'Eury.

On the basis of leaf forms Grand 'Eury divides the group into the genera *Cordaites*, *Dory-*, and *Poa-Cordaites*. The first of these divisions includes mainly very large spatulate and blunt-ended leaves, the second large lanceolate and sharply pointed leaf-types, and the third grass-like forms. The genus *Cordaites*, as first used, may include any of these. The isolated stems are usually described as *Cordaioxylon*, branches as *Cordaicladus*, and the piths as *Sternbergia* or *Artisia*. Isolated fruits are named *Cordaianthus*, and the seeds *Cordaicarpus*.

Anatomically the stem is much like that of the conifers, the wood of some forms being scarcely distinguishable from that of *Araucaria*, the Norfolk Island pine. The wood is wholly centrifugal, and its elements are radially arranged and without distinction between primary and secondary xylem in transverse section. Growth-rings are either not present or obscure, a fact that may in part indicate little difference in the rate of seasonal growth. The tracheary tissue consists of groups of spiral elements next the pith, followed by a broad

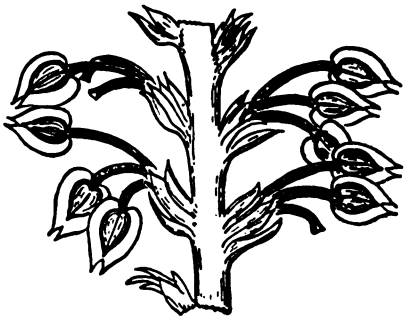


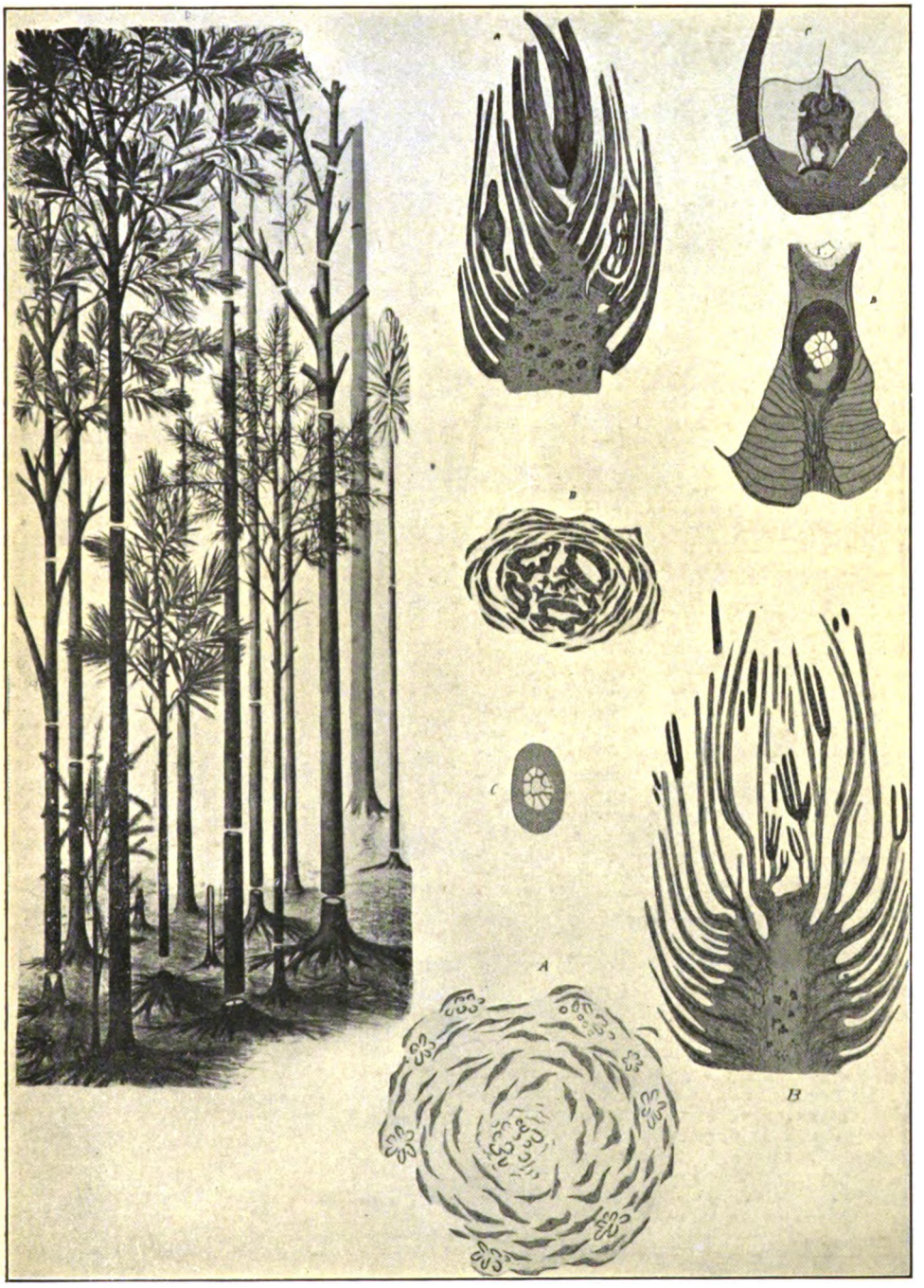
FIG. 6.— *Samaropsis Pitcairniæ.* Fragment of an ovulate inflorescence from Westphalia with the seeds in groups and borne on elongated stems. Natural size. After Carruthers.

zone of wider spiral and scalariform tracheides, and then by the bulk of the wood as composed of pitted tracheides. The medullary rays are narrow. The very large pith, sometimes four inches in diameter, is, however, far more suggestive of that of cycads. As growth proceeded, the pith underwent transverse constriction at intervals, leaving a succession of diaphragm-like spaces, the casts of which resemble piles of biconvex lenses, or coins, long only known separately as *Artisia* or *Sternbergia*. Transverse rupture and discoidal structure of the pith is paralleled in the walnut and some other living plants.

The roots are of diarch, triarch, or tetrarch structure. Outside is a broad zone of periderm apparently derived from the external cortex.

The leaves have conspicuous parallel veins repeatedly dichotomizing in all but the narrowest almost grass-like forms, and are anatomically very similar to single pinnules of either cycads or the *Bennettiteæ*. As in the latter, the structure is well known from silicified specimens. The bundles are of the mesarch type. Each is surrounded by a strong sheath connecting with a usually heavily developed hypodermal sclerenchyma.

The knowledge of the floral morphology of the *Cordaitales* now constitutes one of the most interesting chapters of paleobotany. It is largely based on the labors of Grand 'Eury and Renault, the latter having been so fortunate as to find silicified strobili of both sexes of certain species



For explanation, see Article Cordaitales.

preserved in astonishing perfection in the siliceous fragments of Grand Croix.

The staminate strobili are borne in considerable number in inflorescences, as shown in Fig. 7. Each strobilus is about a centimetre long and consists of a thick axis covered by long spirally arranged bracts resembling leaves, and replaced near the apex of the fruit by interspersed fertile filaments bearing erect tufts of five or more sporangia (see Fig. 3, A and B). The pollen grains, which have been found both in place and actually in the pollen chambers of the macrospores, are large and contain a highly interesting group of prothallial cells (Fig. 3, C), suggestive of a theoretical transition stage between *Pteridophytes* and *Spermatophytes*.

FIG. 5.— *Cordaianthus spicatus* Lesquereux. Diagrammatic, showing involucrate nutlets distichously to subalternately borne on both sides of a thick rigid stem. Involucral scales embracing the nutlets indistinct. From the coal measures of Pittston, Pa. One half natural size.

The ovules occur either singly (Figs. 5 and 7), or in small groups (Fig. 5), or in strobili quite similar to, and, as fossil imprints, often difficult to separate from, the staminate form just described. In ovulate strobili of the latter type (Fig. 4, A and B), the lateral bracts are long and overlapping, and a terminal tuft of long bracts crowns the strobilus. Here each ovule is borne in the axil of one of the larger bracts on the end of a very short lateral axis, which itself bore some bracteoles. The ovule had two integuments, an outer thick and fleshy, and an inner forming a delicate lining to the outer, from which it may not have been wholly distinct.

In another species, *Cordaianthus grand 'curyi* (Fig. 4, C. and D), the outer integument is partly broken away, and but little is preserved of the inner, the nucellus being left standing free. In its upper end the pollen chamber is plainly to be seen, as well as several pollen grains, the structures corresponding quite precisely to the similar stage at the beginning of fertilization in the living gingko and the cycads. This fossil ovule was "surprised at the very moment of pollination." It is of fundamental importance that pollen grains found in the nucellar canal are larger than those in the sporangia, and their group of internal cells more developed, while grains found free in the matrix exhibit an intermediate condition. The conclusion is hence doubtless correct that the pollen grains continued to grow after their discharge from the anther, and especially after their entrance into the pollen chamber. It is obvious that such a condition is one of the most readily thinkable steps in the later stages of the evolution of heterospory and of seed-plants from asexual spore-bearing plants producing dicœcious and free growing prothallia. By analogy from the cycads and gingko there can be but little question that the pollen grains produced free-swimming spermatozoids.

The *Cordaitales* were, at least in part, monœcious (Fig. 7), but must also have exhibited various conditions of monœcism and dicœcism.

Seeds in various stages of growth have been found attached to the leafy twigs of cordaitean forms, sometimes solitary (Fig. 5), and sometimes in groups (Fig. 6). The mature seeds are in *Cordaicarpus* heart-shaped at the base and somewhat flattened. The testa is double. The outer layer, or sarcotesta, was soft and fleshy during life, the endotesta hard and lignified. No embryos have yet been found in any species, although in certain younger and wonderfully preserved specimens *archegonia* have been observed. Structurally the seeds are distinctly cycad-like.

FIG. 7.— *Cordaianthus Pitcairniæ*. Branch of monœcious form bearing leaves and leaf scars with an ovuliferous inflorescence on the right, and on the left an inflorescence consisting of small staminate strobili. After Grand 'Eury.

The *Cordaitales* derive a unique significance from their great age and primitive characters, so manifestly important in our conception of the manner and course of plant evolution. Most paleobotanists are agreed that the cordaitalean and cycadalean groups had a common ancestry and that from the *Cordaitales* have been derived the *Gingkoales*, the *Coniferales*, and probably the *Gnetales*. Others would go further and place the *Cordaitales* in a position ancestral to the angiosperms as well. This is more debatable. Increasing knowledge of the group will, however, doubtless show it to be a much more varied one than as yet conceived of, and in any case its discovery must be regarded as one of the great triumphs of paleobotany.

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Corday d'Armans, kôr-dā där-mäṅ, **Marie Anne Charlotte,** French revolutionist: b. Saint Saturnin, near Séez, Normandy, 27 July 1768; d. Paris 17 July 1793. Her lover was accused by Marat as a conspirator against the republic, and assassinated by villains hired for that purpose. This excited Charlotte Corday to revenge. History had inspired her with a deep-rooted hatred against all oppressors, and she determined to free her country from Marat. Having left home, she entered Paris 11 July 1793, and obtained an interview with Marat on the pretext of disclosing Girondists' plots. The assemblies at Calvados were the first subjects of conversation, and Marat heard with eagerness the names of those who were present at them. "All these," he exclaimed, "shall be guillotined."

At these words Charlotte plunged her dagger into his bosom, and he called out "*A moi! mon ami*"; when some attendants rushed in and seized her. On the morning of 17 July she appeared before the revolutionary tribunal with a dignified air, and her replies were firm and noble. She spoke of her deed as a duty which she owed her country. Being condemned to death she was guillotined the same day, retaining her presence of mind to the last. Her remarkable beauty, and her lofty bearing on her way to the guillotine, sent a thrill even through the hearts of her executioners. One young German enthusiast, Adam Lux, a deputy from the city of Mentz, on witnessing the execution, conceived a romantic passion for her, and when her head fell, he cried with a voice hoarse with emotion: "She is greater than Brutus." He wrote a pamphlet, suggesting that a statue with such an inscription should be erected to her memory. He was arrested and guillotined. André Chénier, who had paid a glowing poetical homage to her heroism, shared the same fate before a year had elapsed. When Vergniaud was informed of Charlotte's death, he exclaimed: "She has killed us, but she teaches us how to die." Consult Lamartine, 'Histoire des Girondins'; Huard, 'Mémoires sur Charlotte Corday' (1866).

Corde'lia, the youngest daughter of Lear in Shakespeare's tragedy, 'King Lear.'

Cordeliers, kôr-dā-lē-ā. 1. Another name for the Franciscan friars in general, but given, in France to the branch of the order usually known as Franciscan Friars Minor (O. F. M.). After the death of Saint Francis in 1226, the next minister-general of the order relaxed somewhat the rigor of the rule of poverty as taught and practised by Saint Francis. This relaxation caused a division in the order, a number of the friars adopting the modified rule were called Conventuals (O. M. C.), and those adhering to the original observances were called Observantines, and later, Friars Minor. In France the name Cordeliers was given to them on account of their girdle. The Cordeliers or Friars Minor are in several places in the United States. (See FRANCISCANS.) 2. A political club during the first French revolution, which received the name of Cordeliers from the fact that its members met in the chapel of the old convent of the Franciscan friars situated near the Rue de l'École de Médicine and the Rue de l'Observance, in the centre of the quarter of Paris known as the Cordeliers' district. The club of the Cordeliers became the focus of the wildest agitators, while at the same time it was constantly quarreling with the Jacobin club. The leading events of the reign of terror may be traced to the conflict of the two clubs, and chiefly to the influence of the Cordeliers, of whom Marat and Danton were the ruling spirits. At the time the club was in its zenith, Camille Desmoulins edited a popular journal in connection with it, under the name of 'Le vieux Cordelier,' without however identifying himself completely with the politics of the formidable club. After the execution of Danton, Hébert, and Chaumette, the club declined in influence, and was closed by the law of 6th Fructidor, or 23 Aug., 1795, which dissolved all the political clubs of France.

Corder, Frederick, English musician: b. London 26 Jan. 1852. He studied at Cologne under Ferdinand Hiller and after his return to England devoted himself to his profession of composer and teacher. Among his works are the operettas of 'Philomel' (1880), and 'The Storm in a Teacup' (1880); the operas of 'Morte d'Arthur' (1877); and 'Nordisa' (1887); the cantatas 'The Cyclops' (1881), and 'The Bridal of Triernain' (1886); and 'In the Black Forest,' an orchestral suite (1876).

Cordiani, kôr-dē-ā'nē. See SANGALLO.

Cordier, Henri, ŏñ-rē kôr-dē-a, French Orientalist: b. New Orleans 8 Aug. 1849. He studied in Paris and England, and in 1869 went to China, where he remained till 1876. After his return to France he became professor of the history, geography, and law of the Orient at the School of Oriental Languages at Paris and was also professor at the School of Political Science. He published a bibliography of China, 'France in China in the 18th Century' (1880); 'Conflict between France and China' (1884); and 'Atlas Sino-corée' (1896).

Cor'dierite, a name formerly given to the mineral iolite (q.v.), in honor of Cordier, a French geologist.

Cordilleras, kōr-dēl-yā'rās, a name from the Spanish for a mountain chain or ridge, formerly applied to any lofty and straight areas of land, but now specifically to chains, ranges, or ridges of mountains, and especially to such of these elevations as are long and continuous. It is used particularly in physical geography, although in geology also it is sometimes applied to mountain systems at or near the coasts or borders of continents. The name was first given by the Spaniards to the chains of the Andes (q.v.) in South America, and was afterward extended to their northern continuation through Central America and Mexico, and finally to the entire mountain systems stretching up the western coast of the United States, British Columbia, and Alaska, and spreading eastward to include the Rocky Mountains (q.v.). This portion of the continent geographers have come to call the Cordilleran region of North America, designating the corresponding elevations of South America under the old name of Andes. This region covers in the United States the whole western mountain portion of the country, including the Sierra Nevada, the Coast Range, the Cascade Range (qq.v.), and extending to and embracing the Rocky Mountains, as well as all the ranges lying between them and the mountains of the western coast. Included within this Cordilleran region are mountain systems many of whose lesser chains, in length and elevation, equal some of the famous ranges of Europe. As these great physical features of our own country become better known in their general magnificence and their interesting local details, their relative importance in comparison with similar forms of the earth's surface is more highly estimated.

Cor'dite, a smokeless powder employed by the English government. It was invented in 1889 by Sir Frederick Abel and Prof. James Dewar, and consists of a mixture of nitro-glycerine 58 parts, nitrocellulose 37, vaseline 5. The nitrocellulose is a mixture of various cellulose nitrates, insoluble and soluble. At the Royal Gunpowder Works at Waltham Abbey it is required that the nitrocellulose used shall not con-

tain more than 12 per cent of soluble cellulose nitrate, or 0.6 per cent of mineral impurities, nor less than 12.5 per cent of nitrogen. It is made by intimately mixing the ingredients in a mechanical kneading-machine with the aid of acetone, by which the whole is converted into a gelatinous mass which is then squirted into cords by means of a "stuff press," a machine similar to those used in forming macaroni. The cords vary in diameter from 0.01 inch to 0.65 inch. The former are chopped into short lengths for use in pistols, the latter for use in 12-inch guns. The cords for small-arm cartridges are 0.0375 inches in diameter. The cords are heated in drying-houses to drive off the acetone, leaving them in the form of an amber-colored, translucent, flexible mass.

Cordite is made up into charges by reeling the cords on bobbins, and then spinning these strands into larger cords, thus obtaining the desired length, volume, and weight. Before the South African war 1,200 tons of cordite had been manufactured for the British government. It is believed that the performance of cordite in that war was not satisfactory, and that the authorities are prepared to adopt a straight nitrocellulose powder.

Córdoba, kōr'dō-bā, Argentine Republic, a province next in size and population to that of Buenos Ayres, bounded on the north by Santiago del Estero, on the east by Santa Fé, on the south by Buenos Ayres and the territorial government of La Pampa, and on the west by the provinces of San Luis, La Rioja, and Catamarca. Area 54,000 square miles. Its northwestern portion is mountainous, and rich in minerals. Copper, silver, gold, lime, marble, graphite, and salt are found. The central and eastern regions lie in a great plain, watered by the rivers Cuarto, Segundo, Primero, Dulce, etc., with the lake called Mar Chiquita; and here agricultural and grazing industries are carried on. Cattle, horses, and mules are bred in the south; wheat and fruits are raised along the river courses; there are large flocks of sheep and goats in the centre and north. Besides wheat and fruits, the principal crops are maize, lucern, barley, sweet potatoes, and white potatoes. Of the total productions, about one half, in value, are pastoral, one third agricultural. The mining industry is as yet comparatively undeveloped. Manufactures are: Flour, lime, and cement, bricks, hides, and leather, beer, wine, and alcohol, boots and shoes, cut wood, vermicelli, gold embroideries, butter and cheese, cut stone, belts, candles, and soap, artificial ice, etc. Principal railway centres are the capital city, Córdoba (q.v.), Villa Maria, and Villa Nueva. Under the constitution of the republic dated 25 Sept. 1860 the province has its own constitution, "framed upon the basis of a republican representative system of government, and in harmony with the principles, declarations, and guaranties of the national constitution"; said provincial constitution relating to "the administration of justice, the administration of the local government, and primary instruction. Upon these conditions the federal government guarantees to each province the practice and enjoyment of its own constitutions." The provinces have their own local institutions and laws; "they elect their governors, legislators, and provincial functionaries of all classes, without the intervention of the federal government." The province is represented in the national legislature by two senators, elected by the provincial legislature, and by deputies elected directly by the people. Each province is, for this purpose considered as an electoral district, and the election is by a plurality of votes in the proportion of one deputy to each 20,000 inhabitants, or fraction of that number not less than 10,000. Population of the province 419,000.

Córdoba, Argentine Republic, the capital of the province of the same name, situated on the right bank of the Rio Primero at the junction of five railways. It is one of the progressive inland cities, having adopted many of the modern improvements, such as electric light, running water, street railways, sewers, and excellent pavements. Its university, founded in 1813; astronomical observatory, established 1871; National Academy of Science; National Meteorological Institute; national college, normal schools and elementary schools, have made it well known as an educational centre. Railway communication with Buenos Ayres was established in 1869. The first national fair was held here in 1871. A score of newspapers and reviews are published in the city. There are fine public buildings and private residences, and attractive parks. Pop. about 65,000.

Córdoba, Mexico, a town 66 miles west of Vera Cruz; in a fruitful valley, 3,045 feet above the sea. Formerly important, it sank greatly after the revolution; but in later years it somewhat recovered its trade. It is surrounded by rich coffee plantations. Pop. about 8,000.

Córdoba, Spain, a town and capital of the province of Cordoba, situated on the Guadalquivir, in Lower Andalusia. It is built on a gentle declivity of a chain of mountains, forms an oblong quadrangle, and is surrounded with walls and lofty towers. A part of the town is of Roman, a part of Moorish origin; many of the buildings are in ruins, and a number of gardens occupy a great part of the inhabited space. The streets are narrow, crooked, and dirty; the plaza mayor, the principal market-place, however, is distinguished for its size, its regularity, and the beauty of the colonnade by which it is surrounded. The remains of the residence of the Moorish kings now form a part of the archbishop's palace. The cathedral is a splendid building, originally a mosque, erected in the 8th century by King Abd-er-Rahman I. Cordoba has always carried on considerable trade; and even under the Moors the leather exclusively manufactured there (cordovan) was exported in all directions. At what period the Romans laid the foundation of the town (Colonia Patricia, afterward Corduba) is not known. In 572 it was conquered by the Goths. During the reign of the dynasty of the Ommiades it was the capital of Arabian Spain; and afterward it became the residence of the powerful caliphs of the West, the sacred city of the Moors, and the centre of Mohammedan worship and of Arabian splendor and science. At that time the city is said to have been about 15 miles in circuit, and to have possessed a population of 1,000,000. In 1236 it fell an easy prey to Ferdinand III. of Castile. In 1808 it was pillaged by the French, who captured it again under Soult in 1810. Pop. (1897) 57,313. The

province of Córdoba includes the fertile and beautiful valley of the Guadalquivir and the snow-capped mountains of Sierra Morena. The area of the province is 5,188 square miles, and the population (1897) 443,582.

Cordon, kôr-dŏn or kôr'dŏn, in a military sense, troops so disposed as to preserve an uninterrupted line of communication, to protect, for instance, a country from hostile invasion; also a similar line intended to protect a place from contagious diseases. In the latter sense it is called a *cordon sanitaire.* The word "cordon" also means, in fortification, the coping of the escarp or inner wall of the ditch. It is usually rounded in front and projects one foot over the masonry.

In horticulture, cordon is a term applied to a system of training fruit trees. The trees are dwarfed by training and pruning to one or two stems which extend horizontally or obliquely, and from which the fruit-bearing spurs are developed. The objects sought are economy of space and increased size and improved quality of fruit. The system is in little use in America, where land is cheap, but in Europe it is very popular. It is best adapted to such trees as pears and apples, which naturally bear their fruits upon spurs.

Cordon Bleu, kôr-r-dŏn blėr, a knight of the ancient French Order of the Holy Ghost, at one time the most aristocratic order in the kingdom, whose decoration was attached to a blue ribbon or baldric. The knights frequently met in club form, and were noted for their excellent dinners, whence the term came to be applied to a cook of superior skill.

Cordon Grand, grŏn, a term applied to a member of any grade of the French Legion of Honor, because the cross of the order is always suspended from a broad ribbon.

Cordova, Fernando Fernandez de, fĕr-nän'dō fĕr-nän'dĕth dā kōr'dō-vä, Spanish general and statesman: b. Madrid 1792; d. 1883. He entered the military service in 1810, and was rapidly promoted during the war with Napoleon. In 1847 he officiated for a short time as minister of war, and was appointed inspecting general of the infantry. On 8 March 1850 he was nominated captain-general of New Castile, in the following year to the same position in Cuba, and in 1853 general-in-chief of the cavalry. Immediately after the outbreak of the revolution of 1854, he was called upon by the queen to form a new cabinet. This he declined, but he ordered his soldiers to fire upon the insurgents, and when the latter proved victorious, he fled to France. In 1856 he returned to Spain, and was reinstated in his position of general, and 10 years later was active in the revolution which drove Queen Isabella from the throne. He was captain-general of Cuba for the second time in 1870.

Cordova, Francisco Hernandez de, fränthēs'kō är-nän'dĕth dā, Spanish navigator: b. in the latter part of the 15th century; d. Cuba 1517. He was the discoverer of Yucatan, which he visited in 1517, and had several encounters with the natives. He lost some of his men, and two were taken prisoners and carried up the country. Shortly after his return to Cuba he died; but the account he gave of his discoveries led to a new expedition under Juan de Grijalva, to whom was subsequently assigned the honor of the discovery.

Cordova, Francisco Hernandez de, Spanish soldier and explorer: b. about 1475; d. Leon, Nicaragua, March 1526. In 1514 he went to Panama with Pedrarias and was sent by him to take possession of Nicaragua. He founded Granada, Leon, and other towns, and discovered the outlet of Lake Nicaragua. He was afterward accused of disloyalty in trying to set up an independent government, and was seized by Pedrarias and beheaded.

Cordova, José Maria, hō-sā' mä-rē'ä, South American general: b. Antioquia, Colombia, about 1797; d. 17 Oct. 1829. At the age of 15 he left his father, who belonged to the Spanish party, and joined a band of guerrillas, among whom he soon became noted for his intrepidity in their contests with the Spaniards. At the battle of Boyaca, 8 Aug. 1819, he won the rank of colonel. Not long after he was appointed general, and distinguished himself at the battle of Ayacucho, after which he was made general of division on the field. In September 1828 he became head of the war department of the republic of Colombia, under Bolivar, but, a year afterward, revolted against him. He found but few adherents, however, and being attacked, 17 October, by a force greatly superior to his own, was slain with most of his followers.

Cordova, Luis Fernandez de, loo-ēs fĕrnän'dĕth dā, Spanish general: b. Cadiz 1799; d. Lisbon 29 April 1840. He took a prominent part in the movement of 1820 as a constitutionalist, and in that of 7 July 1822 as an absolutist. He officiated afterward on diplomatic missions abroad, and eventually deserting the forlorn cause of Don Carlos, espoused that of Christina and Isabel, took a distinguished part in the battle of Mendigorria, was appointed commander-in-chief of the Christinos as successor of Valdez, but unable to finish the war, was driven from office after the movement of 1836, and fled to France, whence he soon returned to Spain. He now conspired with the party of Narvaez against Espartero, but retired to Portugal when the latter came into power.

Cordova, Pedro de, pā'drō dā, Spanish Dominican missionary: b. 1483; d. Santo Domingo 28 June 1525. He was vicar of the first Dominican colony in Hispaniola in 1510, preached against Indian slavery, and endeavored to have laws framed for the protection of the Indians.

Cordova y Figueroa, ē fē-gā-rō'ä, **Pedro de,** Chilean historian: b. Concepcion 1692; d. there after 1770. He served in the Chilean army in Araucania and was alcalde of his native place about 1740. He wrote a 'Historia de Chile' which includes an account of the settlement of the country up to 1717. The MS. of the work was preserved at Madrid.

Cordova, a name of several cities. See CORDOBA.

Cor'dovan, a fine leather which took its name from the Spanish city of Cordova, where it was manufactured in large quantities. It was also called cordwain.

Corduroy, kôr'dū-roi, a ribbed cotton fabric, woven with a pile which is cut so as to

leave the surface ridged in the direction of the warp. See FUSTIAN; VELVETEEN.

Corduroy Road, a roadway covered with logs, slabs, or poles laid close together. They were used generally in the pioneer days to bridge over swampy places, and at the present day are sometimes found in country districts.

Cordwood, wood, especially firewood, cut in lengths of 4 feet and piled in an oblong stack 8 feet long and 4 feet high, which thus has a cubical content of 128 feet. The term is applied also to piles of similar wood of other dimensions in length and height, but the measurement of such piles, for purposes of sale or of labor on the material, is determined by the same standard of cubic content.

Cordyceps, kôr'dĭ-sĕps, a genus of fungi, some of which are found on dead leaves and branches, while others are remarkable for growing on the larvæ of insects, which they latterly kill. It grows very freely over a wide area, and in different countries 28 species have been found.

Corea, kō-rē'a. See KOREA.

Coreal, Francisco, frän-thēs'kō kō-rā-āl', the name affixed to the 'Voyage aux Indes Occidentales' which was issued in Paris 1727. Its author asserted that he was born in Carthagena in 1648 and had traveled extensively through Florida, Mexico, and South America. The book abounds in errors and is probably a compilation.

Coregonus, kō-rĕg'ō-nŭs, a genus of abdominal fishes, family *Salmonidæ*. The teeth are very small or wanting, the scales large and the height or front of the first dorsal greater than its breadth. The genus is common in European waters and unusually large varieties are found in the rivers of Siberia. The best-known American representative is *Coregonus albus,* the whitefish.

Corelli, Arcangelo, ärk-än'jä-lō kō-rĕl'lē, Italian musician: b. Fusignano 1653; d. 18 Jan. 1713. As a performer on the violin his execution is said to have been peculiarly characteristic, full of spirit and expression, and his tone firm and uniform. Corelli formed and conducted, according to the original plan of Crescentini, the celebrated musical academy which met at the palace of Cardinal Ottoboni every Monday. By his sonatas on the violin, and by his concerts, he may be considered, as it were, the creator of a new species of harmony, especially for his own instrument.

Corelli, Marie, English novelist: b. Italy 1864. In infancy she was adopted by Charles Mackay, the poet. She was educated in London, and on beginning her literary career adopted as a pen name that which subsequently became her legal name. She has published: 'A Romance of Two Worlds' (1886); 'Vendetta' (1886); 'Thelma' (1887); 'Ardath, the Story of a Dead Self' (1889); 'Wormwood'; 'The Soul of Lilith' (1892); 'Barabbas' (1893); 'The Silence of the Maharajah' (1895); 'The Sorrows of Satan' (1895); 'Cameos' (1896); 'The Mighty Atom' (1896); 'The Murder of Delicia' (1896); 'Ziska' (1897); 'Jane' (1897); 'The Master Christian' (1900); 'Boy' (1900); 'Temporal Power' (1902).

Corentyn, kō-rĕn-tĭn', a river of South America, separating British and Dutch Guiana, and flowing into the Atlantic. It has a course of about 400 miles, and is navigable below the Great Cataracts in lat. 4° 20' N.

Coreopsis, kō-rē-ŏp'sĭs, a genus of annual and perennial herbs of the natural order *Compositæ,* tickseed. Nearly all the species are natives of eastern North America. They have showy, generally yellow, flowers in heads, and are widely cultivated in gardens. They are of easiest culture, being grown from seeds sown in a hot-bed and transplanted to any ordinary garden soil where they will blossom freely with little attention beyond keeping the ground free from weeds.

Corfe (kôrf) **Castle,** a castle in Dorsetshire, England, now in ruins, standing a little north of a small town, to which it gives its name, and with which it is connected by a bridge of four arches. It was built by King Edgar, and at its gates his son Edward the Martyr was murdered in 979. It was the occasional residence of King John, and was for some time the prison of Edward II. During the great civil war it was heroically defended against the parliamentarian forces by Lady Bankes. It was subsequently taken by Fairfax through the treachery of an officer of the garrison, when it was demolished, 1646.

Corfield, William Henry, English sanitarian: b. Shrewsbury, Eng., 14 Dec. 1843; d. Marstrand, Sweden, August 1903. He was educated at University College, London, and in the medical schools of Paris and Lyons, and was the first professor of hygiene appointed in London. He has published: 'A Digest of Facts Relating to the Treatment and Utilization of Sewage'; 'Lectures on Water Supply, Sewerage and Sewage Utilization' (1874); 'Laws of Health' (9th ed.); 'Dwelling Houses: Their Sanitary Construction and Arrangements' (4th ed. 1898); 'Disease and Defective House Sanitation' (1896); 'Sanitary Knowledge in 1800'; 'The Etiology of Typhoid Fever and Its Prevention' (1902).

Corfu, kôr-foo' (anciently CORCY'RA), a Greek island in the Mediterranean, the most northerly and the largest of the Ionian Islands, at the mouth of the Adriatic, near the coast of Albania, about 40 miles long, and from 15 to 20 wide; square miles, 431. The surface rises in the north at one point to the height of 3,000 feet, but the southern portion is low. The scenery is beautiful, the climate pleasant and healthy, save for malaria in the centre and in the south, and the soil is fertile. Oranges, citrons, grapes, honey, wax, oil, and salt are abundant. The ancient name of the island was Drepane. A Corinthian colony settled in the island in the 8th century B.C., taking it from the Illyrian inhabitants. Corcyra's quarrel with Corinth was one of the immediate causes of the Peloponnesian war. The Venetians possessed Corfu from 1386 to 1797, making it a Christian bulwark against the Turks. The British held it from 1815 to 1864. Pop. about 65,000. Corfu, the capital, is finely situated on the eastern coast on a promontory which terminates in a huge isolated rock crowned by the citadel; the streets are Italian in style; chief edifices, the cathedral, government palace, and Ionian academy. There is a good harbor and considerable trade. Pop. about 18,000.

Coriander, kō-rĭ-ăn'dėr, an annual or biennial herb (*Coriandrum sativum*) of the natural order *Umbelliferæ*. It is a native of southern Europe and is cultivated for its fruit (Coriander-seeds), used for flavoring culinary dishes, liqueurs, and confectionery. The plant attains a height of about three feet, bears very finely divided strong-smelling leaves, and small white flowers in terminal umbels. The odor of the leaves is disagreeable, but that of the fruit, when fully ripe and dry, is pleasantly aromatic. In America the plant is less cultivated than in Europe, and is less favored than caraway; but it has been grown in gardens with other culinary herbs, and has escaped to fields, where it is rarely troublesome as a weed. It succeeds well upon any rich soil, and may be cultivated like parsley, caraway, or other sweet herbs of the same natural order. The fruit contains about 1 per cent of a volatile oil, which is the active principle. It is a mild and agreeable carminative, and is useful in flatulence and chronic dyspepsias.

Corinna, kō-rĭn'a, Greek lyric poetess of Tanagra, in Bœotia. She was contemporary with Pindar, whom she is said to have conquered five times at musical contests, and therefore her image, crowned with the chaplet of victory, was placed in the gymnasium of Tanagra. According to Pausanias, who relates this fact, she was so beautiful that her charms may have influenced in some degree the opinion of the judges. Of the numerous poems which the ancients ascribed to her, only a few fragments have come down to us. They have been collected by Bergk in 'Lyrici Poetæ Græci' (3d ed. 1865), and by Schneidewin in 'Delectus Poetarum Græcorum' (1839). Madame de Staël has given the name of Corinne to the heroine of one of her novels.

Corinne, kō-rēn, or **Italy,** a novel by Madame de Staël, published in 1807. Besides its romantic and sentimental interest, in its treatment of literature and art it has always been considered authoritative. It served indeed for many years as a guide-book for travelers in Italy, though modern discoveries have somewhat impugned its sufficiency. When it first appeared its success was instantaneous.

Cor'inth, a celebrated city upon the isthmus of the same name. It was renowned among the cities of Greece, commanded by its advantageous position a most important transit trade, and possessed all the splendor which wealth and luxury could create; while its citadel, the Acrocorinthus, rendered it one of the strongest fortresses of Greece. Only a few ruins remain to attest its ancient magnificence. Of the three ancient harbors the western harbor, Lechæum, on the Gulf of Corinth, is choked with sand, as is the eastern harbor, Kekhries (ancient CENCHREÆ), on the Saronic Gulf. These were anciently the chief harbors of Corinth. The shallow harbor Schœnos, now Kalamaki, at the eastern entrance of the canal across the isthmus, is used to some extent. There is still a wretched village on the site of ancient Corinth. New Corinth (Nea Korinthos) stands about three miles to the northeast on the coast of the gulf, on the railway from Athens to Patras. It is a small town built since 1858, is the capital of the eparchy of Argolis and Corinth, and the seat of an archbishop. It has a harbor and custom-house. Pop. 5,000.

In ancient Corinth great exchange of Asiatic and Italian goods took place. The duty paid on these goods afforded a great revenue to the state; and the citizens accumulated such wealth, that Corinth became one of the most magnificent, but at the same time most voluptuous cities of Greece. Aphrodite was the goddess of the city, and courtesans were her priestesses, to whom recourse was often had, that they might implore the protection of the goddess in times of public danger; and a certain number of new priestesses were consecrated to her at the commencement of important enterprises. Lais and several other females of the same profession were distinguished by their great accomplishments and beauty, and the high price which they set on their charms; hence the old proverb, *Non cuivis homini contingit adire Corinthum*, that is, "It isn't everyone that can afford to go to Corinth." The virtuous women celebrated a feast to Aphrodite apart from the others.

The mythical Sisyphus was the founder of the Æolian dynasty, which is represented as the first that ruled in Corinth. It was conquered by the Heraclidæ, and Corinth was subsequently ruled by an oligarchy called the Bacchiadæ, in whose time the colonies of Syracuse and Corcyra were founded. This was overthrown by Cypselus in 657 B.C. Periander was the next ruler. Corinth took a prominent part in the development of Greek colonization and was long a great naval power. In the sequel Corinth became the head of the Achæan League, and was conquered and destroyed by the Consul Mummius, 146 B.C. Julius Cæsar, about a hundred years later, rebuilt it; but its commerce could not be restored; the productions of the East now took the road to Rome. A Christian community sprang up in the city under Paul's ministrations, and to it he addressed two letters. The Venetians received the place from a Greek emperor; Mohammed II. took it from them in 1458; the Venetians recovered it in 1687, and fortified the Acrocorinthus again; but the Turks, under Ali Comourgi, celebrated in Byron's 'Siege of Corinth,' took it anew in 1715, and retained it until Greece became independent. Against any enemy invading the Morea from the north, Corinth and its citadel were formerly of the highest military importance, and as a fortified post it continued of importance to modern times. But by the present Greek government it has been neglected.

Corinth, Advance on (30 April–30 May 1862), and **Battle of** (3–4 Oct. 1862). Corinth, Miss., an important strategical point, was early occupied by the Confederates. It was the objective point of Gen. Halleck's campaign, for which, early in April 1862, he was concentrating Grant's and Buell's armies at Pittsburg Landing, on the Tennessee River. On 3 April Gen. A. Sidney Johnston marched from Corinth with 40,000 men to strike and crush Grant before Buell could join him; surprised him on the morning of the 6th, at Shiloh; and after a severe fight drove him back to the river, where he was joined by Buell's advance division. Johnston was killed during the battle, and was succeeded by Gen. Beauregard. Grant and Buell renewed the battle on the 7th; Beauregard was defeated, and led his army back to Corinth, hav-

ing lost 10,000 men. Gen. Halleck joined the army at Shiloh, 11 April, assumed command, drew reinforcements from every direction, and at the end of the month had 110,000 men. Grant was second in command. On 30 April the movement began on Corinth, 27 miles distant, held by Beauregard with about 50,000 men, his army having been reinforced. Early in May Halleck began to throw up elaborate works. It was a siege from start to finish, the army entrenching from the Tennessee River to Corinth. On 9 May occurred an engagement in which the Union loss was about 180 killed and wounded; the Confederate loss about 160. Halleck continued his slow approaches, gradually gaining ground, and 28 May he was within a mile of Beauregard's main line. On the morning of the 30th it was discovered that Beauregard had made a clean retreat. At Baldwyn, 31 miles from Corinth, he remained until 7 June, when he fell back to Tupelo, 52 miles from Corinth. Halleck occupied Corinth on 30 May, and Gen. Gordon Granger's cavalry, supported by 50,000 infantry, followed Beauregard as far as Baldwyn and Guntown, and here the campaign for Corinth ended. The loss of Corinth was followed by the fall of Fort Pillow and Memphis and the opening of the Mississippi down to Vicksburg.

On 1 Oct. 1862, Gen. Grant, in command of the Union army operating in west Tennessee and northern Mississippi, had about 48,000 effective men. Gen. Earl Van Dorn, commanding the Confederates in Mississippi, believing that a successful attack on Corinth would expel Grant from west Tennessee, concentrated Lovell's division of his own army, with the two divisions of Gen. Sterling Price's army at Ripley, 30 miles southwest of Corinth, 28 September. Next day he marched north, and arrived at 10 o'clock on the morning of 3 October, three miles northwest of Corinth, where he formed his army for attack. He had about 22,000 men. Rosecrans had been warned, and had made dispositions for the attack. In a severe action that day Van Dorn gained two miles of ground and captured two guns. The main works defending the town were close to it, and consisted of a series of heavily armed redoubts, connected by rifle-pits or breastworks. By 9 o'clock that night Rosecrans had formed his lines for the next morning's battle. It was after 9 o'clock of a still, intensely hot day, before Van Dorn attacked. The battle, which was fought with fury on both sides, did not exceed an hour in duration, and by noon Van Dorn's army, Lovell's division covering the rear, was in full retreat, from one of the most sanguinary fields of the War. Gen. Sterling Price, in his report, says: "The history of this war contains no bloodier page, perhaps, than that which will record this fiercely contested battle." At night Van Dorn halted at Chewalla, six miles from the field, next morning hastening his march for Pocahontas to retire by the way he had come. After fighting at Davis' Bridge over Hatchie River, in which he inflicted upon the Federals a loss of 539 killed and wounded, and himself lost 127 killed and wounded, 420 prisoners, and 4 guns, Van Dorn crossed the Hatchie at Crum's Mill, six miles south, and took the road to Ripley, thence to Holly Springs.

The Union loss at Corinth was 355 killed, 1,841 wounded, and 324 missing; an aggregate of 2,520. Rosecrans says he buried 1,423 Confederates, but the Confederate reports show a loss of 505 killed, 2,150 wounded, and 2,183 missing; an aggregate of 4,838. Deducting the loss at Davis' Bridge (127 killed and wounded, and 420 prisoners), the Confederate loss at Corinth was 2,528 killed and wounded and 1,763 missing. Consult: 'Official Records,' Vols. X. and XVII.; Grant, 'Personal Memoirs'; Sherman, 'Memoirs'; Greene, 'The Mississippi'; The Century Company's 'Battles and Leaders of the Civil War,' Vol. II.; Roman, 'Military Operations of General Beauregard,' Vol. II.; Force, 'From Fort Henry to Corinth.'

E. A. CARMAN.

Corinth, Gulf of, a beautiful inlet of the Mediterranean, about 80 miles long, between the Peloponnesus and northern Greece, having the Isthmus of Corinth closing it in on the east. It is better known as the Gulf of Lepanto.

Corinth, Isthmus of, an isthmus connecting the Morea (Peloponnesus) with northern Greece. It varies in width from four to eight miles. A canal, about four miles long, was constructed across the isthmus in 1882–93, which enables vessels to sail from the Archipelago to the Adriatic without rounding Cape Matapan.

Corinthian Order, that order of Grecian architecture of which the most characteristic feature is the capital of the column, which is adorned with beautifully carved acanthus leaves, but varies considerably in minor details. The column is generally fluted, with a fillet between the flutings, and stands upon a base. The entablature is variously decorated, especially the cornice; the frieze may be quite plain, or sculptured with foliage and animals. The Corinthian order was not very common in Greece before the time of Alexander the Great. Among the Romans it was much employed. See ARCHITECTURE, Plate I.

Corinthians, Epistles to the, two epistles addressed to the Church at Corinth, which have been admitted as genuine writings of St. Paul by even the most critical assailants of the New Testament canon. They were written at a time when the Corinthian Christians had become divided into several parties, some of them inclining to the customs of the Jews. As expositions of doctrine they are second in importance only to the Epistle to the Romans. They are also the most instructive of all the inspired compositions of their class, from the insight which they furnish into the personal character of St. Paul himself, and the conditions of the apostolic Church. The first epistle may be divided into four parts. In the first (chaps. i.–iv.) Paul discourses generally on the dissensions among themselves because of attaching themselves to certain teachers. The second division (chaps. v.–x. 33) is occupied with the concerns of Christians as individuals, and treats of several questions, such as celibacy, which had caused dissension at Corinth. In the third portion of the epistle Paul gives directions for the decent celebration of public worship, with special reference to the abuses which prevailed in the celebration of the Lord's Supper. Lastly, in chapter xv. the doctrine of the resurrection is vindicated, and the epistle concludes (chap. xvi.) with a request that a contribution might be made for the saints at

Jerusalem. The second epistle arranges itself under three divisions. In the first (chaps. i.–vii. 16) the apostle speaks of his sufferings for the gospel's sake, and other matters. The second part (chaps. viii. ix.) enters at length on the subject of the collection for the poor saints of Jerusalem. In the third (chaps. x.–xiii.) Paul defends himself against his calumniators. The date of these epistles is 57 or 58 A.D.

Consult: Fouard, 'Life of St. Paul'; Conybeare and Howson, 'Life and Epistles of St. Paul'; Dean Stanley, 'Commentary on the Epistles.'

Corinthians, Third Epistle of the, an apocryphal epistle or letter, which like one said to have been sent from the Corinthians to St. Paul, were both in Armenian. Apocryphal letters or epistles made their appearance at a very early period after the death of the apostles. See APOCRYPHA.

Corinto, Puerto de, poo-ār'tō dā kō-rēn'tō, Nicaragua, the principal port of entry on the Pacific coast of that republic. A railroad, owned and operated by the government, connects it with Momotombo, at the head of Lake Managua, a distance of 58 miles. There are four regular lines of steamships which touch at Corinto, carrying passengers, mail and general cargo, and navigating the Pacific from North to South America. Owing to the intense heat and unhealthfulness of the place, very few people live there, except the government employees, steamship agents, and those employed on the railway and wharves. A "convention of peace and obligatory arbitration" was signed here 20 Jan. 1902, by plenipotentiaries of the governments of Nicaragua, Costa Rica, Salvador, and Honduras.

Coriolanus, kō"rĭ-ō-lā'nŭs, **Caius Marcius,** Roman hero, called Coriolanus because the city of Corioli, the capital of the kingdom of the Volsci, was taken almost solely by his exertions. Coriolanus became very unpopular when, during the famine which prevailed in Rome 490 B.C., he proposed to distribute the provisions obtained from Sicily among the plebeians only on condition that they would agree that the tribuneship should be abolished. Banished for this cause, Coriolanus, resolving to revenge himself upon his country, went to the Volsci and prevailed upon them to go to war with Rome before the expiration of the truce. He himself was joined with Attius Tullius in the command of their army, which immediately made itself master of the cities of Latium, and the Volscian camp was pitched in sight of Rome before troops could be raised for the defense of the city. The envoys sent by the senate returned with the answer, that Rome could purchase peace only by the surrender of the territory taken from the Volsci. A company of Roman matrons, headed by Veturia, the mother, and Volumnia, the wife of Coriolanus, at length subdued his resolution and he withdrew his army, but attempting to justify himself in an assembly of the Volsci was assassinated in a tumult excited by Attius. Shakespeare, in his play of 'Coriolanus,' calls the hero's wife Virgilia, his mother Volumnia, and the Volscian leader Tullus Aufidius.

Coriolanus, a tragedy by Shakespeare (written about 1609). It is founded on North's 'Plutarch.'

Cork, First Earl of. See BOYLE, RICHARD.

Cork, Ireland, a maritime county, province of Munster, having Saint George's Channel south, County Limerick north, Kerry west, Waterford and Tipperary east. Extreme length, east to west, 110 miles; extreme breadth, 70 miles. The coast is indented with numerous bays and inlets, of which the more important are the bays of Bantry, Dunmanus, Long Island, and Clonakilty, Kinsale, and Cork harbors; and is serrated with headlands and promontories. Off the coast lie the islands of Clear, Whiddy, Dursey, Bear, and several smaller. The county is watered by the Bandon, Lee, and Blackwater, and numerous smaller streams. Pop. (1891) 438,432; (1901) 404,813.

Cork, Ireland, city in the south of Ireland, capital of the county of Cork, situated on the river Lee. It is 15 miles from the sea, and besides an upper harbor at the city itself, and quays extending over four miles in length, there is a lower harbor at Queenstown, 11 miles below. The entrance, deep and narrow, is strongly fortified on each side. Cork is the third city in Ireland, and exports great quantities of grain, butter, bacon, eggs, and live stock. The principal industries are tanning, distilling, brewing, and the making of tweeds and friezes. There are also iron foundries and yards for the building of iron ships. The principal buildings are the Protestant and Roman Catholic cathedrals, exchange, custom-house, chamber of commerce, court-house, Queen's College, etc. There is a naval dockyard at Haulbowline, an island within Cork harbor. Pop. municipal borough, 80,124; parliamentary borough, 104,496.

Cork, the external bark of a species of oak (*Quercus suber*) which grows in Spain, Portugal, France, Italy, Tunis, Algeria, and Morocco, and is distinguished by the cellular texture of its bark, and the leaves being evergreen, oblong, somewhat oval, downy underneath, and waved. The area over which the culture extends is about as follows: Portugal, 600,000 hectares; Spain, 300,000 ha.; Italy, 80,000 ha.; France and her African possessions, 661,000 ha., of which 426,000 are in Algiers and 82,000 in Tunis. The cork oak grows in forests in the company mostly of firs and evergreen oaks, but in a part of Tunis there are forests consisting entirely of cork oaks. The bark of these Tunisian forests is said to be of an extraordinarily excellent kind. France, Great Britain, Germany, and the United States receive about 85 per cent of the total production of cork. Germany, Russia, and the United States have no prohibitory duties on importation of cork and cork goods, and admit the material free or with only a trifling impost. Great Britain also permits of the free entry of cork and draws most of its supplies from France, Spain, and Portugal. The last named takes the chief place in cork productions, producing nearly one half of the total growth of the bark — about 450,000 quartels out of the million produced. The greater part of this — perhaps three fourths — is the crude bark, while the remainder is in manufactured stoppers. Spain exports only manufactured wares. In the collecting of cork it is customary to slit it with a knife at certain distances, in a perpendicular direction from the top of the tree-trunk to the

bottom; and to make two incisions across, one near the top and the other near the bottom of the trunk. For the purpose of stripping off the bark, a curved knife with a handle at each end is used. Sometimes it is stripped in pieces the whole length, and sometimes in shorter pieces, cross cuts being made at certain intervals. In some instances, after the perpendicular and transverse incisions are made, the cork is left upon the trees until, by the growth of the new bark beneath, it becomes sufficiently loose to be removed by the hand. After the pieces are detached, they are soaked in water, and when nearly dry are placed over a fire of coals, which blackens their external surface. By the latter operation they are rendered smooth, and all the smaller blemishes are thereby concealed; the larger holes and cracks are filled up by the introduction of soot and dirt. They are next loaded with weights to make them even, and subsequently are dried and stacked, or packed in bales for exportation. In the course of eight or nine years the same tree will yield another supply of cork.

The uses of cork were well known to the ancients, and were nearly the same as those to which it is applied by us. Its elasticity renders it peculiarly serviceable for the stopping of vessels of different kinds, and thus preventing either the liquids therein contained from running out, or the external air from passing in. The use of cork for stopping glass bottles is generally considered to have been introduced about the 15th century.

The practice of employing this substance for jackets to assist in swimming is very ancient; and it has been applied in various ways toward the preservation of life when endangered by shipwreck. The cork jacket used to preserve the lives of persons in danger of drowning may be constructed as follows: Pieces of cork about three inches long by two inches wide, and the usual thickness of the bark, are enclosed between two pieces of strong cloth or canvas, and formed like a jacket without sleeves; the pieces of cloth are sewed together round each piece of cork, to keep them in their proper situations; the lower part of the jacket about the hips is made wide enough to give freedom to the thighs in swimming; and the whole is made sufficiently large to fit a stout man, and is secured to the body by two or three strong straps sewed far back on each side, and tied before; the straps being thus placed to enable any wearer to tighten it to his own convenience.

The floats of nets used for fishing are frequently made of cork. Pieces fastened together make buoys, which afford direction for vessels in harbors, rivers, and other places. In some parts of Spain it is customary to line the walls of houses with cork, which renders them warm and prevents the admission of moisture. On account of its lightness cork is used in making artificial legs; and from its being impervious to water it is sometimes placed between the soles of shoes to keep out moisture.

In the cutting of corks (when they are made by hand, and not, as is now generally the case, by machinery), the only tool employed is a very broad, thin, and sharp knife; and as the cork tends very much to blunt this, it is sharpened on a board by one whet or stroke on each side after every cut, and now and then upon a common whetstone. The corks for bottles are cut lengthwise of the bark, and consequently the pores lie across. Bungs and corks of large size are cut in a contrary direction: the pores in these are therefore downward — a circumstance which renders them much more defective in excluding air than the others. The parings of cork are used for making Spanish black, and largely in the manufacture of linoleum and similar goods.

Corleone, kōr-lā-ō'nā, Sicily, a town in the province of Palermo, and 22 miles south of the city of Palermo, near the source of the Belici. It is well built, has several churches and convents, a prison, royal college, and some other public edifices. The inhabitants are principally engaged in agriculture. Pop. about 15,000.

Corleone, a novel by Francis Marion Crawford, published in 1897. It is the fourth in the 'Saracinesca' series of modern Italian stories. The scene is mainly in Sicily. The leading character is Don Orsino, son of Giovanni Saracinesca and hero of 'Sant' Ilario.' The novel takes its title from the fact that Vittoria, the Sicilian heroine, is of the Corleone race.

Cor'liss, George Henry, American inventor: b. Easton, N. Y., 2 June 1817; d. Providence, R. I., 21 Feb. 1888. The construction of stationary steam-engines was revolutionized by his improvements and a single engine made by him moved all the machinery in the Centennial Exposition of 1876.

Corliss Engine. See STEAM ENGINE.

Corm, or **Cormus,** in botany, the dilated base of the stems of some plants, as the crocus, cyclamen, etc. It is commonly called bulb or root tuber, but is actually neither.

Cormon, Fernand, fār-näṅ kôr-môṅ, French painter: b. Paris 22 Dec. 1845. He studied under Cabanel, Fromentin and others, and in 1875 he received the Prix de Salon; in 1887 a medal of honor at the Salon of that year; in 1889 the Grand prize at the Paris Exposition, and became an officer in the Legion of Honor. His best-known works are: 'The Stone Age' (1884); 'The Victors of Salamis' (1887); other works of his are 'Cain' (1880), and 'The Raising of the Daughter of Jairus.' His portraits have given him a high reputation in that branch of art.

Cormoran, a giant in the nursery tale 'Jack, the Giant-killer.'

Cor'morant (a corruption of the French words *corbeau marin*), the trivial name of a genus of aquatic birds included by Linné under *Pelecanus,* but properly removed thence by Brisson, to form a distinct genus, denominated *Phalacrocorax.* The cormorants constitute a family *Phalacrocoracidæ* of the order *Steganopodes.* They have the hallux united to the other toes by a common membrane, extending to the base of the broad nails, a condition described as totipalmate, and their feet are thus most admirably adapted for swimming; yet they are among the very few web-footed birds capable of perching on the branches of trees, which they do with great ease and security. The feet are short, robust, and rather turned outward; the legs are wholly feathered, and closely drawn toward the belly; the tarsus is naked, one third shorter than the outer toe, much compressed, and carinated before and behind. The wings are moderate and slender, with stiff quills, of which the second or third primaries are long-

est; the tail is rounded, and composed of 12 to 14 rigid feathers. In the adult the external nostrils have become obliterated, an admirable adaptation to their diving habits, and a bony style is attached to the occiput. The male and female resemble each other in size and plumage, which is remarkable for the iridescent and bronzy reflections of the black feathers; but the young, especially when about a year old, differ greatly from the adult birds.

About 25 species of cormorant are at present known, and are distributed over the whole world. As illustrating their habits those of the common cormorant (*P. carbo*) are described. Like the pelicans, to which they are closely allied in conformation and habits, the cormorants reside in numerous communities near the waters, chiefly salt, whence they obtain fish. It is scarcely possible to imagine any animal better adapted to this mode of life, since they dive with great force, and swim under water with such celerity that few fish can escape them. While engaged in this chase they not only exert their broadly webbed feet, but ply their wings like oars to propel their bodies forward, which, being thin and keel-shaped, offer the least degree of resistance to the water. They swim at all times low in the water, with little more than their head above the surface, and, therefore, though large birds, might easily be overlooked by one unaccustomed to their habits. Should a cormorant seize a fish in any other way than by the head he rises to the surface, and tossing the fish into the air, adroitly catches it head foremost as it falls, so that the fins, being properly laid at the fish's sides, cause no injury to the throat of the bird. When standing on shore the cormorant appears to very little advantage, both on account of the proportions of its head, neck, and body, and because of its awkward manner of keeping itself erect, being under the necessity of resting upon its rigid tail feathers, in which attitude they have been likened to rows of black bottles stood out to dry. But, mounted in air, these birds are of swift and vigorous flight, and when desirous of rest alight on the branches of tall trees or the summits of rocks, where they delight to spread their wings and bask for hours in the sun.

For breeding purposes vast numbers gather on precipitous cliffs and rocky islands on the ledges of which three or four eggs with white chalky shells are deposited on a bed of dry seaweed, etc. Along with those of other birds of similar habits the eggs are much sought by professional egg hunters.

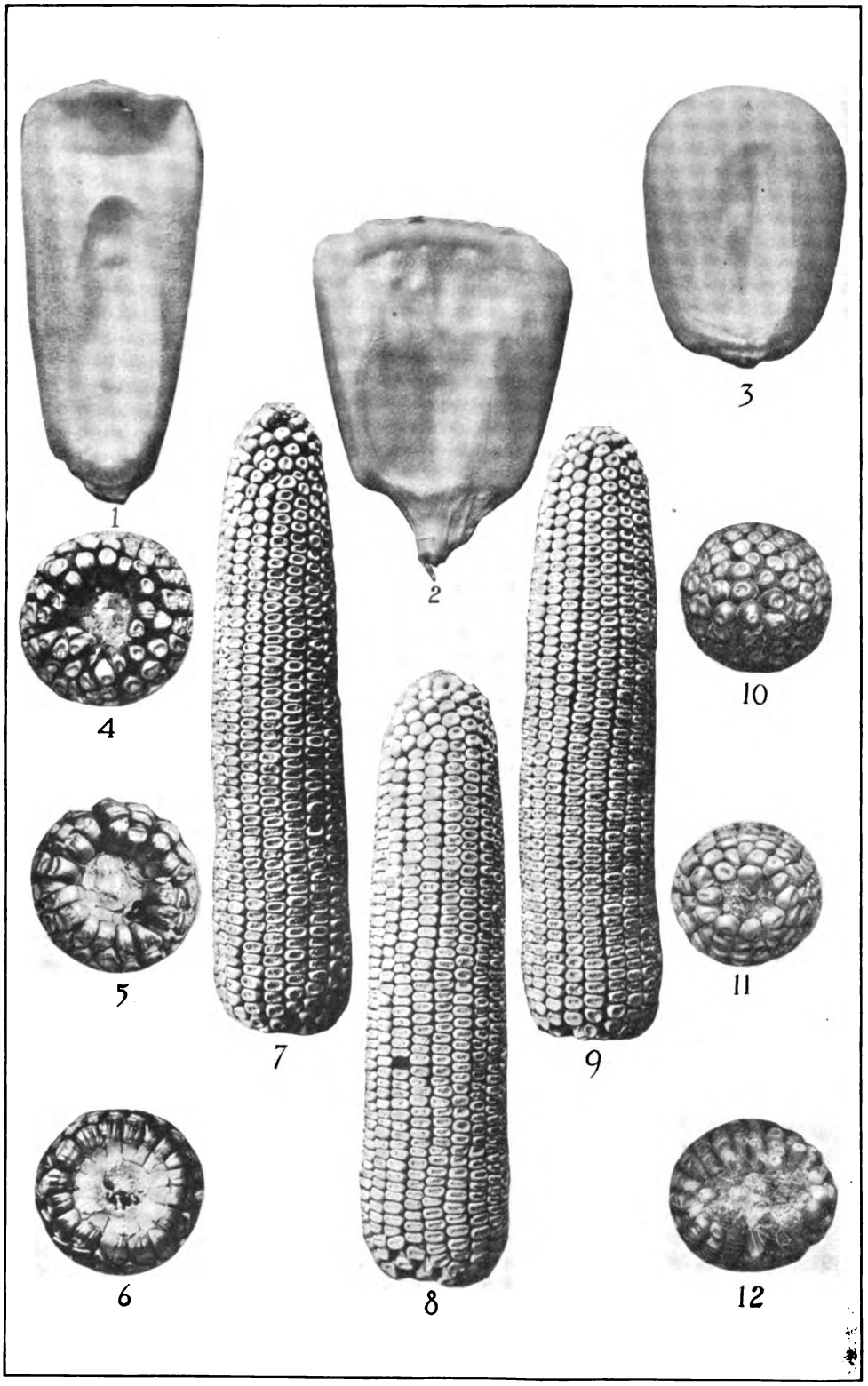
That the services of birds, which are such excellent fishers, should be desired by man, is by no means surprising, and it is well known that the Chinese and Japanese have long trained cormorants to fish for them. This training is begun by placing a ring on the lower part of the bird's neck to prevent it from swallowing its prey. After a time the cormorant learns to deliver the fish to its master without having the ring on its neck. It is said to be a very interesting sight to observe the fishing boats, having but one or two persons on board and a considerable number of cormorants, which latter, at a signal given by their master, plunge into the water, and soon return, bringing a fish in their mouths, which is willingly relinquished. In some parts of Europe frequented by species of the cormorant, they commit great depredations on the fish ponds which are kept for the purpose of supplying the tables of the proprietors, and in Holland they are said to be especially troublesome in this way, two or three of these greedy birds speedily clearing a pond of all its finny inhabitants. From their great voracity and entirely piscivorous regimen, it will readily be inferred that their flesh promises very little to gratify the epicure.

Phalacrocorax carbo, the common cormorant, or shag, is found on the coasts of both sides of the north Atlantic, in America migrating in winter as far south as New Jersey or beyond. In England this species was formerly trained to catch fish, and fishing with cormorants was a pastime much in vogue with the devotees to falconry and is still practised by a few gentlemen. The double-crested cormorant (*P. dilophus*) is confined to the northern parts of eastern North America, frequenting both fresh and salt water, and a southern form, which is now regarded as a variety of this species, is very abundant about the mangrove thickets of Florida. Cormorants are especially numerous on the Pacific coast of North America, where at least five species and several additional varieties occur, and other representatives of the family are found throughout the world.

Consult: Baird, Brewer and Ridgway, 'Water Birds of North America.'

Corn (from French *corne,* from Lat. *cornu,* a horn, from its horny nature), a hardened portion of cuticle produced by pressure. Corns are generally found on the outside of the toes, but sometimes between them, on the sides of the foot, or even on the ball. They gradually penetrate deeper into the parts, and sometimes occasion extreme pain. No part of the human body, probably, has been injured so much by our injudicious mode of dress as the feet, which have become, in general, deformed. To this general deformity of the foot belong the corns, produced by the absurd forms of our shoes and boots. They appear at first as small dark points in the hardened skin, and in this state stimulants or escharotics, as nitrate of silver (lunar caustic), are recommended. The corn is to be wet and rubbed with a pencil of the caustic every evening. It is well to have the skin previously softened. If the corn has attained a large size removal by a cutting or ligature will be proper, if it hangs by a small neck it is recommended to tie a silk thread round it, which is to be tightened every day until the corn is completely removed. In all cases of cutting corns very great precaution is to be observed. The feet ought always to be bathed previously. Mortification has, in many instances, resulted from the neglect of this precaution, and from cutting too deep. Perhaps the most efficacious remedy for corns is the application of glacial acetic acid night and morning. This acid has a peculiarly destructive effect on the epidermis, of which corns are a hypertrophy. Another simple and generally very efficacious means, is the application of a thick adhesive plaster, in the centre of which a hole has been made for the reception of the projecting part. From time to time a plaster must be added.

Corn, the generic term for all kinds of grain used for making bread, and is applied specifically to the principal breadstuff; in England to wheat, in the United States to Indian corn



1. Wedge-shaped kernel. A desirable type.
2. Square kernel. Undesirable type.
3. Round kernel. Most undesirable type.
4. Well-filled butt of ear. A desirable type.
5. Medium-filled butt of ear. An undesirable type.
6. Poorly-filled butt of ear. Most undesirable type.
7. Cylindrical ear with straight rows of uniform kernels.
8. Cylindrical ear with straight rows of uniform kernels.
9. Nos. 7, 8 and 9 illustrate a desirable kind of selection of uniform ears.
10. Well-filled tip of ear. A desirable type.
11. Partly uncovered tip. Undesirable type.
12. Most undesirable type of tip of ear, poorly filled with irregular and small kernels.

or maize, and in Scotland frequently to oats. The word is Anglo-Saxon, and occurs in similar forms in the other Teutonic tongues. The words seem to have been used in ancient times as at present, having a different meaning in different countries.

Corn, Indian, also called maize, is an endogen which grows luxuriantly in warm temperate climates. It belongs to the tribe of *Phalaridæ* of the order of *Gramineæ*, or grasses. It is known in botanical science by the name *Zea mays*. The flowers are monœcious; the male flowers forming a loose panicle at the top of the culm; the female flowers in axillary spikes, enclosed in large, tough spathes, from which only the extremely long styles — in the common species six to eight inches in length — hang out like tufts of feathers or silken tassels. The grains are large, roundish, compressed, naked, and arranged in parallel rows along the upright axis of the spike. The long parallel-veined leaves and the stalks are often used as fodder. The common Indian corn is generally believed to be a native of the warmer parts of America, where it was cultivated by the aborigines before the discovery by Columbus; but a representation of the plant found in an ancient Chinese book in the royal library in Paris, and the alleged discovery of some grains of it in the cellars of ancient houses in Athens, have led some to suppose that it is a native also of the East, and has, from a very early period, been cultivated there, and even that it is the "corn" of Scripture; although, on this supposition, it is not easy to account for the subsequent neglect of it until after the discovery of America, since which the spread of its cultivation in the Old World has taken place with a rapidity such as might be expected from its great productiveness and other valuable qualities. Columbus himself took it to Spain. When first introduced into Europe, many supposed it was brought from Asia, and it was frequently known as Turkey corn, Turkey wheat. See *Zea mays* in CORN CULTURE.

The principal Indian corn-producing countries of the world are Argentina, Austria-Hungary, Bulgaria, and Eastern Rumelia, Canada, Egypt, Italy, Rumania, Russia, the United States, and Uruguay. The combined production in the calendar year 1899 was estimated at 2,611,000,000 bushels, the yield of the United States alone being 2,078,143,933 bushels, valued at $629,210,110; in the calendar year 1900 the production was 2,105,102,516 bushels, valued at $751,220,034. In the United States alone, in the year 1901 there were raised 1,522,520,000 bushels of corn.

Corn Culture. The profitable production of corn depends upon: (1) fertility of soil; (2) conditions of climate; (3) quality of seed; (4) methods of cultivation.

Fertility of soil is the first and most important of these conditions. Three elements, nitrogen, phosphorus, and potassium are important constituents of soil fertility, and the ones which are frequently lacking in quantity in the soil's composition, or become quickly exhausted by continuous cropping without proper rotation of crops or application of manures. In those regions where corn is most extensively grown, as in the Mississippi valley of the United States, the fertility of the virgin soils seemed almost unlimited to the pioneer farmers, who in many instances grew crop after crop of corn, selling the product off the land without apparently diminishing the productiveness of the soil. However, after a half century of such practice, it has been found that the soil has been exhausted by this system of farming. The depleted soils are found to have an insufficient supply of the important elements necessary to render them fertile, and that it has become necessary to resupply them directly in the form of commercial fertilizers, or indirectly, through the use of barnyard or other like manures, or by the growing of green manure crops.

Effect of Continuous Corn Growing.— In order to show the effect of continuous corn growing on typical corn soil, the results of an experiment conducted by the Illinois Agricultural Experiment Station will be presented. In this experiment, corn has been grown on a field of the college farm for 24 years without the application of any kind of manure or fertilizer. The 24 crops have been carefully harvested and weighed, after which the stalks and ears were removed from the field. The experiment was begun 10 years before the organization of the experiment station in 1888, therefore records have been kept for only the last 14 years.

The records of yields from 1888–1901 were as follows:

Year	Ear Corn	Stover	Year	Ear Corn	Stover
	bushels	tons		bushels	tons
1888.....	60.13	1.26	1895.....	63.81	1.51
1889.....	47.15	1.21	1896.....	62.31	1.74
1890.....	41.87	1.19	1897.....	40.10	1.61
1891.....	26.67	1.23	1898.....	18.11	1.39
1892.....	30.92	.75	1899.....	50.09	1.61
1893.....	21.73	1.04	1900.....	48.03	1.29
1894.....	34.83	1.26	1901.....	23.65	1.14

The most valuable results of this experiment will be secured in the tests of the coming 25 years, but the present table is extremely interesting in that it points to the ability of the prairie loam soil to sustain a high yield for a comparatively long period, and the fact that there are strong indications of exhaustion of plant food. In adjoining fields under a system of rotation and manuring, the yields show that by comparison the field continuously in corn is being slowly but surely depleted of its fertility. There is a similarity between these results and the results of the first 25 years tests of growing wheat year after year without manures in the Broadbalk field at Rothamstead, England. In these latter experiments, the second 25 years of wheat cropping showed an increasingly rapid decrease of yield. Further experiments revealed the fact that it was very difficult to bring this exhausted soil back to a state of profitable productiveness. It has become a generally accepted fact that continuous cropping without manures of any kind exhausts the fertility of the soil, injures its mechanical condition, and eventually becomes an unprofitable practice to pursue.

Methods of Restoring or Maintaining the Fertility.— There are several methods which are practised with economical results in the corn belt of restoring exhausted corn lands to a fertile condition, and of keeping up the fertility

of such soil under cultivation. It will be impossible to treat of many of them in detail here, so that only a few of the principal plans will be outlined.

Commercial Fertilizers.— The use of commercial fertilizers for corn land is limited to those soils which are lacking in one or more constituents of plant food which can be bought in the market, either alone or in combination, at a reasonable cost, usually, nitrogen, phosphorus, potassium, or lime. Their general use is limited from the fact that the cost of supplying plant food in this way is so great that the returns in crops like corn do not usually justify the outlay. Nitrogen costs about 15 cents; phosphorus, seven cents; and potassium four cents per pound, when purchased in artificial fertilizers. From the fact that a large quantity of these constituents are removed in a crop of corn it can be seen that it would be unprofitable to use them for the growing of a crop without having as a basis a soil naturally sufficiently supplied with one or more of these elements. In some cases it may be advisable to apply one or more of these constituents to correct some unusual soil condition, but the large areas which are naturally rich in all necessary elements of plant food for corn, and adapted in all conditions for growing corn, precludes their general use for this purpose by the corn growers of the United States.

Barnyard Manure.— Barnyard manure contains a large supply of plant food, and when applied to the soil not only increases its fertility, but improves the mechanical condition, or tilth, as well. The large amount of straw and vegetable matter in its composition, when decomposed and assimilated by the soil, improves its condition for corn crops. In fact it has come to be a generally followed practice among our most progressive farmers to feed the corn crop to live stock, carefully conserving the manure for application to the soil. In such cases, the best plan seems to be to compost the manure, and after it has become well-rotted, to spread it on the field while the soil is frozen in winter, plowing it under to a good depth in the spring. This practice can be followed only where local conditions permit. On soils that leach or are carried off by rains it is necessary to apply the manure at the times when it will not be washed off the soil by winter or spring rains, or wasted from other causes. In such cases, the manure may be spread on grass lands or pastures in the spring or summer, the field being plowed for corn the following autumn or spring. About 10 tons of well-rotted manure per acre is considered a sufficient application for ordinary corn land.

Green Manure Crops.— The most important method of maintaing the soil's fertility is by the use of green manure crops, such as, clover, cowpeas, soy beans, and alfalfa. These crops add to the supply of nitrogen in the soil under favorable conditions and when plowed under improve its tilth. When harvested they constitute a valuable feed for live stock. The addition to the plant food supply of the soil by the growth of leguminous crops is accomplished in two ways: Firstly, by the presence and growth of certain organisms peculiar to these crops, inducing the development of root tubercles. These organisms have the power of drawing upon the free and unavailable nitrogen of the atmosphere and converting it into an available and useful condition for plant food. Secondly, from the fact that these crops root deeply as a rule, drawing upon plant food in the soil, which is not in position for use by ordinary crops. This food is assimilated by the plants, so that when the crop is plowed under the decomposition of the roots and stems, leaves this plant food where it can be gotten at and used by corn or other plants. In addition to the above desirable qualities, these green manure crops tend to break up and make heavy soils more porous. In this way more air and water is admitted into the soil, resulting in the bringing into usuable form some of the otherwise insoluble plant food. Clover can be seeded in the corn at the time of the last cultivation, and if the season is favorable it will make sufficient growth during the rest of the summer and autumn, even in the shade of the corn plants, so that by plowing under the crop late in the fall or early the next spring, considerable benefit will be derived from it. The best plan, and the one most usually followed in the corn belt, is to seed the clover in an oat crop, allowing the clover one year's growth, then plowing under the clover crop in the fall, corn being planted the next year. If it is desirable to harvest the clover hay for feed, it is necessary to follow the latter plan. A second crop containing seed may be secured the same season. However, the removal of two crops from the field in a season, takes out of the soil a large amount of plant food, so that the beneficial effect of the growth of the clover is partly or largely lost. If the clover crop is harvested instead of being plowed under, and the hay fed to live stock and the manure conserved and spread on the fields which are to be planted in corn, the benefits of the clover crop can be retained. If the clover crop is plowed under it should be covered to a good depth, long enough before the corn crop is planted to allow decomposition to take place, so that the mass of plants will not interfere with the natural condition of the soil.

Cowpeas and soy beans are leguminous crops, introduced into this country recently from Asia, and are coming to be grown on a large scale as green manure crops for the preparation of the land for corn. They are somewhat similar in their habits of growth so far as season is concerned, but the soy bean seems to be especially adapted to a rich prairie loam soil, while the cowpea is more suited to clay or sandy lands. The seed of these crops can be sown in the corn between the rows after the last cultivation, either broadcast and then harrowed in, or drilled in with a small drill which runs between the corn rows. In such cases the crops of beans or peas should attain about a two thirds normal growth in an ordinary season with a reasonable amount of rainfall. The crop can then be plowed under, either late in the fall or early the next spring, preparatory for corn. They can also be planted alone, and as they yield valuable returns, this practice seems to be the better plan. In this case it requires an entire growing season to secure a crop, but if the crop is harvested either for hay or seed, and the manure obtained from feeding the crop to stock be returned to the soil, the benefit is such as to justify the use of the land for this purpose. Other crops such as alfalfa, vetch, horse beans, and various other species of leguminous plants

are used for improving the soil. Local experiments are necessary to determine the crop best suited to any given set of conditions, from the fact that there is no general crop adapted to all conditions. The exact nature of the benefits of a rotation of such crops with corn have not been recorded in any given set experiments, but numberless instances might be cited of an increase of from 5 to 25 bushels of corn per acre as the result of the growing of a leguminous crop the preceding season.

In summing up the important points as regards the condition of the soil for corn, it may be said that continuous cropping without rotation or manuring seems inadvisable, and results in the exhaustion of the fertility of the land to such an extent as to render it an expensive process to bring it back to a state of productiveness. Commercial fertilizers are expensive agents for maintaining the food supply for corn, and cannot be successfully used except for local or peculiar conditions or for the correction of some unusual occurrence, as the acidity of certain bog soils, or the small alkaline areas in the fields in certain sections of the middle West. The most successful and profitable plan adapted to most conditions seems to be a rotation of corn with some legume, preferably one which can be used to supplement corn as a ration for live stock, and the feeding of all crops followed by the return to the soil of the plant food in the shape of composted manure.

Climate.—*Zea mays* originated in all probability in Mexico. From Mexico it was carried North by the Indians by means of barter and trade, so that when the early explorers of America visited the section now included in the United States they found considerable areas under a crude system of corn cultivation by the Indian tribes. Upon the development of the vast sections of the Mississippi valley, corn became the principal crop, and is now recognized as the leading American cereal. From America this crop has been carried to all continents of the world, and is grown to a greater or less extent in most of the leading countries, especially in those in which the climate and soil conditions are similar to those of our Mississippi valley region. Corn flourishes best in those sections having an annual rainfall of about 30 inches, or an artificial supply by irrigation, and a season of about 120 days for the maturing of the larger types. The crop seems to reach its best development in the temperate regions, where a part of the season, the time of greatest growth, has warm days and nights. Under such conditions the plants grow with great rapidity. Corn readily responds to climatic conditions; namely, by taking a late variety to a region of short seasons, an early variety can be developed by selection, and *vice versa*. For this reason, we have races of corn which vary greatly in their characteristics, due to the adaptation to climatic conditions. It is not a good policy to suddenly remove a race, suited to a peculiar set of conditions, to very different conditions. Under such circumstances the crop may fail to mature, or may develop some quality detrimental to its value. It is probable that by selection, races may be improved for any given corn region, and that by continued breeding and selection, these races may be further improved without resource to the importation of seed from other sections. However it seems that there are certain conditions in which corn naturally reaches its highest and fullest development, and it is probable that in those sections most advance will be made in the permanent improvement of corn. It may be advisable for corn-growing sections not specially suited for corn growing to occasionally secure a small supply of breeding seed from the best corn regions, which after a few years' growth will have become suited to the new conditions and may have a better type than those which have been grown in the less favorable localities.

One of the important things which has been neglected for the most part, in so far as climatic conditions are concerned in corn culture, is the systematic comparison of different races from different regions, in order to find those races which are the best naturally suited to local conditions. It is probable that before breeding is begun, it would be advisable to make such a test in order to determine the best breeding stock for permanent improvement.

Quality of Seed.—There are a number of races of dent corn (*Zea indentata*) which for the most part are the result of the selection of sports or striking variations. The individuals of these races are not uniform, and from the fact that corn is normally cross fertilized, a pure race frequently becomes mixed with other races. In fact there are practically no pure races under general cultivation, and owing to the difficulty of maintaining the pure type, little attention has been given to systematically breeding these races. As a rule the seed corn used for planting the crop of the world is subject to little, if any, intelligent selection of seed ears. Considerable fraud has been practised by unscrupulous seed dealers in the past, who in order to humbug the public, bought up ordinary corn, gave it a fancy name, advertised it widely without careful tests and through extravagant claims for its productiveness, obtained a wide sale, with consequent loss to the farmers buying the seed, but with considerable financial gain to themselves. An illustration of this practice is found in the case of a certain seed dealer in the corn belt who bought up a large crop of ordinary southern corn. This corn was not adapted to the conditions of growth in the corn belt and was an unprofitable type of corn for any set of conditions. The dealer widely advertised that he had secured this seed as the result of growing for a number of years a few ears of seed which he had discovered buried in an Indian mound. This seed was claimed to have probably been preserved for hundreds of years in the mound and according to the statements of the dealer, when planted gave marvelous results, yielding several hundred bushels of ear corn per acre. The seed corn was sent out shelled to the farmers so that little idea could be gained of the character of the ear, or the habit of growth. This seed was sold for several dollars per bushel, and as a result of the wide advertising, many thousands of bushels were distributed to growers over the corn belt. When the seed was planted only a small per cent sprouted, the plants grew into excessively large stalks bearing small ears, and only a small per cent of the stalks produced ears at all. As a result, the crop was almost a total failure and caused a great loss to the growers. This one example is typical of a general practice in the past, consequently most corn growers became

skeptical of all attempts to improve the races of corn.

Pioneer Corn Breeders.— Previous to 1900, little was done in the way of the systematic improvement of corn. A few men early in the last century realized the value of carefully selected seed, and began to select their corn with reference to some type particularly desirable to them. One of these men was James Leaming, of Wilmington, Ohio, who began the selection of the ordinary yellow corn of the Miami valley for larger and heavier ears. His idea was to secure ears with small cobs, deep grains well filled over the tips and butts, which would mature under his conditions of soil and climate. In order to get early maturity he naturally selected a rather tapering type of ear. This seed was carefully preserved during the winter, and all irregular kernels, such as tip and base kernels, were discarded before planting. Mr. Leaming began this work about 1825, and continued the selection of his type of seed for more than half a century, keeping the race as pure as possible. Some of the pioneers of Illinois, Iowa, and other western States, carried seed of this race with them from Ohio to their new homes. It was found that under the very favorable conditions of the Mississippi valley this race improved in size of ear, depth of kernel, and productiveness. Naturally, it was carried over a large territory and during the past few years has been the subject of considerable attention by corn breeders who have effected further and marked improvement in the feeding quality and yielding power. The Improved Leaming strains of to-day bear little resemblance to the original Ohio stock, and are living evidences of the possibilities in careful selection of seed corn.

Another pioneer in the work of the improvement of corn and the establishment of new races was James Riley, of Thorntown, Indiana. Mr. Riley began the selection of the ordinary white corn of his community about the middle of the last century. He was convinced that by the selection of large well-developed ears for seed, and the weeding out of barren stalks before pollination, a large-eared, uniform type of corn could be secured. By persistent planting of such seed ears in isolated fields, preventing mixture with other types, he achieved success in this work, and produced a race called the Boone County White, which stands foremost among all races of white corn grown in the corn belt. Other races were produced by Mr. Riley, among them a yellow type, which he called Riley's Favorite. The production of this race is interesting because it illustrates the development of new types by crossing, and fixing of type of the hybrid by selection. He crossed a large and late southern race of yellow corn on a small, early maturing, northern yellow race, his aim being to secure a new race having a medium or large ear and early maturity. He accomplished this object successfully, and the Riley's Favorite is now largely grown in northern parts of the corn belt.

Improved Races are Most Productive.— The results of these systems of selection are shown by the comparative tests of races of corn at the Illinois, and other State agricultural experiment stations. It has been found that during a series of 10 years' tests of comparative yields per acre, the Leaming and Boone County White varieties of corn have consistently and on the average for 10 years outyielded all other races. In fact, it has been shown that under widely different conditions, these two races have yielded more than double the amount of the ordinary types of corn. It has further been shown that corn growers who have selected these races for feeding purposes, have naturally selected the types which were most beneficial for feeding purposes, and have developed strains which have a chemical composition better suited for feeding than the ordinary races of corn now grown in any region.

The benefits of improved seed corn are that larger returns are secured with the same effort required to produce ordinary and smaller yields. It does not cost any more to grow a race of high yielding power, possessing a desirable proportion of protein for feeding purposes, or of oil and starch for manufacturing purposes, than to grow the ordinary types of corn. Taking into account the great area devoted to corn in the United States, about 100,000,000 acres, even a slight increase in yield per acre, or a small improvement in quality, means an enormous increase in the profit from breeding. The past five years have demonstrated the practicability of such improvement beyond a doubt, and the results obtained on the farms and by experiment stations, have attracted world-wide attention.

Corn Breeders' Association.—The organization of the Illinois Seed Corn Breeders' Association, in June 1900, marked the beginning of a widespread attempt to put corn breeding on a similar basis to that of live stock breeding. In fact, it has been found that corn breeding follows the same general laws as the breeding of animals. In other words, corn can be bred like cattle. This organization was founded by a few men, extensive growers of corn, and in most cases, noted breeders of live stock, who resolved to begin a careful selection of their own seed for planting, and if favorable results were obtained to offer such seed for general planting in regions suited to the development of the races they selected for breeding. All seed sent out by members of the association was carefully inspected by an officer of the State experiment station, tested for vitality, and examined for uniformity, trueness to type, and freedom from mixture with other types of corn. All seed sold was sent out in the ear so that the man who purchased the seed could see for himself the type and character of the seed sent to him. The success of the plan was so great that other States at once followed the lead of this organization, and at present Iowa, Kansas, Nebraska, Indiana, and Maryland have corn breeders' associations, comprised of men who are systematically selecting their corn, for the most part in co-operation with the State Experiment Station. By means of such organized efforts, States have appropriated large sums of money for further experiments in corn breeding and culture so that progress is being made in this work at a rapid rate and valuable results obtained of wide application and importance.

Some Standard Races of Corn.— The Illinois Seed Corn Breeders' Association recognize eight distinct races of corn, which are the basis for the development of many strains produced by individual breeders. These races, date of beginning selection, originators, and place or origin are as follows:

Boone County White, 1876, James Riley, Thorntown, Indiana.

Silver Mine, 1890, J. H. Beagley, Sibley, Illinois.

White Superior, 1880, P. R. Sperry, Monmouth, Illinois.

Leaming, 1826, J. S. Leaming, Wilmington, Ohio.

Reid's Yellow Dent, 1846, J. L. Reid, Delavan, Illinois.

Golden Eagle, 1871, H. B. Perry, Toulon, Illinois.

Riley's Favorite, 1885, James Riley, Thorntown, Indiana.

Pride of the North, about 1890, F. A. Warner, Sibley, Illinois.

This ear was carefully planted in an isolated patch, and the crop carefully harvested and planted the next season in isolated fields. From this source the seed was obtained for the first general distribution, which has been followed by breeding experiments, and breeders taking up the race for continued improvement by selection.

In order to show some of the characteristics which go to make up a type, which are considered in the study of a race, the following table of characteristics of seven leading races of corn is presented.

One further result of the organization of corn breeders' associations has been the holding of exhibits of samples of corn selected by

NAMES OF VARIETIES.

	Reid's Yellow Dent	Golden Eagle	Riley's Favorite	Leaming	Boone County	Silver Mine	White Superior
Ear: Shape	Slowly tapering	Slowly tapering	Slowly tapering	Tapering	Cylindrical	Cylindrical	Slowly tapering
Length	10 inches	9 inches	9 inches	10 inches	10 inches	9 inches	10 inches
Circumference	7 inches	7 inches	7 inches	7 inches	7½ inches	7 inches	7 inches
Kernel: Condition	Firm upright	Loose upright	Firm upright	Firm upright	Firm upright	Firm upright	Firm upright
Color	Light yellow	Deep yellow	Deep yellow	Deep yellow	Pearl white	Cream white	Starch white
Indentation	Medium smooth	Very rough	Rough	Rough	Rough	Very rough	Medium rough
Shape	Long wedge	Broad wedge	Medium wedge	Medium wedge	Medium wedge	Broad wedge	Very broad wedge
Rows: Number	18-24	16-20	16-20	16-24	16-22	16-20	18-20
Space	Narrow	Medium	Medium	Medium	Medium	Narrow	Medium
Arrangement	Pairs	Distinct	Pairs	Pairs	Pairs	Pairs	Pairs
Butts: Filling out	Deeply rounded, compressed	Moderately rounded, compressed	Moderately rounded, compressed	Moderately rounded, compressed expanded	Moderately rounded, compressed	Moderately rounded	Shallow rounded, depressed
Tip: Filling out	Regular rows of kernels	Regular rows of kernels	Regular rows of kernels	Irregular rows of kernels	Regular rows of kernels	Regular rows of kernels	Regular rows of kernels
Shank: Size	Small	Small	Small	Medium	Medium	Small	Medium
Cob: Size	Medium	Small	Small	Medium	Medium	Small	Medium
Color	Deep red	Deep red	Deep red	Deep red	White	White	White
Per cent of corn	88	90	90	88	86	90	88

From the growing of these races under widely varying conditions, and the effect of selection by individuals having different types in mind, a great many strains have been developed, which in time will probably come to be recognized as distinct races. New races will probably spring up as a result of the selection of naturally prepotent individuals whose projective efficiency is great enough to impress distinct characteristics upon the offspring and create new and dominant types. An illustration of this method of origin of new and dominant races from striking individuals, is found in the history of the Silver Mine race. According to the statement of the originator it sprung from a single ear, which was of such perfection that it attracted this grower's attention among an exhibit of several thousand ears of corn.

men who compete for certain prizes. In several instances, the number of samples brought together in such exhibits has exceeded several thousand, and in one or two instances the number of samples of 10 ears each has reached 10,000. The effect of such exhibits has been to awaken a wide general interest in improved types of corn, and the methods and standards for judging these samples. During the past 10 years, score cards and standards of perfection have been devised, which by continued revision have been developed to a state of great usefulness. The use of the score card is to compare on a uniform basis, individual samples of a given race of corn. Owing to the fact that in the production of races for different purposes, and for different conditions, characteristic differences in shape, size, and other qualities have

been developed, it has become necessary to have a standard for each of the established races.

The Score Card.— The score card in use in Iowa illustrates the general type of score card, and in order to illustrate the work of judging corn, this score card is outlined as follows:

Characteristics	Number of points
1. Trueness to type or breed. Characteristics	10
2. Shape of ear	5
3. Color of ear	5
Color of grain	5
4. Market condition	5
5. Tips	10
6. Butts	10
7. Kernels — Uniformity	5
Shape	5
8. Length of ear	10
9. Circumference of ear	5
10. Space — Furrow between rows	5
Space between kernels at cob	5
11. Proportion of corn to cob	15

In order to use the card intelligently the following explanations are necessary:

1. The sample of 10 ears should be uniform and conform to the race characteristics.

2. The shape of ear should conform to race type.

3. Color of grain should be the characteristic color of the race. Single kernels which vary in color from the rest of the ear indicate xenia and consequent crossing of types. In general, yellow ears should have red cobs, and white ears, white cobs.

4. The ears should be sound, free from injuries, especially those due to germinating kernels and decomposed grains.

5. The tips should be well filled out with uniform-sized kernels. This point should be carefully considered, as a good ear may have from accident of season, or other reason, not received enough pollen to fully fertilize all the kernels on the cob. The ear is an axis upon which the kernels are borne. While an ear which is fully filled out over the tip and butt is preferable to one not so well covered, it may be that the uncovered tip is the presence of a variation of unusual length which developing out of the ordinary time of pollination has not received pollen. It may be desirable to preserve this type, from which in time a type may be developed, producing sufficient pollen and at the proper season for the fertilizing of the entire lengthened ear.

6. The butts of the ears should be regularly filled out with uniform kernels, and the size of the opening to the cob indicates the size of the shank attaching the ear to the stalk. Too large shanks are objectionable on account of difficulty in husking, while too small ones are likely to let the ear drop off the stalk before maturity and cause a corresponding loss to the grower.

7. One of the most important points in the selection of seed ears is the uniformity of kernels in the ear, and as between individual ears. Any irregularity is likely to give rise to uneven stands of corn in the field from lack of a regular drop in the ordinary planter. They are further undesirable because they are usually subject to greater or less loss of vitality. The most desirable condition is where the ears are uniform in number of rows of kernels, and the kernels are uniform in shape, size and general characteristics on the individual ears.

8. We have come to believe that an obtuse wedge-shaped kernel of proper proportions is the most desirable type. Such kernels should have straight sides and edges so that they fit together on the ear with the least possible space between the individual kernels or rows of kernels from the tip to the tops of the kernels. Space between the tips of the kernels results in thin pointed kernels, indicating a lack of constitution and a loss in weight of kernels, making the so-called chaffy ear. Space at the tops of the kernels results in a loss of weight, and is usually accompanied by large rounded kernels, correlated with few rows of kernels on the ear. Therefore in a well-developed ear there should not be any space between the kernels.

9. The proportion of corn to cob indicates the relative size of cob and weight of shelled corn. In general it is desirable to have as large a proportion of corn to cob as is consistent with the total size of ear. The desirable size of ear will depend upon conditions, but other things being equal, the ear should be as large as will mature under the conditions of soil and climate in any given locality.

10. The proportion of corn to cob, the circumference of ears, and the length of ears is given in the foregoing table of characteristics for the standard varieties. Variations in these standards will be developed upon the growing of different strains under different conditions.

Corn Breeding.— Systematic corn improvement by breeding and selection has accomplished results of very great benefit to the corn growers of the United States. The principle underlying the methods of selection is to plant the individual ear by itself so that record may be kept of its production and general performance. The best ears are selected for an isolated field so that intercrossing with undesirable types may be prevented. The ears selected for breeding stock are usually planted in rows, or plats, an ear to a row or plat, and care taken to secure the best possible development of the crop. At the time of tasseling, the tassels of all barren stalks, suckers, and other undesirable stalks are removed in order to prevent the desirable ears from possible pollination through this source. At the end of the season, the rows or plats are harvested separately and the yield of each carefully determined. The seed for the next year's breeding field is selected from those rows which give the highest yield of desirable type of ears. The next best seed may be used for planting the general crop, or for planting a field for the production of general seed corn. In this way, a record may be kept of the development of the ears used for seed breeding, and a pedigree system established for the lines which show desirable characteristics. Such corn registers make it possible for a buyer of seed corn to secure pedigreed strains, much in the same way that the breeder of live stock secures a pedigree of the animals he purchases for breeding purposes. Such a system will do away in a large measure with any fraudulent practices and permit the corn grower to secure seed of known productiveness.

Vitality of Seed.— One of the most important factors entering into the production of the corn crop is the vitality of seed. In planting the ears in individual rows or plats, one of the most notable facts which strike the observer, is the great irregularity of size of plants in the

different rows. One row, for instance, will be on the average a foot higher than the adjoining row and so on throughout the entire field. This irregularity in growth and finally in productiveness was not shown in the seed ears, because in most cases, the seed ears were so carefully selected for uniformity that they were absolutely alike to the casual observer. This difference in vigor of growth is due, in great measure at least, to differences in the vitality of the seed. This vitality means the life of the seed, which is affected by age, storage, heredity, and many other factors. The degree of vitality by the seed ear can be partially measured before the seed is used for planting. No absolute measure can be made of the value of the seed ear, but a comparatively accurate idea may be gained of the vitality by means of the germination test. We believe that the kernels in the individual ear are considerably alike in composition and in vitality, in fact all general characteristics. It has been found that there is a slight variation between the individual kernels in the ear, but that this variation is not as great as the variation between different ears; so that by testing the vitality of the individual ears the most vigorous may be picked out for planting the breeding field. This test can be made by taking out three kernels from near the tip, three from near the middle, and three from near the butt of every ear. In cases where possible, it is more desirable to shell off two rows of kernels from each ear and test all of the kernels in each row. The kernels should be planted in moist sand, point down, or laid between layers of moist cloth. In this moist condition, and under a temperature of about 70° F., 95 per cent of the kernels should sprout inside of three days, and should have sprouts one inch long at the end of five days. If the seed germinates more slowly than this standard, it is an indication of weakened vitality. In other words, the time required for germination is the indication of the degree of vitality. Weak seed of slow germination should be discarded, as it results in a poor stand, the most frequent cause of loss of profits to the grower.

Effect of Methods of Storing Seed Corn.— The usual practice among corn growers is to select the seed corn out of the general crib, in the spring just before time for planting. In some instances, especially during years unfavorable for the maturing of the corn crop, it has been found that such seed was weak in vitality and only a partial stand was secured. In fact, it has been found that seed corn containing a high per cent of moisture is most easily affected by cold weather, while well-dried seed is capable of withstanding cold with the least possible loss of vitality. The amount of moisture in seed varies with the conditions of maturity, immature seed containing an unusually large amount of water, while fully matured seed contains a low per cent of moisture. The dryness of the seed when harvested does not always indicate the amount of water contained, as corn absorbs moisture from humid atmospheres, and imparts it to dry air. That the condition of the seed as regards the effect of cold and other factors upon the vitality is correlated with productiveness is shown by experiments conducted by Mr. C. P. Hartley, of the United States Department of Agriculture, upon the keeping of seed corn during the winter. In this experiment Mr. Hartley tested the yield of seed corn which was fire dried, namely, dried with artificial heat and kept at a steady temperature, compared with similar seed stored in the open crib, not so dried, and exposed to the atmospheric conditions of temperature and moisture. It was found that the crop from the fire-dried seed outyielded the crop from the ordinarily treated or air-dried seed, the most marked case showing a difference of 18¼ bushels in favor of the fire-dried seed, the average yields being 85.59 bushels per acre from the fire-dried in comparison with 67.34 bushels from the air-dried seed. It is probable that the condition of the seed during storage affects its vitality and in turn the yield per acre, so that it is advisable to keep the seed dry during the winter, and protected from extremes of temperature.

Methods of Cultivation.— The methods of corn cultivation vary with the conditions of soil and climate. No definite rules can be laid down for all conditions, in fact, every corn grower must determine for himself the best methods suited to his peculiar conditions. However, there are certain general principles of plant growth which hold true under all conditions, and it will be the object of this discussion to point out the practical application of some of these principles.

Methods of Preparing the Seed Bed.— The methods of preparing the seed bed for corn can best be illustrated by the results of an experiment to test this point, conducted by the Illinois Agricultural Experiment Station, during the season of 1903. The experiment resulted as follows:

EFFECT OF PREPARING THE SEED BED.

(Yield in bushels per acre.)

	Trial No.	Field	Field	Field	Av'rage
A. Plow, *drag, let lie, disk, harrow, plant..	1	65.3	71.3	49.9	
	2	72.1	77.3		
	Ave.	68.7	74.3	49.9	64.3
B. Plow, let lie, harrow, plant.....	1	77.4	96.6	43.0	
	2	70.0	74.0		
	Ave.	73.7	85.3	43.0	67.3
C. Disk, plow, drag, disk, harrow, plant..	1	72.7	134.7	46.2	
	2	69.4	73.3		
	Ave.	71.1	104.0	46.2	73.8

*By drag is meant the implement made of boards or timbers which is used for smoothing the surface of the seed bed and to crush lumps of earth.

This table and general experience goes to show that in the ordinary season, it pays to disk or stir the land before plowing, plowing to a depth depending upon the nature of the soil, and keeping the land stirred until the time of planting. This constant stirring of the soil breaks up the capillarity and prevents the escape of soil moisture, at the same time getting the seed bed in good mechanical condition for the reception of the seed.

Conservation of Soil Moisture.— In the first place it is necessary to supply the corn crop with a large supply of water for growth. It has been estimated, by careful experiments, that for every pound of dry matter produced, the plant uses 300 or more pounds of water. When one considers the great yield of the corn crop in large areas and the necessary amount of water to produce this yield, it can easily be seen how important the conservation of soil moisture be-

comes. The moisture in the soil escapes by capillarity and by drainage. In order to prevent the loss by capillarity, it is necessary to break up the soil condition which conduces to capillary action. This is practically accomplished by plowing, and continued stirring of the surface of the plowed land during dry periods, or by the use of the disk or cultivator. The loss of water by washing or drainage is prevented as far as possible by bringing the land into such condition as to readily take up and hold the rainfall and all moisture that falls upon it. This latter plan is accomplished by sub-soiling, deep plowing at the proper season, growing of such crops as clover, cowpeas, etc., in the rotation, and the addition of humus to the soil, as by plowing under corn stalks, straw, barnyard manure, or other means. When the soil is in good condition and rich in plant food, it is probably in the best possible condition to retain the soil moisture for the use of the crop.

Thickness of Planting.— The thickness of planting best suited to give the most profitable results will depend upon the race of corn, the nature of the soil, the character of climate, the purpose for which the crop is produced, and other factors. However, if yield alone is considered, the following table gives the most reliable data yet obtained on this point:

EFFECT OF THICKNESS OF PLANTING.

(Yield in bushels per acre.)

No. stalks per hill	Field 1	Field 2	Field 3	Field 4	Field 5	Average
1	28.7	41.5	42.6	55.5	36.3	40.9
2	55.0	79.9	67.3	72.8	53.3	65.7
3	67.4	88.8	86.6	86.2	59.6	77.7
4	73.1	82.8	90.4	88.4	53.0	77.5
5	84.5	89.1	98.8	90.2	53.0	83.1

This table indicates that which has been found to be true under general conditions that four to five stalks on good corn land with ordinary seed will give the largest yield, but where machinery is not used in harvesting it is probably more desirable to leave three stalks. With three stalks bearing large ears, less difficulty and expense will be found in harvesting, than with more stalks producing small ears.

Hills v. Drills.—There are two general systems of arranging the seed in the row generally followed, first grouping from two to five kernels in hills some distance apart, second, drilling the seed one seed in a place, along the row closely together. The practice of drilling seed corn was the early method of planting employed by pioneer farmers. In the new countries, which were comparatively free from noxious weeds, it was not found necessary or practicable to cultivate the corn fields as carefully as is now the case in the more fully developed sections. The farmers wished to secure the largest possible yield, and so drilled their seed corn in such a manner as to secure an unusually large number of stalks in the row. As a result large yields of small ears were obtained. Upon the further development of these communities, foreign weeds were introduced and with the lessened fertility of the soil due to continuous cropping, more careful methods of cultivation became necessary. Consequently, the corn for the most part, came to be planted in hills, admitting of cross cultivation, and frequent stirring of the soil keeping the surface comparatively level. In tests of the two systems, equal number of stalks being retained in the hilled and drilled rows, there has been found to be little difference in the yield per acre.

Lister v. Planter.— In some sections, particularly in the States of Kansas and Nebraska, the seed corn is planted with listers. A lister is a plow and planter combined, which opens a furrow, drills the seed corn in this furrow, and covers the seed at the same time. It is therefore the means of planting large areas in a comparatively short time and at a small expense. From the extensive use of the lister in these regions, with apparently good results, the practice has spread to other States where it is now under trial. Experience has suggested certain modifications of the original simple plan, one of which is to plow the land early in the spring, and when ready to plant, use the lister instead of the ordinary methods of preparation of the seed bed and planter. Another method is to open up furrows through the fields with the lister, very early in the spring, without planting, then later list again, opening new furrows between the first ones in which the seed is drilled. It has been found that in these older districts this method is not as successful as the plowing of the land and thorough preparation of the seed bed. It corresponds to planting the seed in a dead furrow. Where it is necessary to plant the seed deep in the ground to get moisture for germination, it is probable that this system may be valuable. On sandy soils it will probably succeed, while in the heavier clay or clay loam soils, it does not give the best results.

Root Injury During Cultivation.— The vital principle of cultivation of the growing corn plant is that the plants be allowed to grow undisturbed and without competition of other plants, with sufficient stirring of the surface soil to prevent the rapid evaporation of soil moisture. In an experiment with pruning or cutting off the roots of the corn plant at the Illinois Agricultural Experiment Station, striking results followed such injury. The experiment was laid out so that one row was root pruned, the next row not pruned to serve as a check upon the pruned row, and so on through the entire plat, the root-pruned rows being repeated a large number of times and the average result obtained. The object of this experiment was to find out whether or not root injury following deep cultivation reduced the yield of the crop. This experiment was carried on for three years, and at the end of that time the results were so uniform that the object was deemed to have been obtained, and the experiment was discontinued. The pruning was done with a broad, flat, thin, and sharp spade-like instrument, which could be used to cut off the roots without injuring or interfering with the condition of the soil about the plants. The roots were cut off about six inches from the hill or about the usual distance to which the cultivator shovels are run. Three general depths were tried, two, four, and six inches, and although in individual seasons other experiments were made upon different and more depths, the results were so similar that they were discontinued and not used in the sim-

ple and striking results cited in the following table:

EFFECT OF ROOT PRUNING ON CORN. AVERAGE OF THREE YEARS' TESTS.

(Yields in bushels per acre.)

Plants not pruned	62
Plants pruned two inches deep	60
Plants pruned four inches deep	45
Plants pruned six inches deep	30

It can be readily seen without further explanation that injury to the roots interferes in the plant's development and reduces the yield.

Depths and Systems of Cultivation.— The cultivation of the growing crop presents many problems differing according to the conditions of soil and climate. The general results of four years of tests of different methods of cultivation, indicating in a general way the effect of different systems in the corn belt, is epitomized in the following table. There was found in these experiments a close correlation between the theory of cultivation and the results obtained by following out the methods suggested by the foregoing discussion.

EFFECT OF DIFFERENT SYSTEMS OF CULTIVATION. AVERAGE OF FOUR YEARS' TESTS.

(Yield in bushels per acre.)

Method	
Weeds allowed to grow	58
Weeds cut with hoe and a loose mulch made with hoe frequent cultivation	96
Two inches deep cultivation (small shovels)	90
Four inches deep cultivation (small shovels)	91
Six inches deep cultivation (small shovels)	84
Six inches deep cultivation (large shovels)	87
Gopher or blade cultivator	88
Deep early and shallow late	85
Shallow early and deep late	89
Mulched with grass	92

The results of the above trials indicate that all competition with weeds must be prevented, from the fact that they live upon the same elements of fertility as the corn plants, and in this way reduce the yield of the corn crop. Deep cultivation injures the roots of the corn plant and reduces the yield. Shallow, frequent cultivation, removing the weeds, keeping a soil mulch on the surface of the soil, gives the best results. This conclusion agrees in general with the facts of ordinary practice in well-drained and fertile soils. In very weedy fields, undrained and in poor condition, it may be necessary to cultivate deeply in order to destroy the weeds, open the soil to the air and sunshine, and allow the excessive water to drain off.

In summing up the important facts of cultivation, the following points should be emphasized:

1. The preparation of the seed bed should be such as to best conserve soil moisture, and obtain the most favorable mechanical soil condition.

2. The cultivation of the growing crop should be such as to avoid all root injury, maintaining a loose surface soil mulch, and preventing the presence of all weeds or competing plants.

3. The method of planting and caring for the crop will depend upon local conditions to such an extent that it is necessary for every grower to make a thorough study of his peculiar conditions of soil and climate in relation to his methods of cultivation.

4. The conditions of growth for the corn crop are moisture, heat, light, and plant food. The supplying of the conditions in the most favorable manner to the corn plants is the business of the grower, and will give the largest profitable returns.

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Corn-cockle (*Agrostemma githago*), a genus of the pink family (*Caryophyllaceæ*). It is an annual pubescent often-branching herb, from one to three feet tall, distinguished by its large purple flowers. Though a native of Europe and western Asia, it is now found in almost all parts of the world, frequenting grain-fields and waste places. When its seeds become mixed with those of the grain, and are ground with them, it is said the effect is to render the grain unwholesome; thus it requires to be separated from the grain by a special kind of sieve. In Germany the seed when ripe and dried is called schwartz-kümmel (black cumin), and is sold for medicinal and domestic purposes.

Corn-crake (that is, "corn crow," because of its cry), the common name in England of a small rail (*Crex pratensis*) which frequents meadow lands throughout Europe; also called landrail. The name crake is applied to various other birds of the family *Rallidæ*, which differ from the typical rails in having a shorter beak. In the United States the common rail (*Porzana carolina*) and allied species are occasionally so called. They are secretive birds, abundant in reedy swamps, and are much sought by gunners in the fall of the year.

Corn-flower, a genus of the order *Compositæ*, having about 350 species, mostly natives of Europe. It is found wild in waste places, and in ballast from Quebec to Virginia. The plant is universally known and admired for the beauty of its wreath-like circle of outer barren florets, and the splendid deep azure of their hue. It was formerly of some medicinal repute, and its blue flowers were used in domestic dyeing. In America many varieties and shades have been developed, as it is a favorite garden plant. It is also known by the names of bachelor's button, corn-bottle, witches' bells or thimbles, corn-centaury, brushes, hurtsickle, blue-bonnets, blaver, and blue-poppy.

Corn Insect-pests. The principal enemies of corn are the boll-worm (q.v.), chinch-bug, cut-worms, and certain caterpillars which bore in the stalks. In the central and southern States, notably in Kentucky and in southern Illinois, the cotton-boll worm in certain years has attacked the corn in the ear, eating the silk and afterward devouring the terminal kernels, hiding within the husk. Whole fields have thus suffered in these States, where there are two broods of the worm, the early and also the late corn faring the worst.

Cut-worms.— These caterpillars are the most insidious pests in fields when the young corn begins to sprout. One species out of many is called the corn cut-worm. It is the young of the Clandestine moth (*Noctua clandestina*). While the fully grown caterpillar has not been described, the young are more or less distinctly marked above with pale and dark stripes, and are uniformly paler below. When first hatched they feed on the corn, descending, when half-grown, into the ground on the approach of severe frosts, and reappearing in the spring, and then beginning to grow again, attaining their full

size and pupating before the middle of July, often much earlier, so that in the New England States the moth is seen from the middle of June to the middle or end of August, during which time it lays its eggs. Remedies: before planting, the seed corn should be soaked in copperas water, and late in the autumn corn land should be plowed deeply, so as to turn up the half-grown worms, and expose them to the winter cold, and to the attacks of insect-eating birds. Cut-worms may be trapped into holes made by a stake in corn-hills. Riley advised dropping between the rows of corn at nightfall bundles of fresh-cut grass or clover, etc., which had been sprinkled with the Paris-green or London-purple solution.

The spindle-worm is a caterpillar nearly an inch long, smooth and naked, with the head and last segment of the body black. It bores into the stalk before the corn spindles and makes the leaves wither. The ravages of this worm begin while the cornstalk is young and before the spindle rises much above the tuft of leaves containing it. On examination a small hole may be seen in the side of the leafy stalk, near the ground, penetrating into the soft centre of the stalk. The obvious remedy is to cut open the stalk, and on finding the worm to pull up all the infested plants. The worm turns into an owlet-moth (*Achatodes zeæ*).

The stalk-borer is a caterpillar of a pale livid hue, with light stripes along the body; it sometimes bores into the cob of growing corn. It occurs in the central and western States in June and July, the moth (*Gortyna nitela*) flying late in August and early in September. The young worm hatches about the first of July and immediately begins to bore into the stalk, but is not noticed till the plant is destroyed. It may be detected on a close examination about the first of July, its hole being at quite a distance from the ground.

The corn-weevil (*Sphenophorus zeæ*) punctures large holes in young corn near the base of the stalk, before it has spindled, and sometimes destroys whole fields of young corn. This weevil has been destructive in Tioga County, N. Y. It pierces the young corn in numerous places, so that each blade has from one to eight holes, the size of a pin or larger; when very numerous every stalk is killed. The weevils occur about an inch under ground, hanging to the young stalks with much tenacity. This weevil (q.v.) or snout-beetle is a rather large insect, its body long, narrow, nearly cylindrical, black, with coarse gray dots or punctures; its beak is nearly a third as long as the body, curved down, the tip triangular.

The corn-maggot is the larva of a fly (*Anthomyia zeæ*) which gnaws seed corn after it is planted; the maggot is like the onion-maggot, a footless, white, cylindrical worm, the head ending in two black hooks, the jaws. This insect sometimes so abounds as to nearly ruin entire fields of corn, gnawing into the seed and causing it to rot. When fully fed and ready to transform it contracts, forming a barrel-shaped brown pupa-case within which lies the pupa or chrysalis; the fly, similar to the house-fly, but smaller, appears a week after. The seed should be soaked, before planting, in gas-tar or copperas water.

Wire-worms, the larvæ or slender hard-skinned grubs of snapping-beetles (*Elates*) often ruin to a lamentable degree the roots of corn. They are hard to eradicate, but may be caught by placing slices of potato, turnip, or apple in the beds, and examining the undersides every morning. Another insect destructive to corn is the chinch-bug (q.v.) which punctures the leaves, sucking the sap. It appears early in June, and there is a summer and winter brood, the adults hibernating in the stubble. (See WHEAT-INSECTS.) Several caterpillars live at the expense of corn, among them being the larva of the *io* moth, a great green worm, with poisonous spines, also the fuzzy larva of a moth (*Arctia arge*).

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Corn-laws, regulations of the grain trade. The best means of securing a sufficient and steady supply of breadstuffs has been a subject of great diversity of opinion, and the practice of governments has varied much at different times. The theory urged by Adam Smith, and now adopted in Great Britain, is that government should do absolutely nothing in the matter, on the ground that farmers and merchants, if unchecked, will always form correct views of their own interest, and that their interest will coincide with that of the community. This theory is supported by a large view of the facts. In ancient times famines were much more frequent than they are now, because commerce was more restricted, less regular and extensive, and subject to more frequent obstructions. A free communication between different countries, by which the abundance of the one may be brought to supply the want of the other, has proved the best security against the want of necessaries, and even of comforts and luxuries.

The Athenians had laws prohibiting the exportation of corn, and requiring merchants who loaded their vessels with it in foreign ports to bring their cargoes to Athens. The public provision and distribution of corn was an important branch of administration at Rome, and very intimately connected with the public tranquillity. The regulation of the supply of corn and the trade in the article have been a fruitful subject of legislation in modern Europe. But it is to be observed that the public solicitude and current of legislation take this direction only in populous countries, or at least those in which the population presses hard upon the means of domestic production of bread-stuffs; for a country of which, like Poland, the staple export is corn, needs to take no measures for securing a supply. In agricultural countries the object of solicitude is to supply the want of arts and manufactures, as in populous and highly improved countries it is to supply the want of food.

But the laws directed to this object have been very various, and some of them contradictory; for as in Athens so in England, at one period the laws prohibited the exportation of corn; whereas at another period, and for a very long one in the latter country, a bounty was given on the exportation; and both these laws had the same object, namely, the adequate and steady supply of the article.

Corn-salad, called also lamb's lettuce, a genus of the valerian family (*Valerianaceæ*). There are about 50 species natives of the northern hemisphere, most abundant in the Mediterranean region. Between 10 and 15 species occur in the western parts of the United States, some

of which are natives. The plant is an humble annual weed, which is used as a spring salad, especially in France and Germany. The commonest species is *V. olitoria*, which is naturalized in the United States, and often called fetticus, white pot-herb, and milk-grass. It is found in waste places and moist ground from April to July. Corn-salad is cultivated in much the same way as spinach, and is one of the first purpose as ergot (q.v.).

Corn-smut, a parasitic fungus (*Ustilago maydis*), affecting the corn. As an agricultural scourge corn smut has an unsavory reputation. In medicine it has been used for much the same purpose as ergot (q.v.).

Corn-snake (*Calopeltis*, or *Coluber, guttatus*), a snake of the family *Colubridæ* (q.v.), common in the southern United States. It reaches a length of four feet, and is reddish brown above, with a series of dark-bordered red blotches, and only a few of the most dorsal rows of scales keeled.

The southern variety of the house snake is also known under the name of corn-snake. It is readily distinguished by the entire anal plate, which is in two pieces in *Calopeltis*, the complete absence of keeled scales, and the series of confluent black and yellow rings on each side.

Cornaceæ, kôr-nā'sē-ē, the dogwood family, a natural order of plants containing about 16 genera and 85 species, chiefly natives of the north temperate zone. Some species produce edible fruits; some are valuable for the medicinal virtues of their bark, and others are cultivated as ornamental plants. See ACUBA; DOGWOOD; TUPELO.

Cornaro, Ludovico, loo-dō-vē'kō kōr-nä'-rō, Venetian nobleman: b. 1467; d. Padua 1566. From the 25th to the 40th year of his age he was afflicted with a disordered stomach, with the gout, and with slow fevers, till at length he gave up the use of medicine and accustomed himself to extreme frugality in his diet. The beneficial effects of this he relates in his book entitled, 'Discorsi della vita Sobria' ('The Advantages of a Temperate Life') (1558, the English translation of which has passed through over 30 editions). Cornaro's precepts are not applicable in their full extent to every constitution; but his general rules will always be correct. His diseases vanished and gave place to a vigorous health and tranquillity of spirits, to which he had hitherto been an entire stranger. He wrote three additional treatises on the same subject. In his work upon the 'Birth and Death of Man,' composed a few years before his death, he says of himself, "I am now as healthy as any person of 25 years of age. I write daily seven or eight hours, and the rest of the time I occupy in walking, conversing, and occasionally in attending concerts. I am happy and relish everything that I eat. My imagination is lively, my memory tenacious; my judgment good; and what is most remarkable in a person of my advanced age, my voice is strong and harmonious."

Corn'bury, Edward Hyde, LORD, 3d Earl of Clarendon, English colonial governor: d. London 1 April 1723. He was the son of the 2d earl of Clarendon, and one of the first officers of his household troops to desert from the service of King James II. to the Prince of Orange in 1688. In return, he was made governor of New York, where he arrived 3 May 1702. He was in debt, and was rapacious and bigoted to such a degree as to have left the memory of the worst governor ever appointed to the colony. Great complaints being made, he was removed from his office in 1708.

Corncracker State, a nickname of Kentucky, whose people are often called "Corncrackers."

Cor'nea (Lat. "horny," "hornlike"), the transparent concavo-convex disk which forms the anterior 5th of the globe of the eye, fitted accurately into the sclerotic or fibrous coat forming the posterior four fifths of the organ. It is a segment of a smaller sphere than the sclerotic, and is from seven to seven and a half lines in diameter; the greatest diameter being the transverse. Its anterior convex surface is covered by a continuation of the conjunctival epithelium, and its posterior concave surface is lined also with delicate epithelium pavement, which is in contact with the aqueous humor, and supposed by some to be concerned in the secretion of this fluid. The degree of convexity varies, being usually greatest in children and near-sighted persons. Its circumference is described as fitting into the sclerotic like a watch crystal into its frame. Its principal thickness, which is nearly the same at all points, is made up of six to eight layers of soft indistinct fibres, continuous with and similar to those of the sclerotic, connected together by delicate areolar tissue; these may be separated by maceration. Behind the cornea proper is an elastic transparent lamina called the membrance of Demours. Though no vessels have been traced into the cornea, their existence is indicated by the occurrence of inflammation, ulceration, and adhesion. A superficial and a deep series of vessels surround the cornea, anastomosing freely around its margin; the superficial vessels are continuous with those of the conjunctiva, and the deep with the short ciliary arteries. In diseased conditions, both sets of vessels may be prolonged into its substance. No nerves have been traced into the cornea. Its diseases are many, frequent, and dangerous to vision; from its exposed situation, it is liable to suffer from blows, cuts, and the introduction of foreign substances. It is often inflamed in various ophthalmic diseases, resulting in opacity, ulceration, increased vascularity, softening, and rupture from gangrene; these affections are tedious and difficult to cure, are often painful, and generally leave the patient with more or less obstruction of the power of vision. In old persons, the circumference of the cornea often presents a whitish zone, a line or two wide, the result of physiological causes, and not interfering with vision. The convexity of the cornea in aquatic and amphibious animals is slight, and sometimes almost lacking.

Corneille, Pierre, pē-ār kōr-nā-yė, French dramatist: b. Rouen 6 June 1606; d. Paris 1 Oct. 1684. He began his dramatic career with comedy. His first piece was 'Mélite,' played in 1629. It was followed from 1632 to 1636 by 'Clitandre'; 'La Veuve'; 'La Galerie du Palais'; 'La Suivante'; 'La Place Royale'; 'L'Illusion Comique,' which had great success. Being more natural and more vigorous in style than the dramas which then held the stage, they announced the approach of a reformer endowed with talents of a higher order, and as such he

was recognized even by his rivals. His 'Medea,' produced in 1635, and imitated from Seneca, was the first indication of his talent for tragedy. His next work was 'Le Cid,' which raised his fame at one bound to its highest pinnacle. It has been translated into numerous languages, but scarcely bears out its reputation. The popularity of the play was unbounded. But its enemies were stimulated by the hatred of Cardinal Richelieu for its author. Corneille had been appointed as one of five authors to whom Richelieu intrusted the writing out of plays from plots furnished by himself, but he had been guilty of condemning the plot of a comedy committed to him, and the offense was unpardonable, Richelieu stimulated Chapelain to write a critique on behalf of the Academy. The critique was moderate, and while condemning the plot, admitted freely the merits of the author. It is printed in some editions of Corneille's works under the title, 'Sentiments de l'Academie Française sur la Tragi-Comédie du Cid.'

Among other accusations brought against Corneille was want of originality. This led to his selecting as his next subject Horace (not the poet, but the Horatius of early Roman history), which is perhaps the work in which he shows the greatest invention, and is one of the most admired of his productions. It appeared in 1639; the same year appeared 'Cinna,' which, according to Voltaire, was the *chef-d'œuvre* of Corneille; and in 1640 the 'Polyeucte,' which other critics have styled the most original, the most touching, and the most sublime work of the author, the *chef-d'œuvre* at once of Christian tragedy and of the French theatre. There is one flaw in this work which its admirers do not seem to have noticed. The poet so far mistakes the spirit of the Christian religion as to make Polyeucte, a convert under the Roman empire, bring martyrdom upon himself by rushing in to interrupt the Pagan sacrifices, and overthrow the altar on which the priest is sacrificing. 'Pompée,' an inferior piece, appeared in 1641, and in 1642 'Le Menteur,' the greatest of Corneille's comedies, imitated, like the 'Cid,' from the Spanish. Foote has produced an English version of it called 'The Liar.'

From this time the success of Corneille as a dramatist steadily declined and many of his numerous works, in spite of the fame of their author, never acquired celebrity. On the merits of others the utmost diversity of opinion has prevailed, the same work being the subject of extravagant eulogy and unqualified condemnation. 'Rodogune,' 'Heraculius,' 'Don Sanche,' and 'Nicomède' are among the best works of his second period, 1646–52. 'Rodogune' was his own favorite production. Some critics speak highly of it; others condemn it as showing marked indications of decline. From 1653–9 he gave up writing for the stage, and employed himself with preparing a poetical translation of the 'De Imitatione Christi.' In the latter year he was induced to return to the drama, and persevered for 15 years amid declining success to produce pieces generally inferior to his earlier works. 'Œdipe' (1659) and 'Sertorius' (1662) are the best works of this period. 'Tite et Bérénice' (1670) was a rival production to the 'Bérénice' of Racine, the subject being prescribed to both poets by the Princess Henriette; but Racine's poem was a success, that of Corneille a failure. His last pieces, 'Pulchérie' (1672), 'Suréna' (1674), were the weakest as well as the last. He had been chosen a member of the Academie Française in 1647, and was dean of the Académie when he died in 1684. Besides his dramas he wrote some minor poetry, elegies, sonnets, epistles, etc., under the title of 'Poésies Diverses,' and also in prose three discourses, 'Sur le Poeme Dramatique'; 'Sur la Tragédie'; and 'Sur les trois Unités.' Voltaire has remarked that Corneille was the first dramatist who made the sentiment of admiration the basis of tragedy instead of terror or pity.

The admirers of Corneille gave him the strongest praise for the quality sublimity. This is a quality not easily defined, and in straining after it it is only too easy to fall into faults very much opposed to sublimity. The faults found with Corneille in his weaker productions are precisely such as might be produced by such an effort, declamation, inflation, abuses of sentences, and great words. His versification is less accurate and polished than that of Racine, as when he began to write the language was less formed, and his own taste in this respect probably less fastidious. There may also be observed in Corneille's delineation of character a straining after a heroic ideal, rather than a true and profound analysis of the real springs of human sentiment and emotion, in which alone an inexhaustible fund of dramatic action is to be found. He was, like Racine, strongly impressed with religious convictions, and extremely scrupulous in his writings. He had a high idea of his own powers, but was deficient in social tact, and in conversational ability to such an extent that it is said he did not always express himself grammatically. When reproached for his carelessness in cultivating the graces of society, he would reply, «Je suis toujours Pierre Corneille.»

Corneille, Thomas, tō-mä, French dramatist, brother of the preceding: b. Rouen, 20 Aug. 1625; d. Andelys, 8 Dec. 1709. He lived in the most friendly union with his brother till the death of the latter. They had married two sisters, lived in the same house without any division of means, and were remarkable for the conformity of their tastes. His first comedy, 'Les Engagements du Hasard,' appeared in 1647, and was successful. The number of his dramatic works is 42; yet most of them are now little known. His comedies, however, at the time of their appearance, were received with greater interest, if possible, than those of the great Corneille, in imitation of whom Thomas applied himself to tragedy; and his 'Timocrate' (1656) was received with such continual applause that the actors, weary of repeating it, entreated the audience, from the stage, to permit the representation of something else, otherwise they should forget all their other pieces. Since that time it has not been brought upon the boards at all. 'Camma,' in 1661, produced an equal sensation. The spectators thronged in such numbers to witness the representation that scarcely room enough was left for the performers. His best tragedy is 'Ariane' (1672). 'Le Comte d'Essex' (1678) has also retained some celebrity, although marred by the ignorance it displays of English manners and history. 'L'Inconnu,' a heroic comedy, appeared in 1675. In 1677 he versified 'Le Festin de Pierre' at the request of the widow of Molière, and until recently, when the prose of

Molière superseded it, it was always represented in his version. He was a dramatist of the second rank, laborious but wanting in originality, yet not without considerable resources. In 1685 he succeeded his brother in the French Academy by a unanimous vote.

Cor'nel, (L. *cornu,* horn, from the hard horn-like wood), a shrub belonging to the genus *Cornus,* about 20 distinct species, native of north latitude, temperate climate. Flowers generally small, four parted, ovary inferior, and two- or three-celled; fruit fleshy, and edible in some species, especially those in Europe. The cornelian cherry (*Cornus mas*), of Europe, bears small greenish flowers; the fruit is acid and edible. The dogwood of the eastern part of the United States is the *Cornus florida,* a small tree which in May and June is covered with large white or pale pink flowers; the wood of which has a fine fibre and is very hard. The bark is sometimes used as a tonic. *C. canadensis,* bunchberry, of woods in the northern part of the United States, is a low herb which bears a close cluster of flowers that ripen into red, fleshy, edible berries. In North America there are about 18 well-known species. See DOGWOOD.

Cornelia, Roman matron, the daughter of Scipio Africanus the elder. She married Tiberius Sempronius Gracchus, censor 169 B.C., by whom she was the mother of the two tribunes, Tiberius and Caius. Left a widow with a young family of 12 children, she devoted herself entirely to their education. Only three of her family survived their childhood, her daughter, married to Scipio Africanus the younger, and her two sons. Cornelia was highly educated, and united the severe virtues of the old Roman matron with the refinement which then began to prevail in the upper class society of Rome. She bore the death of her sons with magnanimity, and afterward retired to Misenum, where she spent the remainder of her life. She exercised unbounded hospitality, and was constantly surrounded by men of letters. The Roman people erected a statue to her with the inscription: "Cornelia, Mother of the Gracchi."

Cornelian, kôr-nēl'yan, or **Carnelian** (Fr. *cornaline,* from Lat. *corna,* "horn"), a precious stone varying from a light and fleshy red, opaque, and semi-transparent, with and without veins, to a brilliant transparency and color approaching the ruby, from which they are, however, known by sure distinctive marks. It consists of silica along with minute quantities of the oxides of iron, aluminum, and sometimes of other metals, and is actually a variety of chalcedony. It is much used for seals, bracelets, necklaces, and other articles of minute gem sculpture; appended to watches, ornaments now in little use. It was known to the Romans, as we learn from Pliny, by the name of *sarda,* from being found originally in Sardinia. The number of the cornelians that were engraved by the ancients, and have reached our times, is very considerable, and nearly equal to that of all the other kinds of gems with which we are acquainted. Pliny thinks they were clarified by being steeped in the honey of Corsica. The national collection at Paris, and the British Museum of London, have many beautiful engraved cornelians. Many of the latter were found in the field of Cannæ in Apulia, where Hannibal defeated the Romans.

Cornelis, Cornelius, Dutch painter: b. Haarlem 1562; d. 1638. He studied with Peter Ærtsens the younger, and afterward worked at Antwerp under Peter Porbus and Giles Coignet. In 1583 he returned to Haarlem, where his great painting — the 'Company of Arquebusiers' — established his reputation. Descamps called it a collection of figures sketched by the Genius of History. In 1595, with Charles van Mander, he instituted an academy for painting at Haarlem. His numerous pictures are rarely to be bought, on account of the great value which the Flemings set upon them. Cornelis painted great and small pieces, historical subjects, portraits, flowers, and especially subjects from ancient mythology. His drawing is admirable. He is a true imitator of nature, and his coloring is always lively and agreeable. The galleries at Vienna and Dresden contain some of his pieces. J. Mueller, H. Golzius, Saenredam, L. Killian, Matham, Van Geyn, and many others have imitated his manner.

Cornelius, Peter Von, pā'tėr fŏn kôr-nā'lē-oos, German painter: b. Düsseldorf 23 Sept. 1787; d. 7 March 1867. He early exhibited a taste for art, and accustomed himself to copy from memory the works of Raphael and other masters. He thus acquired an early proficiency, and at 19 was entrusted with the painting of the cupola of the Church of Neuss, near Düsseldorf. It was executed in chiaroscuro, in figures of colossal size, and showed already the grandeur of conception by which he was afterward distinguished. He soon after removed to Frankfort, where in 1810 he commenced a series of designs illustrative of Gœthe's 'Faust.' In 1811 he went to Rome, where, with Overbeck, Veit, and other associates, he projected the formation of a new school of German art, and especially the revival of fresco painting, in imitation of Michael Angelo and Raphael. Bartholdy, the Prussian consul-general, commissioned some members of this school to paint his villa. Cornelius executed two frescoes for this purpose — 'Joseph Interpreting the Chief Butler's Dream,' and 'Joseph Recognizing His Brethren.' He afterward began a series of frescoes from the 'Divina Commedia' for the Marquis Massini, but left it unfinished in consequence of receiving a commission to execute the frescoes in the Glyptothek, then newly erected at Munich. The designs for the villa of Massini, though never painted, were engraved by Schoefer, and another series, illustrative of the 'Niebelungen Lied,' were engraved by Amsler and Lips.

Before leaving Rome (1819) Cornelius had been appointed director of the Academy at Düsseldorf. His first work was to reorganize the Academy, and then to give his whole attention to the painting of the Glyptothek, which demanded a constant residence at Munich. He resigned the directorship after a short time, and received in 1825 that of the Academy of Munich. Simultaneously with the Glyptothek he undertook the painting with frescoes of the Ludwigs-Kirche. In these two great works he was assisted by his Munich pupils. Many of the cartoons prepared by him were painted under his superintendence by Zimmermann, Schotthauer, and others. In the Glyptothek two large halls were entrusted to him to decorate. In the one, called the Hall of Heroes, he gave a repre-

sentation on a colossal scale of the leading events of the Iliad; in the other, named the Hall of the Gods, he symbolized the Grecian mythology. In the Ludwigs-Kirche the greatest painting in size and importance was the 'Last Judgment,' of which one critic says that it is without a rival among contemporary paintings, another that it is enough to say of it that in it Michael Angelo is both imitated and disregarded. Cornelius also painted at Munich the Pinakothek, a picture gallery for which, with the assistance of his pupils, he executed an extensive series of frescoes representing the history of painting. In 1841 he was invited to Berlin by Frederick William IV., who entrusted him with the painting of the royal mausoleum or Campo Santo. The most celebrated cartoon in this series is the 'Four Riders of the Apocalypse.' The series consists of 12 paintings, which have been engraved. He was admitted a foreign member of the Institute of France in 1838, and a member of the Academy of Berlin in 1841. His advice and assistance were widely sought, and he executed or superintended various works besides those enumerated.

On his merits as an artist there are the widest diversities of opinion according to the sympathies of those by whom he is appreciated. Cornelius was a true representative of modern German thought in its highest phases. He introduced into art a metaphysical and subjective element which in the hands of so competent an interpreter could not but be productive of great results, but which is equally open to the severest criticism. That he was the founder of a school and threw new life into German art the mere enumeration of his great undertakings is sufficient to prove. Even his admirers, however, admit certain faults in his execution, and it would seem that in aiming at grandeur he too often failed to be natural. In seeking to develop his leading idea he subordinates details to an extent which amounts to sacrificing them, and that idea is often admittedly recondite, and requires learning and study to appreciate it. Still his admirers insist that his merits are such in the grandeur and beauty of his designs and the elevation of the tone of his execution as to overbear all faults of detail; but there are not wanting detractors who say that his excellences, whatever they may be, do not belong to the region of art, and that it is necessary to go outside of it into that of metaphysics to be able to appreciate them. Consult Grimm, 'Neun Essais' (1865); Von Wolzogen, 'Peter von Cornelius' (1867); Riegel, 'Cornelius, der Meister der deutschen Malerei' (1870); Förster, 'Peter von Cornelius: ein Gedenkenbuch' (1874); Muther, 'History of Modern Painting,' Vol. I. (1895).

Cornelius, Peter, German musician and writer: b. Mayence, 24 Dec. 1824; d. there, 26 Oct. 1874. He was first an actor, but became a follower of Wagner and wrote: 'The Barber of Bagdad,' 'The Cid,' and other successful operas. He also brought out a volume of 'Lyric Poems.'

Cornelius Nepos. See NEPOS.

Cornell', Alonzo Barton, American capitalist and politician: b. Ithaca, N. Y., 22 Jan. 1832. He is a son of Ezra Cornell (q.v.), and his early life was spent as a telegraph operator and manager in Cleveland, New York, etc. He was defeated as Republican candidate for lieutenant-governor in 1868; was chairman of the New York State Republican committee 1870–8; surveyor of customs, New York, 1869–73; speaker of the assembly 1873; and naval officer of the port of New York 1876–8. During Cornell's occupancy of the latter office, President Hayes issued his famous order requiring office holders to refrain from politics. In spite of this warning, Mr. Cornell, as chairman of the State committee, called the Rochester convention to order, and as a consequence lost his office, July 1878. In 1879 he was elected governor by the Republicans, and served until 1 Jan. 1883, since which time he has devoted himself to the care of his large financial interests. He wrote: 'True and Firm: Biography of Ezra Cornell, Founder of the Cornell University: a Filial Tribute' (1884).

Cornell, Ezra, American philanthropist: b. Westchester Landing, N. Y., 11 Jan. 1807; d. Ithaca, N. Y., 9 Dec. 1874. His early education was scanty, and he began life as a mechanic and miller at Ithaca, N Y. In 1842, when telegraph lines were first being put in operation, his suggestion that the wires should be strung on poles was adopted. He then devoted himself to telegraph line construction and the organization of telegraph companies, and accumulated a large fortune. He was a member of the State assembly in 1862–3 and of the State senate in 1864–7, but is best known as the founder of Cornell University (q.v.).

Cornell, John Henry, American musician: b. New York 8 May 1828; d. there 1 March 1894. He studied music in Germany and England; was organist of St. Paul's Church, New York, 1868–77, and of the Brick Presbyterian Church 1877–83, his latter years being given up to composing, adapting, and editing. His publications include: 'Primer of Modern Musical Tonality' (1876); 'Easy Method of Modulation'; 'Manual of Roman Chants'; 'The Congregational Tone Book'; 'Practice of Sight Singing'; a translation of Bussler's 'Theory and Practice of Musical Form'; and of Ambros' 'The Boundary of Music and Poetry,' both from the German.

Cornell College, a coeducational institution in Mount Vernon, Iowa; organized as a college in 1857, under the auspices of the Methodist Episcopal Church. Number of professors and instructors, 34; students, 647; volumes in the library, 22,300. Its endowments are over $300,000, and its income is nearly $45,000.

Cornell University, a coeducational institution at Ithaca, N. Y., owing its origin primarily to the Land Grant Act of 1862, "donating public lands to the several States and Territories which may provide colleges for the benefit of agriculture and the mechanic arts." Under this act New York received as its portion 989,920 acres of land. The institution established was named in honor of Ezra Cornell (q.v.), who offered to give $500,000 with which to erect its buildings (the terms of the land grant forbidding the use of its proceeds for that particular purpose), on condition that it should be located at Ithaca. The university was incorporated in 1865, and was opened to students in 1868. The number of students (412) who registered at the opening was highly satisfactory. The liberality of the charter, which guarded against possible control or undue influ-

ence by any religious denomination; the nature of the entrance requirements; the promise of opportunities to pursue lines of study not found in other schools then existing; the location, free from the distractions of a large city — these and other features combined to attract students to the new school. Yet, encouraging as was the beginning, the university for the next four years had much difficulty in maintaining its existence. The State's land scrip, which was expected to bring not less than $10 an acre, was being sold for only 50 cents an acre, when Ezra Cornell, believing that the land would increase in value, purchased all the scrip which had not been otherwise disposed of, and bought over 500,000 acres of excellent timber lands in Wisconsin, which before his death he transferred, with full title and control, to the university. But not before 1872 were any of these lands sold for amounts sufficient materially to aid the institution; then the sum of $2,320,000 was realized from the sale of 140,000 acres. Later other lands were sold at fair prices, making in all from the land grant lands a net profit of about $6,000,000.

Besides Ezra Cornell's endowment, the university received large gifts from Henry W. Sage, for a women's dormitory, a chapel, a library, a school of philosophy, a museum of archæology, etc., all generously endowed; a donation from John McGraw for a building devoted to museums and scientific laboratories; from Hiram Sibley for a college of mechanical engineering and mechanic arts; from Andrew D. White a priceless historical library; from Dean Sage a fund for supplying the college pulpit, etc. The university is also indebted to A. S. Barnes for a Christian Association building; to William H. Sage for the chapel organ, the purchase of the great Zarncke library, a stone bridge, and, in conjunction with Dean Sage, an endowed infirmary for sick students; to Oliver H. Payne for the Cornell Medical College; and to others for valuable gifts. The total property valuation of Cornell University in 1900 was $10,420,222.29. The total invested funds were $7,327,506.48, total income for 1900, $841,288.55, of which $191,191.83 represented tuition fees. Grounds, buildings, equipment, and other property used by the university were estimated at $3,092,715.81, not including the new medical college in New York estimated at $1,000,000, but not then entered on the books. The library comprised 238,676 volumes and 39,000 pamphlets. The book funds were $300,000, and the average annual growth of the library was about 13,000 volumes. In all 5,632 degrees had been granted, and there were about 5,000 living graduates.

The broad scope and many-sidedness of the university are based on Ezra Cornell's proposition, "I would found an institution where any person can find instruction in any subject," in which the more specific purpose of the national donors was absorbed and included. Since provision was made for women in the early seventies they have formed from 10 to 15 per cent of the student body. The university annually grants free tuition to 600 students of New York State, apportioned by assembly districts; also to students in agriculture, and to New York State students in forestry and veterinary medicine. On 17 June 1903 the board of trustees of the university suspended indefinitely the State College of Forestry. This action on the part of the university was in consequence of the veto by Gov. Benjamin B. Odell, Jr., of the item in the State appropriation bill providing for the support of that college.

Cornell University occupies in the United States a middle ground between the institutions of private or chiefly private foundation, with independent corporate existence, and the State universities supported and controlled by the States. The government of the State of New York is represented in Cornell University by *ex officio* members on the board of trustees. Its constitution has undergone many changes, as well of internal arrangement as of outward expansion. Its present organization is as follows:

1. Graduate department.
2. Academic department, or department of arts and sciences.
3. College of Law.
4. College of Civil Engineering.
5. Sibley College of Mechanical Engineering and Mechanic Arts.
6. College of Architecture.
7. College of Agriculture.
8. College of Medicine.

The graduate department has charge of all the graduate studies of the other departments. Courses leading to the degrees of A.M. and Ph.D. are pursued in this department; and 17 graduate scholarships of the value of $300 each, 22 fellowships of $500 each, and 2 of $600 each, are annually granted to graduate students, besides one traveling fellowship in architecture of the annual value of $1,000, good for two years. The academic department allows elective courses in science and the classics, and leads to the A.B. degree. The College of Law has the usual law courses and grants the degree of LL.B. The College of Civil Engineering provides instruction in all departments of that subject, and particularly in some of the more advanced developments of the science. Special instruction is given in bridge engineering, railroad engineering, sanitary, municipal, hydraulic, and geodetic engineering. Numerous graduate courses are provided, for illustrating which an astronomical observatory or laboratory, a magnetic laboratory, an extensive hydraulic laboratory, and other laboratories furnish ample means. The museums of the College of Civil Engineering are rich in collections of models, instruments of precision, base-line, and gravity apparatus, together with a large assortment of the usual field instruments, such as transits, theodolites, levels, etc.

The Sibley College includes eight departments: mechanical engineering, experimental engineering, electrical engineering, machine design, mechanic arts or shop-work, industrial drawing and art, and graduate schools of marine engineering and naval architecture, and of railway mechanical engineering. Courses of study are four years in length, and the degree of mechanical engineer, electrical engineer, etc., are conferred upon those who successfully complete the respective courses. The laboratories, museums, shops, and other parts of the college are very completely furnished and equipped. Hiram Sibley continued making additions to his first donations, and in 1885 the trustees of the university organized the college under the name by which it is now known. Mr. Sibley's gifts amounted to $180,000, and $50,000 additional have been contributed by other members of the

family. The College of Architecture gives the usual course in this subject, both in theory and practice, and confers the degree of B. Arch. The College of Agriculture gives extended and practical courses. An experiment station established by the Federal government is connected with this department. The College of Medicine (established in 1898) has a two years' course in Ithaca, and a finishing course in the New York school.

The entrance requirements to all the departments have been raised, and are now substantially the same as those of other first-class universities. In 1902 the total number of students in attendance was 2,845, and of this number the academic department had 831, and Sibley College 792. There were 367 members of the faculty, some of whom were engaged in university extension work. The summer school has always had a large attendance (see SUMMER SCHOOLS).

The campus is admired for its beauty and extent, and the group of buildings which belong to the university are models of architecture. The library, with its famous Fisk Dante collection and the Andrew D. White French Revolution collection; the laboratories, halls, and dormitories; the class-rooms, and other features of the university all present special advantages and attractions. The present income of the university is about $800,000.

Corner, a commercial term used in England and the United States to signify the control of so large a supply of an industrial or commercial product or of so much of a stock that the market value of the commodity held is tremendously advanced, and those who have made contracts to deliver the stock or commodity in question must buy at the prices set by the pool. So the actual difference between the manœuvre of the corner-man and the normal effort to bull prices by controlling supply is that the corner is based upon knowledge of contracts made for future delivery by those who are not in present possession of the stock. Successful corners depend then not only on a thorough understanding of where the control of the commodity in question lies, lest another holder at the critical moment be able to undersell the would-be corner-man, but on the willingness of the buyer to keep his contracts at no matter what cost. In other words, if the corner-man is too greedy and demands too high a price, buyers may smash the corner by refusing to keep their contracts, a procedure with a certain amount of poetic justice in it, at least when the members of the corner have gained control of the supply which they are to rebuy from the contractors. Cereals and cotton, because of the large amount of future trading done in them, are favorite fields for the corner-man; but the exact amount of a year's crop and the thorough location of such holdings make the manœuvre particularly dangerous. Many of the worst financial panics in the United States have been the results of attempts, usually unsuccessful, to corner the gold market.

Cor'net (Fr. «little horn»), formerly a reed wind instrument of the oboe class; but the name cornet or *cornet-à-pistons* is now given to a brass musical instrument with a cup-shaped mouthpiece, which has a very agreeable tone, and is much used in orchestras and military bands, and sometimes with organ in church music. The cornet is intermediate in character between the French horn, the trumpet, and the bugle. Its characteristic feature is its three pistons, which may be pressed down by the fingers singly or together, so as greatly to increase its compass. The first lowers the pitch by a tone, the second by a semitone, the third by three semitones. From its military use the term cornet was transferred to a cavalry troop, because it was accompanied by a cornet player, and then to the color officer of this troop, the cornet of cavalry corresponding to the infantry ensign. This title of the English army was abolished in 1871, the rank of sub-lieutenant taking its place.

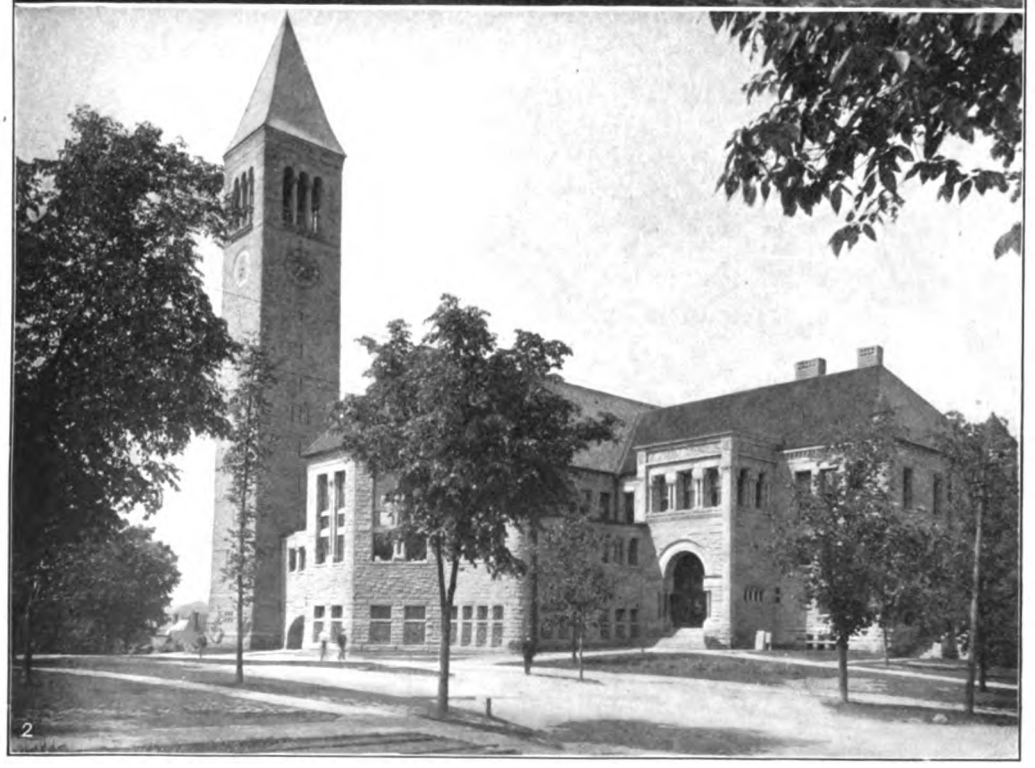
Corneto, kōr-nā'tō, or **Corneto Tarquinia,** Italy, a picturesque, mediæval-looking town, situated 12 miles north of Civita Vecchia, 3 miles from the Mediterranean, on the Marta River. Corneto is the seat of an episcopal see. It rose out of the ruins of the Etruscan city of Tarquinii, whose remains, within a mile and a half of Corneto, are among the most important for the student of Etruscan history. The painted tombs, of which some 20 are specially interesting, were known in the 18th century; but it is mainly since 1842 that they have been examined; valuable new discoveries were made during excavations in 1881–2. Pop. about 7,000.

Corn'hill, London, one of the principal streets of the city, once a corn market. In mediæval times two of its attractions were the Tun, a round house used as a temporary prison, and the Standard, a water conduit and also a point of measurement.

Cornice (It. «cornice»), **La Corniche,** or **Cornice Road,** a famous highway between France and Italy, skirting the Mediterranean from Nice to Genoa. The word cornice means literally «shelf,» in allusion to the fact that for miles the road is cut in the face of the cliffs. The modern road was begun by the French, and finished by the Sardinian government after the fall of Napoleon.

Cornice, in classical architecture, the uppermost of the three parts of an entablature, composed of the projected moldings of the roof. (See ARCHITECTURE, Plate I.) The Doric cornice consists of a Doric cyma, the corona projecting considerably, and containing the ends of the roofing boards, a second cyma, and an erect bell molding. The Ionic cornice shows a fillet either with dentals or quite plain, above which are a wave molding and the corona, terminating in a slab and erect bell molding. The Corinthian cornice differs from the Ionic in having small consols, composed of volutes and acanthus leaves. In Gothic architecture the cornices are often elaborately adorned with animals or with human figures.

Corning, Erastus, American capitalist: b. Norwich, Conn., 14 Dec. 1794; d. Albany, N. Y., 9 April 1872. He became a prominent iron merchant in Albany, N. Y., subsequently engaged in the banking business, and applied much of his time and means to the development of the railroad system of New York State. He effected the consolidation of various roads into the New York Central R.R., and was its president 12 years; was State senator 1842–5; member of Congress 1857–9 and 1861–3; member of the



1. Boardman Hall.

2. Library Building.

Peace Congress in 1861, regent of the University of New York in 1833, and vice-chancellor of the board.

Corning, James Leonard, American physician: b. Stamford, Conn., 28 Aug. 1855. He studied at the universities of Heidelberg and Würzburg in Germany, graduating at the latter. He has an international reputation as an expert neurologist, and as the discoverer of spinal anæsthesia (1885). He has contributed a large number of articles on his specialties to the medical press, and among his publications are: 'Brain Rest' (1883); 'Local Anæsthesia' (1886); 'Hysteria and Epilepsy' (1888); 'Treatise on Headache and Neuralgia' (1888); 'Pain in Its Neuro-Pathological and Neuro-Therapeutic Relations' (1894); 'Experimental Researches Regarding the State of the Mind in Vertigo' (1895). Under the pseudonym of Roland Champion he wrote a romance entitled 'Princess Ahmedee' (1900).

Cor'ning, N. Y., a city, county-seat of Steuben County. It is situated on Chemung River, the Erie, and the Delaware, Lackawanna & Western railroads; it is widely known for its extensive foundries, glass factories, railroad car works, and the coal mines in its vicinity. Pop. 11,061.

Cor'nish, Charles John, English naturalist: b. Salcombe House, Devonshire, 28 Sept. 1859. He was educated at the Charterhouse and Hertford College, Oxford, and has for many years been a frequent contributor to 'The Spectator' on natural history and out-door life. His published books include: 'The New Forest' (1894); 'The Isle of Wight' (1895); 'Life at the Zoo' (1895); 'Wild England of To-day' (1896); 'Animals at Work and Play' (1896); 'Nights with an Old Gunner' (1897); 'Animals of To-day' (1899); 'The Naturalist on the Thames' (1902).

Cornish, Francis Warre, English writer and educator: b. 8 May 1839. He was educated at Eton and King's College, Cambridge; was assistant master at Eton 1861–93, and is at present (1903) vice-provost of Eton. He has published: 'Life of Oliver Cromwell'; 'Sunningwell,' a leisurely, meditative story with much charm of style (1901); 'Chivalry.'

Cornish Engine, a single-acting steam-engine used for pumping water. The pump-rods are loaded so as to have sufficient force by their gravity to raise the water, and the down-stroke of the steam piston at the other end of the beam is used to raise them. The name comes from the engine's use in the copper and tin mines of Cornwall.

Cornish Language, a Celtic dialect spoken in Cornwall, which died out in the 18th century, though isolated words or terms are still in use, and some fragments of literature are still extant. It is allied to the Welsh and Breton. See Celtic Languages and Celts.

Cornstalk, chief of the Shawnee Indians: b. about 1720; d. 1777. He was a man of high abilities and dignity of character. He first appears as heading the Greenbriar (q.v.) massacre of July 1763, in Pontiac's war; next in a far higher role, as commanding the Indian forces at the bloody and hard-fought battle of Point Pleasant, 10 Oct. 1774, in Dunmore's war (see Colonial Wars). He had opposed the war, being convinced that it meant ultimately swifter ruin for the Indians; but once embarked, he fought with a skill and resolution that excited the admiration of his enemies. After the defeat he was in favor of carrying on the war to the end; but finding his head men and sub-chiefs determined on giving up, he went himself to make the best terms he could. His oratory was said by the Virginians to equal Patrick Henry's. His death was a shame to the slayers. Early in 1777 he came with his son and two other Indians to the garrison at Point Pleasant, to tell them that, although he wished to keep the peace, his tribe was resolved on war, and if so, he must join them. The party were held as hostages; but one of a company of rangers being killed by Indians near by, the rest and their captain rushed to the fort and butchered the four, Cornstalk rising to meet his fate without a word.

Cornuco'pia, the horn of plenty, a wreathed horn overflowing with flowers, fruit, corn, etc. It was the symbol of plenty, peace, and concord, and was fabled to have been given by Jupiter to his nurse, the goat Amalthæa. It was a frequent attribute of Ceres.

In botany, Cornucopiæ is a genus of grasses, tribe *Phalereæ*, which bears flower spikes resembling the mythological symbol of plenty. The only known species is the *C. cucullata* (horn of plenty grass), a native of Greece and Asia Minor, often cultivated in gardens.

Cornus. See Cornel; Dogwood; Tupelo.

Corn'wall, Duke of, a hereditary title of the eldest son of the sovereign of Great Britain. Cornwall is a royal duchy, the revenues of which belong to the Prince of Wales for the time being. The title of Prince of Wales is conferred by special creation, that of Duke of Cornwall descends by inheritance. The dukedom of Cornwall was created for the Black Prince in 1337.

Cornwall, Barry. See Procter, Bryan Waller.

Cornwall, Henry Bedinger, American chemist: b. Southport, Conn., 29 July 1844. He graduated at Columbia 1864, and from its school of mines 1867, becoming assistant in the latter 1865–73, save for two years' study at the mining school in Freiburg, Germany. In 1873 he was appointed professor of applied chemistry and mineralogy at Princeton University, a position he still holds (1903). With Caswell, he translated Plattner's 'Manual of Qualitative and Quantitative Analysis with the Blow-pipe' (1875), and has written: 'Manual of Blow-pipe Analysis, with a System of Determinative Mineralogy' (1882), and many scientific papers that have appeared in the special journals of his profession.

Cornwall, Canada, a port and manufacturing town, capital of Stormont County, in the province of Ontario, on the north side of the St. Lawrence, and at the mouth of the Cornwall Canal, 67 miles southwest of Montreal. It has a trade in grain and flour, and manufactures of cottons and woolens, paper, flour, etc. Pop. (1901) 6,704.

Cornwall (Lat. *Cornu Galliae*, "horn of Gaul," that is, the remotest land inhabited by Celts), England, a maritime county, forming the southwestern extremity of the island. Its form is irregularly triangular. Its area is 1,357 square miles. The northwestern coast-line is broken by a number of shallow bays. The

south coast is much more broken, and is marked both by bolder promontories and deeper bays. At Land's End, between these two coasts, terminate the hills of the Devonian range. The rivers of Cornwall are numerous but short. Among them are the Fowey, the Camel, the Inny, the Attery, the Lynner, etc. The climate, owing to the elevation and exposure of the surface, is very variable. The soil, consisting of decomposed slate, admits of easy drainage, but requires much manure. In many of the more elevated districts much of the land is almost barren. Nearly 70 per cent of the total area is under cultivation, a large amount of grain being grown, and much land being devoted to market-gardening for London consumption. Cattle, sheep, and horses are reared. The mines of copper and tin still constitute the richest treasures of the county, though the value of both has greatly diminished. The chief mining district is in the southwest part of the county. Several mines exceed 350 fathoms. In the once productive Botallack copper mine, situated a few miles north of Land's End, the workings are on the very verge of the cliff, and, descending beneath the sea, are carried far beyond low-water mark. The Dolcoath mine, near Camborne, is the chief tin mine, and there are other important tin mines in the same locality. The value of tin ore produced in 1898 was about $1,450,000. The production of copper has greatly decreased in recent times. Besides tin and copper, silver, lead, zinc, iron, manganese, antimony, cobalt, and bismuth are found in comparatively small quantities. China-clay is an important mineral product, being valued at $1,415,000 in 1898. There are few manufactures, but the fisheries, particularly of pilchard and mackerel, are valuable.

At the time of the Roman conquest Cornwall was occupied chiefly by tribes of Cimbri and Damnonii, and became included in the province of Britannia Prima. After the Romans withdrew the natives regained their independence, and retained it till the time of Athelstane, when they were subdued by the Saxons. Their Celtic origin is fully established by the abundance of rude monuments spread over the country, and consisting chiefly of unwrought stones placed erect, singly or in circles, with others laid across. It is divided for parliamentary purposes into six divisions, each returning one member. Pop about 323,000. Consult Boase, 'Bibliotheca Cornubiensis' (1874–78).

Cornwall, kôrn'wal, or **Cornwall-on-the-Hudson,** N. Y., a village in Orange County on the west shore of the Hudson River, at the foot of Storm King Mountain. The beauty of the adjacent scenery and the proximity to New York city, which can be reached in less than two hours by the Erie or the West Shore R.R., makes it a favorite summer resort. A carpet mill gives employment to a fourth part of the inhabitants. Pop. (1900) 1,966.

Cornwal'lis, Caroline Frances, English author: b. Kent 12 July 1786; d. Lidwells, Kent, 8 Jan. 1858. She acquired a thorough knowledge of Latin and Greek, and making herself conversant with nearly every study which occupies thoughtful men, from an early age, carried on a correspondence with many eminent persons. Her refusal to accept the hand of the Italian historian, Sismondi, did not forfeit his friendship, and she lived much in Italy. Her first work, 'Philosophical Theories and Philosophical Experience, by a Pariah' (1842), was the first of a series of 20 'Small Books on Great Subjects,' the said subjects including the 'Connection of Physiology and Intellectual Science'; 'Ragged Schools'; 'Criminal Law'; 'Greek Philosophy,' and the 'History and Influence of Christian Opinions.' She also published in 1847 'Pericles, a Tale of Athens,' and her 'Letters and Remains' appeared in 1864.

Cornwallis, Charles, MARQUIS OF, English general: b. London 31 Dec. 1738; d. Shazipur, India, 5 Oct. 1805. He was educated at Eton, and Cambridge, and entering the army served in 1761 in a campaign of the Seven Years' war as aide-de-camp to the Marquis of Granby. After passing through all the various promotions he obtained the rank of general. He represented the borough of Eye in Parliament from 1760 until the death of his father in 1762, when he succeeded as Earl Cornwallis. In 1770 he was made governor of the Tower. In Parliament he generally supported the ministry, but exercised an independent judgment on several important questions. In particular he was opposed to the policy which brought on the American war; but though offered a special leave of absence from the king sailed with his regiment when it was ordered to America in 1776. He served with distinction under Gens. Howe and Clinton in the campaigns of 1776–9 in New York and the Southern States, and in 1780 was left in independent command in South Carolina, with 4,000 men. He defeated Gen. Gates at Camden 16 Aug. 1780, and Gen. Green at Guilford 15 March 1781. He then invaded Virginia, but after moving his forces according to successive and contrary instructions from Sir Henry Clinton, he was besieged in York Town, where he had intrenched himself, and compelled to surrender on 19 Oct. 1781. In 1786 Lord Cornwallis was sent to India with the double appointment of commander-in-chief and governor-general; and not long after the government of Bengal declared war against the Sultan of Mysore for an attack upon the Rajah of Travancore, the ally of the British. The first campaign was indecisive; but in March 1791, he invaded Mysore, captured Bangalore; and in the year after besieged the city of Seringapatam, and obliged the sultan, Tippoo Saib, to sue for peace, and surrender a large portion of his dominions. On the conclusion of the war Lord Cornwallis returned to Great Britain, and in 1792 was created marquis, appointed master-general of the ordnance, and admitted a member of the privy council. In 1798, at the time of the rebellion, he was appointed lord-lieutenant of Ireland, which office he filled until 1801, conducting himself with great firmness and judgment. In the same year he was sent to France, where he signed the Peace of Amiens. In 1804 he was again appointed governor-general of India.

Cornwallis, Kinahan, American lawyer and miscellaneous writer: b. London, England, 24 Dec. 1839. After two years in Australia he came to the United States in 1860, and since 1886 has edited the 'Wall Street Daily Investigator.' Among his many works are:

'Yarra Yarra, or the Wandering Aborigine' (5th ed. 1885), in verse; 'Howard Plunkett' (1857); 'My Life and Adventures' (1860); 'Pilgrims of Fashion' (1862); 'The Gold Room and the New York Stock Exchange' (1879); 'A Marvelous Coincidence' (1891).

Cornwell, Henry Sylvester, American poet and physician: b. New Hampshire 1831; d. New London, Conn., 1886, where he was a physician. From many poems published singly by him he issued but one collection, 'The Land of Dreams and Other Poems' (1878).

Cornwell, William Caryl, American banker: b. Lyons, N. Y., 19 Aug. 1851. He was cashier of the Bank of Buffalo (1873–98); organized and is president of the City National Bank of Buffalo. He is well known as a clear and forceful writer on currency and banking. He has published 'Currency and Banking Law of Canada' (1894); 'Sound Money Monographs' (1897); 'What is a Bank?' of which 500,000 copies have been sold or distributed.

Coro, kō'rō, or **Santa Ana de Coro,** Venezuela, a town in the state of Falcon, near the Gulf of Coro, an inlet of the Gulf of Maracaybo, two and a fourth miles from the Caribbean Sea, on which is its port, Vela de Coro, about seven miles distant by railway. The trade was once considerable, but is now much fallen off; as is also the town since 1578, when the seat of government was transferred from it to Caracas. Pop. 9,000.

Coroados, Indians of Brazil, the name being derived from their tonsures, just as the name Botocudo is applied to other aborigines of the same country who wear botogues or labrets. It is an arbitrary collective title for ethnic fragments whose tribal names have been lost. Tribes thus designated are found at the present day in some of the southern States of Brazil, especially in Paraná, Rio Grande do Sul, São Paulo, and Matto Grosso; but only a few thousands remain in scattered groups, evidently representing different stages in development, though in a general way the Indians of the Upper Paraná and Upper Paraguay region may be classified as true aborigines, "the nearest representatives, and probably the direct descendants, of that primitive race whose osseous remains have been found in Lagoa Santa caves and Santa Catarina shell mounds." Consult: Keane, 'Man, Past and Present'; Porter, 'Native Races.'

Cor'ody, or **Corrody** (Lat. *corrodium,* "provision"), an allowance of meat, drink, or clothing, anciently due to the king from an abbey or other religious house, for the sustenance of such of his servants as he put there for maintenance. Corodies were also retained by the private founders of religious houses and were granted to benefactors, and consisted in the right of a certain number of persons to be boarded at an abbey.

Corolla, kō-rŏl'a, the inner whorl of two series of floral envelopes, occurring in the more highly developed plants, the outer being the calyx. In all cases its divisions, which are called petals, alternate with those of the calyx. They are generally colored — namely, they are some other color than green. The corolla is, as a rule, larger than the calyx. When the petals of a corolla are all distinct, they are said to be polypetalous, and this is the normal type. When they cohere continuously by their margins they are called monopetalous, or, better, gamopetalous, meaning that the petals are joined. The petals of a corolla are really only modifications of leaves. The corolla merely assists reproduction by shading the productive organs from injury, and, in some cases, by secreting honey attracts bees and other insects to aid in their fertilization.

Cor'ollary (Lat. "crown," or "garland," and in a derived sense "gift"; hence something given or granted), in logic, a proposition the truth of which appears so clearly from the proof of another as not to require separate demonstration.

Coromandel (kŏr-ō-măn'dĕl) **Coast,** the east coast of the Indian Peninsula, between Calimere Point and the mouths of the Krishna. It is open, sandy, and has no secure harbors; the surf, continually beating on it, renders landing difficult, often dangerous, and it is commonly accomplished in native boats of a peculiar construction. A violent monsoon accompanied by hurricanes blows from the middle of October well into December.

Coromandel Wood, another name for calamander wood (q.v.).

Corón, kō-rōn', Philippines. See PEÑON DE CORÓN.

Corona, kō-rō'na (a crown), in astronomy, a halo or luminous circle round one of the heavenly bodies; specifically the portion of the aureola observed during total eclipses of the sun, which lies outside the chromosphere or region of colored prominences. (See HALO.) In botany the corona is an appendage of the corolla in some flowers, coming as it were between the corolla and the stamens, well seen in the cup of the daffodil. In architecture it is the lower member of the projecting part of a cornice. See ARCHITECTURE, Plate I.

Corona Australis, ôs-trā'lĭs (the southern crown), one of Ptolemy's southern constellations, containing 49 stars, varying from the third to the seventh magnitude.

Corona Borealis, bō-rē-āl'ĭs (the northern crown), one of Ptolemy's northern constellations, containing about 30 stars visible with the naked eye, α, Gemma, of the second magnitude, forming the centre of a cluster of seven stars of the fourth and fifth magnitudes. In 1866 a new star of the second magnitude appeared in the constellation, but soon after became invisible save with a glass.

Cor'onach. See CORANACH.

Coronado, kō-rō-nä'thō, **Carolina,** Spanish poet: b. Almendralejo, province of Badajoz, 1823. About 1848 she married Horatio J. Perry, an American, who died in 1874. After his death she lived in retirement in Lisbon. She was precocious, and published a collection of poems in 1843. Her lyrics are distinguished for melody and depth of feeling. Her few dramatic pieces had little success; but her novels and short stories,— especially 'Jarilla' (1850) and 'The Wheel of Misfortune' (1874),— and her little sketch of travel 'From Tagus to Rhine,' won popular favor.

Coronado, Francisco Vasquez de, frän-thēs'ko väs kĕth'dā kō-rō-nä'dō, Spanish explorer: b. Salamanca, Spain, about 1500; d.

Mexico after 1542. On the arrival in Culiacan of Alvar Nuñez, Cabeça de Vaca, from his extraordinary journey from Florida in the year 1536, when he brought news of the existence of half-civilized tribes far to the North, living in populous cities, acquainted with the arts, and possessing quantities of gold, silver, and precious stones, an expedition was sent out under Marco de Niza, in 1539, to explore the regions referred to. The result tended to strengthen the belief in the existence of great wealth among the nations far to the north, and a second expedition was fitted out under Coronado, which departed from Culiacan, on the Pacific coast, in April 1540. He passed up the entire length of what is now the Mexican state of Sonora to the river Gila. Crossing this he penetrated the country beyond, to the Little Colorado (called by him Rio del Lino), and paid a visit to the famed cities of Cibola mentioned by Cabeça de Vaca and De Niza. In the kingdom were seven cities, but he declares that there was no truth in the reports of his predecessors regarding their wealth. "All was quite the contrary," he adds, "saving only the names of the cities and great houses of stone." From Cibola, Coronado traveled eastward, visiting several towns occupied by a similar people to those he had met, which are recognized in the existing villages of the present Pueblo Indians. He proceeded eastward to what he calls the "big river," which is the Rio Grande, where he heard of the great city of Quivira. In their journey eastward they "met with a new kind of oxen, wild and fierce, whereof, the first day, they killed fourscore, which sufficed the army with flesh." They continued to Quivira, almost 300 leagues distant, by their account, traversing "mighty plains and sandy heaths, smooth and wearisome, and bare of wood." Coronado's narrative is of value as it furnishes the first authentic account of the buffalo, the great prairies, and the desert plains of New Mexico. It describes, too, with every appearance of truth, the towns of the Pueblo or semi-civilized tribes of Indians, as they existed more than 300 years ago, and which are still found in New Mexico.

Corona'tion, the act of crowning a sovereign; the pomp or assembly attending the investiture of a monarch. Justin II., who succeeded Justinian I. 565 A.D., was the first emperor crowned with ceremony by the Patriarch of Constantinople. Charlemagne adopted the custom, and was crowned by the Pope, at Rome, 800. Edward I. (the Elder), crowned in 902, is said to have been the first English monarch to adopt the ceremony. The custom of crowning the queen originated in England before the Conquest. The French queens were for a long time crowned at the abbey of St. Denis, near Paris. Edward the Confessor fixed the monastery founded by him at Westminster as the place for the coronation of the English monarchs. The real history of the coronation stone, which legend makes Jacob's pillow and geology proves of Scotch origin, is that it was transferred from Ireland to Scotland at an early period, and was placed in the abbey church of Scone in 850. The Scottish kings were crowned here till 1296, when Edward I. carried it to England. It was agreed by the treaty of Northampton, in 1328, that the stone should be returned to Scotland, but this was not done. It is called the "Stone of Destiny," and is fixed under the seat of the coronation chair, which is made of oak, and is now kept in the abbey of Westminster. In the actual coronation service in England, litany, ante-communion service, and sermon are followed by the administration of the oath upon the Great Bible. The archbishop anoints the sovereign, gives him a sword, which is offered as an oblation and then redeemed, invests him with robe and orb, puts the ring on his finger, and after giving him sceptre and rod, crowns him, repeating a collect in the king's behalf. The peers are then presented to the king and a communion service follows. Save in Great Britain coronation has been little practised since the middle of the 19th century, because of the attendant dangers to the king.

Coronation Gulf, an inlet on the northern coast of British America into which empty the waters of the Coppermine River.

Coronea, kŏr-ō-nē'a, a small town of Bœotia, southwest of Lake Copais, where in 447 B.C. the Bœotians defeated the Athenians and became the leading state of Greece; and in 394 Agesilaus defeated the allied Greeks. The town is now in ruins.

Coronel, kō-rō-nĕl', Chile, a port in the province of Concepción, on the Araucobai River, important on account of its coal mines. The customs receipts at this port were 670,040 pesos in 1901 and 544,932 pesos in 1902. Pop. 5,000.

Cor'oner, a functionary whose name coroner, or crowner, implies that he has principally to do with pleas of the crown or in which at least the crown is concerned. His office is very ancient, mention being made of it in 925 A.D. His office in England was peculiarly a county institution. In Alfred's time he was appointed by the king, but since Edward I.'s time the office has been elective. His duties originally had to do with inquiries into fires, and cases of wreckage and of sudden death, but now his court is a court of record in which, after sight of the body of one who has died in prison, or so suddenly that suspicions of violence may be excited, a jury summoned for the purpose pronounce a decision as to the cause of death. The proceedings under the auspices of the coroner prepare the way for a criminal prosecution. He also officiates as a sheriff's substitute when the sheriff himself is interested in a suit, and cannot therefore act in it himself. In the United States the coroner is an elective county officer. His duties are similar to those of a coroner in England.

Cor'onet, an inferior crown worn by the nobility. The coronet of the Prince of Wales consists of a circlet of gold, on the edge four crosses *pattée* or between as many fleur-de-lis; and from the centre crosses rises an arch surmounted by an orb and cross. The coronet of a duke is adorned with eight strawberry leaves above the gold rim; that of a marquis with leaves and pearls interposed; that of an earl has the pearls raised above the leaves; a viscount's coronet is surrounded with pearls only, as is a baron's; but in the latter case the number is restricted to four.

Coronis, in Greek mythology, the daughter of King Phoroneus, whom Neptune loved, and who was changed into a crow by Minerva.

Coro'nium, a hypothetical chemical element, supposed (by some astronomers) to exist in the sun. The evidence in favor of its existence consists in certain bright lines that are seen in the spectrum of the solar corona at the time of a total eclipse, and which are not known to be due to any recognized terrestrial element. On account of the great height above the sun's surface to which the matter that gives these lines extends, coronium has been assumed to be far lighter than hydrogen, which is the lightest known terrestrial element. Certain French and Italian scientists have reported the discovery of coronium in terrestrial volcanic gases; but their results need confirmation, and the existence of the supposed element, even in the solar atmosphere, has not yet been demonstrated.

Corot, Jean-Baptiste-Camille, zhŏń bāptēst kä-mēl kō-rō, French landscape painter: b. Paris 28 July 1796; d. there 22 Feb. 1875. Against the wishes of his family he studied art, first under Michallon, next under Victor Bertin, and then passed a year or two in Italy. In 1827 he first exhibited in the Salon, but it was not till nearly 20 years afterward that his genius in landscape painting was generally recognized. The last 25 years of his life were spent in affluent circumstances (his professional income being immense, and his father's death having brought him a large fortune) and in the happiness engendered by success. In 1867 he was made an officer of the Legion of Honor. Skilful as a figure-painter, it was in landscape that Corot excelled. He was a diligent student of nature, whose aspects he idealized on canvas with no profusion of color, but in sober tints of brown, pale-green, and silver-grays. He was preeminently successful in painting scenes in the faint lights of dawn and twilight, behind a transparent veil of mist, the early rays glinting through dense foliage, mirrored in sparkling water. There is a sameness in Corot's work which forbids him the very highest rank, but within his own province he was inimitable. Among his works may be mentioned: 'Danse des Nymphes' (1851); 'Martyrdom of St. Sebastian' (1853); 'Morning' (1855); 'Evening' (1855); 'Sunset' (1857); 'Orpheus' (1861); 'Rest' (1861); 'Solitude' (1866); 'Landscape with Figures' (1870); 'Pleasures of Evening' (1875); and 'Danse des Amours.' The Boston Art Museum contains his 'Dante and Vergil'; the Metropolitan Museum in New York his 'Ville d'Avray,' and there are various other works by him in public and private American galleries. Consult Blanc, 'Les Artistes de mon temps' (1879); Rosseau, 'Camille Corot' (1884); Thomson, 'Life of Corot' (1892); Stranahan, 'History of French Painting' (1899).

Corozal, Porto Rico, a municipal district of the department of Bayamon. Pop. (U. S. War Dept. Census) 11,508, including 7,286 native whites, 56 foreign whites, 364 negroes, 3,797 mixed, 5 Chinese, and 6,441 persons over 10 years of age who could neither read nor write.

Corozal, Porto Rico, a town in the department of Bayamon. Pop. 1,057.

Corozo-nut. See VEGETABLE IVORY.

Cor'poral, in the army, a non-commissioned officer with nominal rank under a sergeant. He has charge of small bodies of men, places and relieves sentinals, etc. In the British army there are five corporals to each company of infantry, and four to each troop of cavalry. There are also soldiers distinguished by the designation of lance-corporal, who are privates acting as corporals but receiving only privates' pay. In the United States Army a corporal is the lowest non-commissioned officer. His especial duty is to place and relieve sentinels. The corporal wears two chevrons on his sleeve as a mark of his rank, the lance-corporal one only. A ship's corporal is an officer who has the charge of setting and relieving the watches and sentries, and in general assists the master of arms. See also ARMY OF THE UNITED STATES.

Corporal, the linen cloth laid on the altar, on which the sacred vessels are set during the consecration of the elements of bread and wine in the Mass or Holy Communion. It is to be distinguished from the veil, which is used to cover the chalice and paten, and the palla or pall (q.v.).

Corporal Punishment, punishment applied to the body of the offender. In its connection with civil government it technically includes flogging, imprisonment, and the death penalty, but in common parlance its meaning is more restricted. Various extreme and cruel methods of punishment once in vogue have been discontinued in Christian nations, but are still practised in Oriental countries and among uncivilized races. Corporal punishment was once considered indispensable in school discipline, and was very severe in form in the schools of Europe before the advent of the Innovators (q.v.). Since that period its moral and even its immediate practical benefits have been increasingly questioned, and its practice has gradually lessened. American schools have gone farther in this respect than those of Europe. This form of punishment is forbidden by the school law of New Jersey, and to a greater or less degree is restricted in many municipalities of the other States. See BASTINADO; CANGUE; FLOGGING; TORTURE.

Bibliography.—Mann, 'School Punishment'; Painter, 'History of Education'; Rein, 'Outlines of Pedagogics'; White, 'School Management.'

Corporal Trim, a servant of Uncle Toby in Sterne's 'Tristram Shandy.' He is an old soldier and performs his duties in strictest military fashion.

Corporate Control, the control of any trade or industry by a single corporation and not by many firms of unlimited liability. The growth of the corporate form of organization in the United States has been an evolution from rigidly circumscribed beginnings. In the popular estimation they were viewed with suspicion; the original charters were subjects of special legislative action and were granted only to associations of a large and semi-public character, such as railroad, canal, steamship, and water-supply companies.

With the growth of the corporate form of organization popular prejudice against it gradually declined, the legislative view underwent a change, and a wide range of industries was

brought under corporate form of organization. At first charters were granted only by special statute and were often made exceedingly expensive. The legislatures retained this prerogative in some States until forced by constitutional amendment to relax it and frame general laws providing for their organization. Now there are but few States in the North that have not a general corporation law, in which not only the organization but the limitations and responsibilities of corporations are provided for.

The chief advantage of the corporate form of organization is in the limited liability feature. The members of a partnership are all liable to the full amount for all the debts of the firm, and a single partner has it always in his power to commit the firm to undertakings beyond its capacity and to involve it and his partners in financial ruin. But the liability of the corporation extends only to its corporate assets, and of the shareholders only to the extent of their respective holdings fully paid in.

The corporate form also enables the individual in business without associates to set apart a portion of his capital for his own particular business, with merely nominal shareholders in the same undertaking, and to rest assured that no accidents or misfortunes of business will involve him beyond the amount of stock paid up, which he holds in the company. Where the stock is only partly paid he is held liable to the amount remaining unpaid for debts of the corporation.

Again in most important undertakings the established custom or "good will" of the business in time becomes one of the valuable, not infrequently the most valuable, of assets of the establishment. In the case of a partnership or firm this might be lost or destroyed by a dissolution or the death or defalcation of one of the partners. In case of a corporation it is not affected by anything except the failure or dissolution of the company.

The corporation continues, and no dissolution is required or imposed by the death of a shareholder. And in case a part owner desires to withdraw his capital from an undertaking, if a partnership, it frequently imperils the entire business, but, if a corporation, is without power to affect the life of the business or the interests of associates.

And in case of the failure of the corporation the individual proprietors, or shareholders, escape the stigma of insolvency — are often even classed with the creditors, and may in such a position be influential in effecting a valuable reorganization. In disputes that lead to litigation it is the corporation that sues or is sued, but in a partnership the firm name and the names of the partners individually are involved.

Nor does the insolvency of any shareholder have any effect upon the corporation or its other shareholders, while it would ordinarily compel the liquidation of a partnership.

And in a partnership each partner has the financial fate of his associates in his hands, but in a corporation he can do only what he is especially authorized to do by the constitution and by-laws of the organization or by resolution of its board of directors, and his power to commit the corporation can be closely limited.

Corpora'tion, a corporate body legally empowered to act as a single individual, and having a common seal. A corporation may be either aggregate or sole. Corporations aggregate consist of two or more persons legally incorporated in a society, which is kept up by a succession of members, either in perpetuity or till the corporation is dissolved. A corporation sole consists of a single individual and his successors, the intention being to perpetuate a function or office which cannot be done in any man in his personal or bodily capacity. Thus in Massachusetts certain church property is vested in a corporation sole composed of the pastor of the church. To render valid a transfer of lands to such a corporation, the phraseology must always include the words "and his successors." In England the king or a bishop is a corporation sole, as the office is immortal though the man may die.

Corporations are liable to the ordinary laws and treaties of the country, but are not citizens in the sense of exercising a political or municipal franchise. United States law has also had occasion to emphasize the distinction between a public corporation which may be affected by legislation, and a private corporation. Further, according to United States law, the franchises of a corporation are treated as realizable assets for creditors. The amount of property which may be held by a corporation in the United States is frequently limited in the act or charter.

Corporation in Commerce. Of corporations as above defined (see CORPORATION) only the ordinary joint-stock corporation, operated for the profit of the shareholders, is here treated. At the close of the 18th century business corporations in America were small in number and insignificant as to wealth. There were several banks, a number of insurance companies, a few turnpike companies, some stage-coach companies, and some manufacturing corporations. The bulk of the business of the country was conducted, however, by individual traders or by partnership concerns. With the growth of trade and the increase in commercial activity of all sorts the organization of corporations was speedily resorted to as offering many advantages over the old-fashioned partnership. Among those advantages is the opportunity afforded to all to invest in such enterprises without incurring the liability of general partners; in other words, a man can invest such sum as he is willing to lose in the business, with the certainty that he cannot be compelled to pay anything beyond that amount toward the debts of the concern. Then, again, a shareholder in a corporation has his affairs managed for him by salaried officers, without care or responsibility on his part.

At first, in order to organize a corporation, legislative action was required in every case. This answered very well until the power was abused and it was found necessary to limit the power of the various State legislatures in this respect. Corporations are in the eye of the law persons, and it was found that a person of this description, having no body to be imprisoned, was hard to control; so legislatures from time to time passed general laws regulating the formation and management of corporations, endeavoring in this way to restrict them and force each to confine itself to its own particular business. Efforts have been made from time to time by State legislatures to enact a systematic

code regulating all corporations, so now we have in many States a general law for banking corporations, another for insurance companies, another for trust companies, another for railroads, and others. Recently, also, following the example of the English Parliament, many of the States have enacted laws under which corporations may be organized to carry on any legitimate business, no matter what, not already provided for by general statutes.

Corporate organization has been of great advantage to the country. By greater economy in production the poor have profited in the reduced price of most of the necessaries and comforts of life. This reduction in price is a most interesting subject for study and reflection, and if space permitted it would be easy to give numerous illustrations. Indeed, it would be hard to find any considerable number of comforts or necessaries, the price of which has not been reduced by the direct influence of corporate management. The comfort and convenience of all dwellers in this country have been greatly promoted by corporate control of business. Take, for instance, our facilities for traveling. Again, the regularity and cheapness of communication by mail, telegraph, and telephone have only been made possible by the co-operation of hundreds of corporations all working together in intelligent harmony. Again, what could we now do without banks, and without insurance companies? We owe it to corporations that we can protect our property against loss by fire, and our families from want in the case of the death of their breadwinner; and to the savings banks that we can keep safe our surplus earnings, and receive them back again with reasonable interest. In one word, the conditions of modern life would be impossible were it not for corporations. The reduction in the price of articles of general consumption is due, in the writer's opinion, to two causes which in their operation would at first glance seem calculated to produce contrary results, but which, in fact, both tend to the same end. These two causes are competition and consolidation. It is easy to see how competition between two or more concerns engaged in the production of an article would tend to lower its price until a point should be reached when only a narrow margin of profit would remain. The consolidation, on the other hand, of all the competing concerns engaged in the same business would seem to tend to an advance in the price of the commodity produced. But although this is the case primarily, experience shows that there is more money in selling a large quantity at a small profit than in selling a small quantity at a large profit, and the application of this principle results in the ultimate reduction of price. A most notable instance of this truth is to be found in the reduction in price of kerosene-oil since the consolidation into one company of various corporations engaged in its production.

How great have been the advantages to our commerce and our country's development from corporate organization no one can say. Have these advantages been to some extent counterbalanced by certain evils? The concentration of wealth in the hands of corporations has had the effect of driving the individual producer out of business. In the early days of our country's existence many industries were carried on in the towns and villages by skilled workmen who were their own masters, and who were in business for themselves. These industries are now to a great extent monopolized by large corporations, and the men who were formerly independent in their business are now represented by salaried workmen. The gradual extinction of this class of men of moderate means who carried on their business for their own account seems to be a distinct loss to the community. In the same way, repeated consolidations of great concerns have forced out of business many commercial travelers. In the earlier days of the history of this country our foreign commerce was entirely, or almost entirely, in the hands of individual traders and private partnerships. The vessels by means of which the trade was carried on were owned by individuals, the ownership of a vessel being divided sometimes among a number of persons, the captain in many cases being a part owner. This method of doing business afforded a good field for the exercise of individual skill, and the profits made by those engaged in it were far in excess of anything that can be realized by traders of the present day. The sub-marine cables going to all parts of the world, owned by corporations, have entirely revolutionized our foreign trade. Our individual ship-owners have nearly all retired from business, and the carrying trade of the country is done by steam-vessels owned by corporations, and nearly all of them are owned by foreign capitalists and manned by foreign sailors. No doubt the greatest good of the greatest number is promoted by the operation of great industries in corporate hands. The cost of living is reduced; but the disappearance from the ocean of American ships commanded by American skippers and manned by American sailors is a distinct misfortune. Whether this disappearance can fairly be traced to the influence of corporate organizations is a question which can not be answered. It is perhaps partly due to this cause and partly to other causes.

Another evil growing out of the great development of corporate control of business is a lowering of the standard of business honor and business morality. The administration of the affairs of corporations of our country by their directors has in many instances been unfair to the stockholders, and advantageous to the directors. It cannot be denied that many large fortunes have been made by men who availed themselves of the knowledge acquired by them as directors to buy and sell shares for their own profit. Many a director in a corporation would consider it preposterous to be told that he had no right to trade in the stock of his corporation, and yet the director is to all intents and purposes a trustee for the stockholders, and ought not, any more than any other trustee, to trade in the trust estate. More than this, it has not been at all uncommon for directors to engage in transactions with their own company, the result of which has been greatly to their own advantage. Many instances might be cited where directors, under form of law, have bled the corporations for which they were acting. The directorate, for instance, of some great corporate interest, rightfully active within a certain field, leases in the form of privileges certain of its functions to outside corporations, in the success of which its members are concerned. Valu-

able concessions, involving thousands of annual revenue, are granted for the most nominal considerations, and the tributary companies wax rich and pay large dividends, while the great corporation whose revenues are thus diverted from its stockholders, pays none at all, and its only beneficiaries are found among the directors, who misuse their power for their own ends.

Vast sums of money, American and foreign capital, have been invested in enterprises in this country under corporate control. A great deal of this money has been lost to the investor forever. Some of it has gone because the project in its inception was ill considered, and the blame must rest upon the poor judgment of the investor; but too many schemes have been floated by corporations conceived in fraud, through which confiding investors have been fleeced. A common form of swindle is an issue of bonds secured upon nothing but a franchise that has cost the corporation nothing. A fraction of the proceeds may be used in construction; the balance may be, and often has been, distributed among the promoters. An allusion to this form of corporate dishonesty is all that space admits of; were it not so, it would be instructive to refer here at some length to the common device of dishonest directors who contract with so-called construction companies in which they are themselves the shareholders, thereby reaping a dishonest profit.

The power of corporate organization has been invoked to work great hardship and wrong in many cases to the towns and cities throughout the country. Franchises of enormous value — especially the right to use the streets for elevated and surface roads — have been obtained for a most inadequate consideration. This abuse of power by corporations has been demoralizing in its tendency and mischievous in its results. It is idle to say that public convenience requires that hideous structures like the elevated railroad should exist, or that cable-cars should be run on the surface of our principal thoroughfares. It is not so in any other civilized country on earth, and would not be tolerated in any other civilized country.

The corporation is a tremendous power with us, both for good and evil. It is probable that as time goes on its powers will increase rather than diminish. By its means cheaper living, more comfort, and greater luxury will be brought within the reach of us all. Let us hope that a higher plane of business honor may be reached in the management of our corporations.

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New York.

Corporations, National Control of. In considering the question of the national control of corporations, three aspects present themselves. In the first place Alexander Hamilton in 1796 said: "We are laboring hard to establish in this country principles more and more national and free from all foreign ingredients so that we may be neither Greeks nor Trojans, but truly Americans." Herein he established a precedent for the intelligent thought of to-day in regard to corporate legislation. The whole trend of our affairs is to the establishment of principles more and more national, and free from sectionalism so that we may be truly Americans. The second phase is that interstate warfare, unfavorably affecting trade and commerce, has frequently resulted in Federal assumption of jurisdiction over the matters in dispute as involving the public welfare. The third point is that whenever in the history of this nation any force truly national affecting, or relating to, the welfare of the country has been found to outgrow the swaddling-clothes of the express power of the Constitution, the American people have always over-ridden new technicalities and availed themselves of the implied powers of the Constitution.

The country demands uniform national corporate legislation formulated with a view to the good of the nation as a whole and supplanting sectional legislation. A National Incorporation Act, along the lines of the National Banking Act, permissive not mandatory, for the organization of corporations, national in extent, whose business is between States or with foreign countries, might be such a law, and certainly would be immeasurably superior to the the national control of State-created corporations in affording the protection of the national government against conflicting State legislature and local political enactments and, what is equally important, enforcing well-considered regulations and wholesome restrictions similar to the provisions of the national banking system. A National Incorporation Act should be based upon the public demand for clearer uniform legislation on a vital business foundation with proper control and proper restrictions. Provisions for publicity and similar requirements made under Federal jurisdiction and thereby less subject to evasion, attract the attentions of the *whole* nation, and could not be passed with the secrecy and despatch of a State act, emanating from a legislature that might be engaged in a competitive warfare for reward from corporations.

Trusts are a national force. While the word trust has not become generic to the extent that it is defined by all alike, nevertheless one may be satisfied to accept the term as indicating a corporate aggregation engaged in national business, not confined in its operations and scope to the State of its creation. Included are commercial combinations, financial aggregations, and any other organization which tends to concentration and consolidation of force. The trust has advanced beyond the province of mere academic discussion. Whatever be the promoting or direct cause of combinations, they are to-day an integral element in the nation's struggle for commercial supremacy. Nor is the tendency to combination, concentration, and aggregation of power as yet at its height. Its progress will be as great in the future as it has been during the last decade.

The national force and international power of this movement, realized and recognized by Americans and foreigners alike, has led to discussions based far more upon conjecture than upon actual experience, since the advantages, and at the same time the dangers, of these gigantic combinations have up to this time been outlined rather than demonstrated. From the standpoint of the undoubted advantage to the country, some are inclined to advocate perfect freedom to combinations through the United States and the doing away with legal limitations upon their progress and growth; they urge the liberalization of our corporation laws without regard to proper control or wholesome

restrictions. On the other hand, having in mind the potential dangers involved in the possession of power of any kind, others are inclined to advocate devoting the entire legislative energy to the repression and suppression of the trust movement, their conviction being that the centralization and enlargement of power accompanying the formation of vast combinations, unless brought under rigid restriction, must present more than a mere menace to the well-being of the country.

The safe principle, however, is found in the statement that the trust problem is not the problem of abolishing industrial combinations, but of properly applying the principles which they represent, recognizing that they are a power national in extent and a necessary subject of Federal jurisdiction. Discussion as to the legal control of combinations must be not primarily utility and secondarily control, but utilization and control, standing on the same footing. The trusts of to-day are a national force and power in that their business not only extends through all the original and acquired territory of this country, but is rapidly overleaping the boundaries of our States and possessions, entering into foreign countries and making rapid inroads into foreign markets; and national in extent also in that their financial roots extend down and into every commonwealth and municipality of this country.

Investing stockholders of the so-called trusts and combinations are innumerable and widely scattered; the list of stockholders of a single corporation contains over 5,000 investors scattered throughout the United States. Special emphasis must be given to the term "investing stockholders," as showing the hold which these organizations have taken upon the people of this country; a safeguarding both for the country and for the corporation, but a menace besides, inasmuch as an industrial panic would not be confined to the bankers and financiers of Wall Street, but would be felt in every village, town and city throughout the United States.

It has been said that the death of a financier controlling the policies of great industrial combinations would affect the industrial, financial and commercial interests of the United States, more than would the death of a President of the United States. Be this as it may, it needs no demonstration to show that the trusts of to-day are a force national in extent and are a fundamental part of the commercial and financial growth of this country. Correlated with this proposition is the equally demonstrable statement that, in so far as power and force present advantages to this country, to the same extent that power and force, uncontrolled, must tend to become a menace.

Legal Character of Trusts.— Not only are these combinations the creation of legislation and of limited geographical jurisdiction, but in many respects the courts of the State that created them have jurisdiction of their internal affairs to the exclusion of the courts of the States into which they may go; the general rule being that, where the act complained of affects the complainant solely in his capacity as a member of the corporation, whether it be as stockholder, as director, president or other officer, and is the act of the corporation, whether acting in stockholders' meeting or through its agents, the board of directors, such action is the management of the internal affairs of the corporation, and courts of the State which created the corporation have jurisdiction to the exclusion of courts of other States. It has been further held that it is immaterial that the visible tangible property of the foreign corporation is situated in a State where suit is brought and that all questions as to the organization of the foreign corporation, its corporate functions, who shall become its members, and what are their rights as members, should be relegated to the courts of the State which created the organization. Thus the rights of a Boston stockholder in a South Dakota organization are determined by the judge of the South Dakota courts interpreting the statutes of South Dakota. The members of the great financial combinations practically located in New York, with their millions of capital, are relegated to the courts of New Jersey for a determination of their rights as stockholders. And the foreclosure of the properties of great trusts, properties, real and personal, in various States, are ordered, decreed, modified and stayed by courts in New Jersey. The United States Supreme Court refers such matters back to the States.

Public Opinion.— Apart from the personal character of the officers in charge, the great controlling influence upon the combinations is public opinion. This is of two kinds: unformulated, that is, that which is created by discussion, by literature and chiefly by the press; and formulated public opinion,— the statutes. The latter, because of their enacting power, should be the highest form of public opinion; but to-day, under our system of State legislation, that proposition is reversed.

If the best thought, the majority of the best minds, the integrity of intellect of this country, can convince the people of the United States as a whole, that certain lines of control are for the good of the people as a nation, then a national legislative body should create Federal statutes as wide as the interests involved, and as broad as the public opinion which demands the law. Such, however, is not now the case. The subject is national in extent, the interests are national, the best public opinion is national, but legislation is State and sectional. All laws are supposed to be but the formulation of an intelligent public opinion based upon an understanding of the situation and a just appreciation of the interest of the parties involved. On the subject of corporation law public opinion to-day, when it reaches what ought to be its highest stage of efficiency, becomes circumscribed and limited in its efficiency; as it is (1) always circumscribed geographically by the limits of the State creating the statute; (2) generally dwarfed in its birth by the subordination of the general principle involved to the local and ofttimes political State issues; (3) frequently limited in its application by the elimination of the question of the good of the nation and by the substitution for the welfare of the country, of the interest, frequently political, quite generally financial, of the State in question, even to the prejudice of other States, and (4) sometimes formulated as a part of a political system which looks to the good of the party, rather than to the best interests of the State.

There is to-day no forum in which a public national opinion in regard to the great national question of trusts, their advantages or disad-

vantages, their uses and abuses, can be heard and the judgment of the nation formulated into a nationally created and nationally enacted public law. All of these great and vitally important national questions are relegated to the geographical limitation, the financial rivalry and the political systems of the States, with a result that South Dakota, West Virginia, and Maine, on their respective lines of policy formulate a public opinion in the shape of a statute which in its resulting effect, passes over and into the State of Massachusetts, relating to and affecting the property of the citizen of Massachusetts, who, as a stockholder in a South Dakota, West Virginia, Maine or Delaware corporation is relegated to the formulated public opinion of that State for the determination of his rights, according to the statutes and laws of that State, perhaps in disregard of public opinion which prevails in his own State. There can be no effective publicity — no effective restrictions or regulation of corporate power under a system of diverse State legislation. Laxity of legislation as a rule fixes the standard upon the principle that "the team is no faster than the slowest horse." Public opinion formulated into statutes, to be of the highest efficiency and to be freed from evils of subordination, must be uniform among all the States and national in extent.

State Systems.— Many States whose corporate system of legislation is of a high order have not only approached this system at the inception of their laws from different view-points, but from that view-point have built up a legislative scheme, and have a thoroughly adjudicated system of case law upon this subject. Massachusetts, Pennsylvania and New Jersey are examples.

Massachusetts strongly, and Pennsylvania perhaps less urgently, insist upon general publicity for all corporations, public, quasi-public or private. New Jersey, on the other hand, insists on and has consistently adhered to the principle of private publicity as being the better doctrine for business companies. As to the issuance of stock, they differ in theory, Massachusetts more nearly taking the position of insisting upon an official State valuation for stock, while New Jersey, not permitting stock to be issued for services (the great means of "watering stock"), permits the issue of stock for property or money, but compels publicity to the extent of requiring the corporation in the certificate of payment of capital stock, and thereafter in each annual report, to distinguish between that stock which is issued for cash and that which is issued for property. By means of private publicity, every stockholder can ascertain for himself for what property the stock is issued.

Massachusetts and Pennsylvania take the stand that stock must be issued for money or money's worth, and that the State and the courts are the judges as to the law and the fact of what is the value of the property for which stock is issued. New Jersey takes the position that this is too dangerous for the stockholders because of the tendencies of juries and courts after a failure, looking backward, to minimize values of property; and therefore she makes a standard the judgment of the board of directors as determined and declared at the time of the issue, provided that judgment is free from fraud.

The trend of State legislation is sometimes to enact laws with a view to procuring pecuniary returns to the State rather than adhering to sound principles. Corporate measures are apt to be weighed by some legislatures, first, upon monetary scales; second, upon political scales; finally, if found satisfactory by these tests, by the standard of propriety and integrity. The controlling question seems to be one of immediate financial returns, of financial expediency and resulting political desirability. Special legislation for the benefit of any particular corporation, because of the revenue the corporation brings or is expected to bring to the State, is open to the charge of being legislation for a price, especially if the character of such legislation be manifestly unsound in principle. The support of a legislative body given to the passage of an act in consideration of a moneyed return, actual or prospective, to the State, provided the act is otherwise unjustifiable, leads to the charge of being State legislation for a price, and to the further charge that this class of legislation tends to corruption on the ground that an example is set by the State, which is sometimes followed by the individual legislator in individually legislating for a price. It is needless to add that this statement is not always well founded; but the fact that such legislation is open to suspicion and gives rise to such charges is a good reason for its avoidance if not its condemnation. The granting of special charters to individual corporations, with special and unusual privileges and immunities, tends to create public distrust, not only respecting the integrity of the legislation, but also as to the freedom from bias of the individual legislator. One of the commendable features of New Jersey's corporate legislation scheme is that the constitution of that State prohibits such special legislation with respect to corporations, and compels all corporations of a given class to incorporate under the same act, with the same rights and privileges, and subject to the same restrictions and control.

The fostering of legitimate capital and the inducing of incorporated capital to locate within the borders of the State are not only legitimate but commendable in every way. Moreover, the securing of proper returns to the State by way of taxes is eminently proper, and economically commendable.

Some charter-granting States legislate for the following classes of corporations: (1) corporations organized primarily for the purpose of doing business which is outside of the State; (2) corporations organized for the purpose of doing without the State business which is forbidden to be done within the State which created them; (3) those formed for the purpose of doing their entire business outside of the State, being specifically forbidden by their charters from operating or carrying on such business in the State which created them; and (4) corporations organized for the express purpose of doing business in evasion, sometimes in violation, of the law of a State into which they propose to go and to operate. On the other hand, we have States attempting to tax property of corporations — as the State of New York in the case of the United Verde Copper Company (People ex rel. United Verde Copper

Company *v.* Feitner, 54 N. Y. App. Div., 217)—not within their limits and therefore taxed elsewhere; and we have some States attacking domestic and foreign corporations with laws tending to make it difficult to associate capital for commercial operations too large for individuals.

As early as 1866 the State of Pennsylvania granted a special charter to the New York California Vineyard Company, giving it power to do the business set out in its charter, "in any of the United States or territories thereof except in the State of Pennsylvania, the same as a natural person." In 1870 the name of the company by special act was changed to the Land Grant Railway and Trust Company and banking powers were granted to it to be exercised "in any State, territory or country except the State of Pennsylvania." The State of Kansas thrust out this corporation from its borders, refusing to allow it to do business there. The Supreme Court (6 Kan. 255), said: "At the very creation of this supposed corporation its creators spurned it from the land of its birth as illegitimate and unworthy of a home among its kindred and sent it forthwith a wanderer on foreign soil. Is the State of Kansas bound by any kind of courtesy or comity or friendship, or kindness to Pennsylvania to treat this corporation better than its creator (the State of Pennsylvania) is bound? . . . No rule of comity will allow one State to spawn corporations, to send them forth into other States to be nurtured and do business there when the State first among States will not allow them to do business within its own boundaries."

In the year 1897 New York introduced certain legislation tending to make the stockholders and directors of foreign corporations personally liable for the debts of the company in New York, provided the corporation failed to conform to certain New York requirements. This was understood to be aimed specially at the numerous New Jersey corporations doing business in New York. As a counter move a bill was drawn, passed by the New Jersey legislature, and signed by the governor, all within 48 hours, making it law that such corporate liabilities created by the statutes of other States were not enforcible in the State of New Jersey. The passage of this act was sufficient to end the usefulness of the New York acts.

New York has its railroad and transportation laws and forbids local railroads, telephone, or telegraph companies to organize under any other act, and refuses to give such organizations power to do business in New York State unless they accept the conditions and restrictions of the railroad and transportation laws. The case of New York is cited because it is the latest among the eastern States to sell telephone, telegraph and railroad charters free from the ordinary restrictions thrown about such corporations, provided their operations shall be removed and kept out of the State of New York, and because this case is indicative of the tendency of the times. Connecticut recently created by a special charter a banking company with power to hold its stockholders' meetings anywhere in the world. In addition to banking powers the corporation was authorized "to transact the business of merchants, manufacturers, miners, commission merchants, agents of every kind, shippers, builders, financiers, brokers, contractors, and concessionaires," to construct private or public works of any sort or kind, "outside the State of Connecticut"; to do a general transportation and railroad business "outside the State of Connecticut"; to say nothing of power to act as common carrier and express forwarder outside of the State of Connecticut.

Many States seem neither to look beyond their own borders nor to legislate for the good of the country at large or the good of the commercial movement of the times. It needs no argument to enable the student of corporate legislation to come to the conclusion that the drift of State legislation is not toward uniformity, but toward interstate warfare. This contest between States has reached the point where the State of Minnesota has openly charged the State of New Jersey with permitting a great corporation to be organized for the express purpose of doing the very things which are forbidden by the State law of Minnesota, and directly affecting property located in Minnesota.

Federal Assumption.— In early days commerce was the subject of a State war between New York and New Jersey. New York imposed a duty on the New Jersey farm and garden products which came into New York. The boats of the New Jersey men were seized and their cargoes confiscated, if they attempted to escape the payment of this duty. New York had put on a bit of sand shore, now known as Sandy Hook, a lighthouse for the guidance of commerce coming into New York city. New Jersey in retaliation taxed this at the rate of $1,800 a year. The Supreme Court of the United States ended that war.

New York granted to Robert Fulton and others the exclusive right to operate vessels propelled by steam up and down the Hudson River and into the waters of New York Bay. Men from other States who attempted to navigate vessels by steam from points in New Jersey to New York were enjoined by the New York courts. The United States Supreme Court freed trade and commerce from State exactions and from interstate warfare by holding that States had no jurisdiction over what is to-day called interstate commerce, and the decision in Gibbons *v.* Ogden (9 Wheaton, U. S. 1) is interesting reading from a retrospective standpoint. Many other instances might be cited, but the principle is well recognized.

Corporate Legislation in Germany and Austria.— Prior to the 19th century there were few business organizations in Germany, and these were semi-public institutions. Few, if any, joint stock companies were organized in the first 30 years of that century. It is true that there was no political power at that time that could establish uniform corporation laws for all of Germany. The practices of different states differed materially. As a rule, a special act of incorporation was required for the formation of a business company in practically all of the states, and Hamburg and Bremen alone permitted the free incorporation of joint stock companies.

Subsequent to 1830 the construction of railways, the development of banking and insurance, and finally, the development of large scale production in manufactures, led to the formation of many joint stock companies and a demand for corporation laws of more utility. Austria

In 1838 passed a general railroad law. Prussia enacted similar legislation later in the same year. In 1843 Prussia created a new law concerning joint stock companies in general, and in 1852 an imperial "patent" was issued in Austria on the same subject. These laws made some concessions to business companies; yet they required special authorizing acts for the formation of a company, and in many other respects were far from the modern idea of corporation laws.

As early as 1857, a realization of the evils of diversity of corporation laws led to a public demand for a reforming of corporation statutes. At that time, Prussia and Austria were the only states with general laws, excepting some of the Rhine provinces. In Hamburg and Bremen freedom of incorporation existed by prescriptive right. In many of the states it was a matter of controversy whether special authorization was or was not required for the formation of a corporation. The demands of a growing and modern business finally compelled the German states to adopt what were then radical measures. Between 1861 and 1865, to a certain degree uniformity of legislation was secured by the adoption of a commercial code (Handelsgesetzbuch) by the separate states. This, among other things, required a special act of authorization for the formation of a corporation and required the states to exercise strict control over such companies; yet it permitted individual states to allow freedom of incorporation, and accordingly Baden, Oldenburg. Würtemberg, and Saxony soon made this concession to business interests, as did the cities of Hamburg and Bremen. In 1868 or 1869 the commercial code was made a law of the North German Confederation. Yet, although some degree of uniformity was now secured, the law of Germany was too illiberal for the needs of modern business. In 1870 the Reichstag amended the law of 1868 in such a way as to permit freedom of incorporation; and this act has been the foundation of all later legislation of the German empire. This business demand for uniformity of legislation, and, as well, uniformity and concurrence of jurisdiction, led to the adoption of the commercial code by voluntary action of the separate states; it led the North German Confederation to make corporation laws the subject of federal legislation; and, under the present German empire, it has resulted in imperial control of laws relating to business corporations.

Publicity.— Public opinion demands publicity, and that demand is being met by many corporations. We find charters of great organizations voluntarily prescribing broad publicity and making it obligatory on the part of the management.

Publicity is of two kinds, public and private. Private publicity means giving full information to each stockholder. This is the first step. Public publicity means giving this information to the public at large and that, too, whether the organization be a public corporation, a quasi-public corporation or a private company. As a matter of fact, private publicity is simply presenting the thin edge of the wedge, and public publicity is sure to follow in all cases where the proposition is a matter of interest to the public. In the case of a small corporation with half a dozen stockholders, the information may be confined to those stockholders, but the operation is not likely to be large or to affect the public. On the other hand, if there are many stockholders and its stocks and securities are held as investments, many people will earnestly inquire about it, and by means of the enforcement of private publicity many people will find out the details, and therefore the country at large will know them. Public publicity is the logical result of private publicity in all cases where the public is sufficiently interested to make inquiry. Publicity will give a clear insight into the operation and workings of a trust and when this is fully known the public will know how to deal with the proposition as a whole.

Every corporation man recognizes the proposition that to-day there is practically no such thing as enforced publicity in its length and breadth throughout the nation. Neither are many other economic demands enforced under State legislation. State legislation is more easily controlled than national, it can be managed more quietly and more secretly. Bills for the benefit of some particular corporation or corporations, are said to be cloaked sometimes under the disguise of a public measure. They are amendments so-called to existing laws, but they are actually the thrusting of new, and ofttimes evasive matters into a section of the statute in which they do not belong. Such acts can be passed in State legislatures. They are not noted by the public because they are not always commented upon by the press.

An act passed in South Dakota affecting fundamental rights of the stockholder of a great corporation, a law quietly enacted in Delaware or in West Virginia, might not be the subject of national discussion and national comment, and therefore, a national public opinion might not have an opportunity to be heard before its passage. The managing editor of a great daily might not censure the news department if a bill should be introduced, rushed through and passed in the legislature of South Dakota or Delaware affecting a corporation whose visible and tangible property was in Massachusetts; but should a "sneak act" affecting great corporate interests be introduced at Washington, and on the very day of its introduction the majority of the press throughout the United States not be apprised of its introduction, there would be trouble. A Federal law would tend to put all legislation, proper and improper, in a glass case and expose it to the views of the entire public. Proper publicity would not only be obtained, but also maintained by the national act. Upon the introduction of any corporate law under a national system the representatives of every State would be heard upon the subject. Public opinion of every locality would be transmitted through the representative of that locality and made an integral part, either in the opposition or in the promotion of the measure. A National Incorporation Law would truly represent and formulate the public opinion of the nation.

The Form of a National Act.— With some hesitation I suggest that a national act might contain some of the following elements: First: It should be optional with corporations, as in the case of the National Banking Act, to organize under the State acts if they choose. Second: The law should prohibit the use of the name "national" to any but national corporations, compelling other corporations which assume that

title to relinquish it. Third: A national corporation should be protected from State attack to the same extent to which national banks are protected, namely, it should not be subject to attachment or other provisional remedies which prevail in some States against non-residents. Fourth: National corporations should be assured of the privileges and immunities guaranteed to natural persons by the Constitution of the United States and discrimination against them by State laws forbidden. Fifth: National corporations should have freedom from State supervision and should be subject to taxation by the State only to the amount of property actually in the State, and then upon the same basis as an individual. Sixth: The national corporation should be subject to national supervision and examination, and at least private publicity should be compulsory, which would eventually result in a proper degree of public publicity. Seventh: An annual report should be made by the corporation to the Federal authorities, showing the taxing situs of all its property. Such information should be collated by some Federal authority and furnished to the taxing officers of the various States in order that the corporation might be justly and correctly taxed. Eighth: A national corporation should pay taxes upon all its property locally where property is situated. Its stock in the hands of stockholders might be exempted from taxation of every nature.

In the organization and creation of our system of national banks the way was paved for an extension of this system to other corporations. Neither the Constitution of the United States nor Federal or State statutes so distinguish between banks and other corporations that the analogy cannot be reasoned out. The constitutional warrant for the national bank would seem to include a similar warrant for the industrial combination. We have therefore before us an example of national corporations in our national bank system.

It is fitting to close this article with the language of one whose writings are entitled to profound respect. In his commentary upon the works of Alexander Hamilton, Mr. Henry Cabot Lodge said:

"The danger, inconvenience, and utter inefficiency of the State banks are still freshly remembered. The country groaned and chafed under them for more than 20 years, until the Republican party came into power and established the present system of national banks. The new plan did away with the State banks by absorbing them and thus destroying the active and interested opposition which confronted the old Bank of the United States and its predecessor. The present system seems to be firmly and permanently established. It embodies Hamilton's two great principles — national banking, supervised by the central government, and a national bank currency. Hamilton's policy of national banking has become an integral part of our financial system, and has prevailed over all the attacks which have been made upon it. There is another side, however, to the question more important than its financial results. This is the constitutional argument employed by Hamilton in his Cabinet opinion to which allusion has been made in a previous note. In this famous Cabinet opinion Hamilton summoned to his aid the doctrine of the implied powers of the Constitution, and the establishment of the bank was the first triumph of that principle which has done more than anything else to build up and strengthen the power of the national government."

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Corps, kōr (Fr. "body"), a word often used in military and political language. The term is applied to various kinds of divisions of troops; *corps d'armée* is one of the largest divisions of an army (the German *Heeresabtheilung*); *corps de garde,* a post occupied by a body of men on watch; also the body which occupies it; *corps de reserve,* a body of troops kept out of the action, with a view of being brought forward if the troops previously engaged are beaten, or cannot follow up their victory, or are disorganized; and *corps volant* (a flying body) is a body intended for rapid movements.

In political use, *corps législatif* was used from 1857 to 1870 of the lower house of the French legislature; its members were elected for six years. *Corps diplomatique* refers to a nation's entire body of ambassadors, ministers, and other diplomatic officers.

Corps of Engineers. See ENGINEERS.

Corpse (Lat. *corpus,* "body," through Fr. *corps*), a dead body, usually animal, and in most common usage applied only to the human body. To the human corpse there can be no property rights, save in the rare case of disposition by regular will of one's body. Questions as to disposition of a corpse must be heard by an ecclesiastical court in England, by the usual civil courts in the United States, and elsewhere if Church and state be independent. Prior right to a dead body naturally goes to the nearest of kin, marriage ties ranking those of blood. Burial expenses come under the general head of property rights in that they take precedence over any claims against deceased or his estate. Privileges of the corpse extend still further, pagan superstition, which identified to a certain degree body and soul, and long established Christian belief in the resurrection of the body, combining with the law's view, to make mutilation of the buried body, or body-snatching, as digging up the corpse for anatomical or other purposes is called, detested and criminal. Both practices are still widely exercised and public opinion seems less severe than formerly. See BURIAL; CREMATION; MAUSOLEUM; MUMMY; etc.

Cor'pulence, the state of the human body when loaded with an excessive quantity of flesh and fat. The flesh forms the muscular system; and its extent being limited by the form of the particular muscular parts, its quantity can neither exceed nor fall below a certain bulk. The fat is much less limited, and the production and deposition of it is confined to no such definite form. The accumulation of fat depends, in a certain degree, on the state of the health. Children and females have a larger proportion of it than adult men. It is promoted by rich diet, a good digestion, inactivity, tranquillity of mind, etc. There is, however, a diseased state of the system, which, independently of all these influences, will increase the production and deposition of fat. Indeed, corpulence in many cases appears to bear no proportion to food, and

is evidently a disease. A well-known example of corpulence is Daniel Lambert, who exhibited himself in London early in the 19th century. His weight was 704 pounds, and his height 5 feet 11 inches. In recent times much attention has been paid to this subject, a result partly owing to the wide circulation of a pamphlet written in 1863 by William Banting, a London tradesman, who reduced his own troublesome obesity by a regular course of diet. The starch, sugar, and fat of the diet he suggested, are reduced to a minimum. They are, as a matter of fact, less than is sufficient for the liberation of heat and energy. Consequently, the stored-up fat of the body would be drawn upon to yield what was deficient in the diet. In the second place, the richness in nitrogenous material would stimulate oxidation changes, and, aided by exercise, would hasten the consumption of the deposited fat. The diet was successful with Banting, but as a matter of fact it is a modified starvation diet. It is not, therefore, to be hastily tried by everyone with a tendency to stoutness. Its main principles are: avoidance of all foods rich in carbohydrates, or very sparing use of them, notably potato, white bread, rice, sago, tapioca, corn-flour sweets, sweet fruits and sweet vegetables — like carrot, turnip, parsnip, beet-root — reduction of fat, butter, cream, and abstinence from sweet wines and ales. On the other hand, there are allowed all kinds of lean meats, lean fowl, and lean fish, eggs, game, green vegetables, succulent fruits, natural wines, bitter ale in small quantity, and spirits. Brown bread should be substituted for white.

Modern German physicians have been particularly fortunate in their treatment of corpulence. Ebstein of Göttingen allows the use of fats, urges eating asparagus, spinach, cabbage, and other albumen-carrying vegetables, but excludes carbohydrates. Stokes and Oertel combined gymnastics, notably mountain climbing, with careful dieting. Mineral water cures are common, and the Kissingen water is particularly efficient. Dr. Schweninger of Munich won great repute by his cure of Count von Bismarck; his method was based on a careful analysis of each case and upon a study of the patient's previous ailments. In short, he recognized that corpulence is usually a result of various abnormal conditions which must be remedied as a preliminary to direct treatment.

Corpus Christi, kôr'pŭs krĭs'tē, Texas, city and county-seat of Nueces County; on Corpus Christi Bay, at the mouth of the Nueces River, and on the Mexican National, and the San Antonio & Aransas Pass railroads, 140 miles south of San Antonio. Corpus Christi has regular steamboat connections with New Orleans. It is the stock-raising and farming centre of the county, and has an extensive fish and oyster-packing business, several daily and weekly newspapers, a Catholic convent, several churches, a national bank, and an assessed property valuation of $2,000,000. Pop. (1900) 4,703.

Corpus Christi College, Cambridge, Eng., sometimes called Benet College, was founded in 1352 by the united guilds of Corpus Christi and the Blessed Virgin, two fraternities which used to meet for prayers at Saint Benedict church and Saint Mary's respectively. The endowments of the college were considerably increased by Archbishop Parker, who also bequeathed to it his valuable collection of manuscripts. It consists of a master and 12 fellows, besides 26 scholars. The college has the patronage of 10 livings. The college has a wonderful collection of plate and the Lewis collection of printed books. Christopher Marlowe and John Fletcher were members of Corpus Christi.

Corpus Christi College, Oxford, Eng., a comparatively small college founded by Richard Fox, bishop of Winchester and lord privy seal, under a license from Henry VIII. It consists of a president, 15 fellows, 28 scholars, 7 exhibitioners, and two chaplains. Three of the fellowships are annexed to two professorships, the professors occupying the position of honorary fellows, being elected by boards appointed by university statute. The college has the patronage of 16 livings. It counts some famous men among its members, notably Udall, author of 'Ralph Roister Doister'; Richard Hooker Keble, the hymnologist; Thomas Arnold, Master of Rugby; and Chief Justice Coleridge.

Corpus Christi, Festival of, a holiday instituted in the Roman Catholic Church in honor of the mystery of the Eucharist. Its observance began in the diocese of Liège while the archdeacon of that diocese was James Pantaleon, who afterward became Pope Urban IV. In 1264 Urban composed a bull ordering throughout the Church the celebration of the festival on the Thursday following the first Sunday after Pentecost: the bull seems not to have been promulgated save, perhaps, in the city of Rome, for though the festival was duly observed by the Pope and his court, no proof exists of its celebration on that year or after for a long time in other parts. The proximate occasion of Urban's act was the reported occurrence of a miracle at Bolsena in the papal dominion, when a priest in saying the mass accidentally spilled out of the chalice some drops of the sacramental species of wine and tried to cover it up with a linen cloth: forthwith the cloth was covered with red spots in the form of the sacred host. The bull of Urban was revived at the Council of Vienne, 1311, by Clement V., and succeeding pontiffs down to the Council of Trent were zealous for the observance of the holiday. The Council of Trent declared the institution to be a triumph over heresy regarding the doctrine of the Eucharist.

Corpus Delic'ti (literally "the body of the crime or offense"), in Scots law, those external marks, facts, or circumstances which accompany a crime, and without the proof of which the crime is not supposed to be established. There is no correspondent expression in English, but the term is common to the civil law of continental Europe. Here we should say that certain proofs are indispensable to establish a crime, and that unless they exist there is no legal ground to convict the party; so that *corpus delicti* is equivalent to the proofs essential to establish a crime. According to German law no crime can be established unless the *corpus delicti* is clearly present, and self-accusation or confession without this does not empower a court to convict.

Corpus Doctrinæ, dŏk-trī'nē (Lat. "body of doctrine"), in German ecclesiastical history, the name given to each of several collections of theological writings promulgated by various Ger-

man Protestant churches during the 16th century. Among the most important of these collections were the 'Corpus Misnicum' or 'Philippicum' (1559), enforced by the elector of Saxony, containing the Apostles', Nicene, and Athanasian creeds, the Augsburg Confession, and Melanchthon's 'Loci Communes'; the Pomeranian of 1561; that of Nuremberg of 1573; and the Hamburg (1560), Brunswick (1563), Pomeranian (1564), Prussian (1567), Brunswick-Wolfenbüttel (1569), Saxon (1570, called Corpus Thuringicum); and others of a Lutheran character. These were all superseded in 1580 by the 'Formula of Concord.'

Corpus Juris Canonici, jū'rĭs ka-nŏn'ĭ-sī, the body of laws for government of the Church enacted by popes, councils, and synods, or drawn from the writings of the fathers, and the whole approved and promulgated by the holy see. There were numerous collections of canons made and published both in the East and the West prior to the time of Gratian, the Camaldolese monk, professor of theology in the University of Bologna, who in 1139 compiled the *Decretum,* called also *Decretum Gratiani,* which constitutes the first part of the body of the canon law: it is the first methodized general collection of Church laws from the time of Constantine to the year of its publication, and is in three books, treating, the first, of ecclesiastical persons and offices; the second, of cases arising under the several canons, decretals and other authoritative rules; and the third, of the sacraments and rites of the Church. The second part of the Corpus Juris Canonici is the Decretals of Gregory IX., promulgated in 1234. This book contains all decretal epistles of popes from 1139 to the date of its publication. It is followed by the Liber Sextus, 1298, promulgated by Bonifacius VIII.; by the Clementinæ or constitutions of Clement V., 1317; finally the Extravagantes, revised in 1563, contain all decretals promulgated to that date. With the Extravagantes ends the systematic compilation of matter of canon law. In the reign of Henry VIII. the English Parliament ordered a revision of the Corpus Juris Canonici to make it conform to the new order of things brought about by the law of the king's supremacy in matters of religion: meanwhile the old system was to hold so far as might consist with the new order. But no revision has been made, and hence, with a few reserves, the Corpus Juris Canonici is law for the Church of England.

Corpuscle, kŏr'pŭs-l, in anatomy, a small, usually microscopic, body regarded by itself and defined by some qualifying term; as, blood corpuscles (see BLOOD); the Malpighian corpuscles of the kidney and of the spleen; the tactile corpuscles, otherwise known as Meissner's, Wagner's, and palpation corpuscles, found in certain papillæ of the skin of the hand and foot, the gustators or taste corpuscles of the papillæ of the tongue, etc. See PACINIAN CORPUSCLES.

Corpus'cular (or **Emission**) **Theory of Light,** the older theory, which explained the phenomena of light by supposing that a luminous body emits excessively minute elastic particles of matter, "corpuscles," as they were called, which, striking the eye, produce the sensation of light. These corpuscles were supposed to travel in straight lines with equal velocities; reflection was explained not as a case of the impact and rebounding of one moving solid from another fixed one, but as due to repulsion by the molecules of the reflecting surface; refraction was produced by the attraction of the refracting body. The supporters of this theory found great difficulty in explaining how reflection and refraction can co-exist, and in adjusting it to include the phenomena of absorption, the unequal refrangibility of the different colors, etc.; and latterly it assumed a most arbitrary and complicated form. The theory is now completely displaced by the "undulatory" or "wave" theory. Newton held the corpuscular theory, and supported it with great ingenuity, and among its other eminent advocates were Laplace and Biot. A long and interesting controversy was carried on with respect to the truth of these theories, which engaged, some on one side and some on the other, all the most illustrious mathematicians and naturalists of Europe from the time of Newton almost till our own day. See ELECTRON; LIGHT.

Corpuscular Philosophy, a name sometimes applied to the atomic philosophy taught by Leucippus and Democritus. According to their doctrine matter is eternal, and everything in the whole universe, including the soul itself, is produced by a special arrangement and aggregation of minute indivisible bodies or particles called "atoms." These atoms are of various sizes and shapes, and, in some forms of the theory, of different qualities; and it is on these primary differences, combined with the endless varieties of position and figure, that distinctions between things are based. Change is but a rearrangement of atoms caused by their unceasing primary motions. This philosophy was elaborated and developed by Epicurus and other thinkers, and received its grandest expression in the great poem of Lucretius, 'De Rerum Natura' ('On the Nature of Things'). It may be regarded as an ancient form of the modern atomic theory, which, however, differs from it in being, not a philosophy of the universe, but merely a hypothesis concerning the physical constitution of matter, adopted in order to give convenient expression to scientific facts and to aid in scientific advance. Le Sage, in his celebrated and ingenious explanation of universal gravitation, assumed the existence of what he called "*ultramundane corpuscles,*" to whose impact attractions between bodies were due. If a body were isolated in space it would be equally bombarded on all sides by these small bodies from beyond the confines of our universe, but if it were placed in the neighborhood of another body, each would intercept a certain number of corpuscles which would otherwise have bombarded the other. Thus the bombarding force is no longer equally distributed, and there is a resultant attractive force acting between the two bodies.

Corral, Poinciano, pō-ēn-chē-ā'nō kŏr-rāl', Central American general: b. Costa Rica about 1810; d. Grenada, Nicaragua, 8 Nov. 1855. As commander of the Nicaraguan troops he defeated the filibusterer William Walker (q.v.) in the early part of 1855, but later made terms with Walker, and became minister of war. He was subsequently detected in treasonable correspondence with the Legitimists, and after a trial by court-martial was shot by Walker's order.

Correa de Serra, José Francisco, hō-sā' frän-thēs'kō kŏr-rā'ä, Portuguese scholar: b. Serpa, Alentejo, 6 June 1750; d. Caldas, Rainha, 11 Sept. 1823. He was educated in Rome and Naples, was admitted to holy orders, and soon after his return to Portugal in 1777, was made perpetual secretary of the academy recently instituted at Lisbon. He collected cabinets of natural history, especially of botany, established a laboratory for scientific research, and prepared for the press numerous unpublished documents relating to the history of Portugal. Accused before the inquisition, he escaped to Paris in 1786, but was permitted to return to Portugal after the death of Pedro III. At Paris he had been intimately associated with the naturalist Broussonet, and became the host of the latter when he fled in disguise from the reign of terror to Lisbon. Endangered by the detection of Broussonet, he took refuge first in Gibraltar and then in London. He lived in Paris in learned society and pursuits from the Peace of Amiens till 1813, when he came to this country, where he continued his scientific studies, and in 1816 became minister plenipotentiary of Portugal. He was recalled to Portugal on the promulgation of the constitution of 1820, and made minister of finance. His most important writings are treatises on the physiology of plants, and a collection of inedited memorials of Portuguese history, in 1790–1816.

Correction of the Press. See PROOFREADING.

Correggio, Antonio Allegri, än-tō'nē-ō ăl-lā'grē kŏr-rĕd'jō, Italian painter, frequently called Antonio da Correggio, from the place of his birth: b. Correggio 1494; d. there 5 March 1534. He was intended for a learned profession; but nature had designed him for an artist. It has not been ascertained how much he was indebted to his first instructor, who was probably his uncle, Lorenzo Allegri. Three qualities will always be admired in him — grace, harmony, and a skilful management of the pencil. There is a peculiar grace in the movements of his figures, and a loveliness in their expression which takes possession of the soul. These attitudes and movements could not be executed by any artist without his masterly skill in foreshortening, which not only gives greater variety to a piece, but is also favorable to gracefulness. Avoiding all roughness and hardness, Correggio delights by mild and almost effeminate beauties. He strove to obtain this object also by harmony of coloring, of which he may be called the creator. He is unrivaled in the *chiaroscuro;* in the grace and rounding of his figures, and in the faculty of giving them the appearance of advancing and retiring, which is the distinguishing excellence of the Lombard school, of which he may be considered the head. In his drapery, he calculated with extreme accuracy all the effects of the *chiaroscuro.* He possessed the power of passing, by the most graceful transition, from the bright colors to the half tints. It was his object to make the principal figure prominent, that the eye, after gazing till it was satisfied on the bright colors, might repose with pleasure on the softer masses. He made a skilful use of this art in his 'Night' (*la Notte*), which is to be seen in the gallery in Dresden, where there are seven pictures in which his progress in the art may be recognized. Among his best pictures, besides the 'Night,' are the 'St. Jerome,' which has kindled the admiration of several distinguished painters to such a degree as to render them unjust toward Raphael; the 'Penitent Magdalene'; the altar-pieces of St. Francis, St. George, and St. Sebastian; 'Christ in the Garden of Olives'; 'Cupid'; the fresco painting in Parma; and, above all, the paintings on the ceiling of the cathedral in the same city. The story of his extreme poverty, and of his death in consequence of it, has been long since disproved, yet Oehlenschläger has made it the subject of one of his best tragedies in German and Danish. Consult Meyer, 'Correggio,' Heaton's translation (1876); Landon, 'Vie et œuvres de Correggio' (1803–20); Morelli, 'Critical Studies of Italian Painters' (Vol. II.) (1893); Ricci, 'Antonio Allegri da Correggio' (1896).

Correggio, Italy, a city in the province of Emilia, about 25 miles northwest of Modena. The modern town has none of the importance of the mediæval city, which was the capital of the principality. Its importance in history is due to its having been the birthplace of the painter Correggio. Pop. (1901) 14,500.

Corregidor, Philippines, an island lying in the entrance to Manila Bay, and forming a part of the inner line of defense of the city of Manila; length, east and west, four miles; average width, one mile; area, two square miles. It rises on the west coast to a height of 649 feet above the sea; on the highest elevation is the semaphore station of the port of Manila, from which the approach of vessels is signaled. There are also four lighthouses on the island. The island is exposed to ocean storms, and this makes the cultivation of the soil unprofitable; a few crops are raised in the sheltered localities. The chief industries are trade and fishing. The island was strongly fortified by the Spaniards in the 18th century, but the defenses were not well kept up. When Admiral Dewey entered Manila Bay 1 May 1898 he steamed past this island, which was supposed to be very strongly fortified, and to be the base of operations for the mines and torpedoes in the bay. The forts have been strengthened by the United States government, which established a military station here in 1900. Pop. 500.

Corregidor, kō-rā-hē-dōr', in Spain, the principal magistrate of a town, appointed by the king. In Portugal the corregidor has administrative but not governing powers.

Correlation of the Physical Forces, a term introduced by Sir William Grove to denote what may more properly be called the convertibility of the various forms of energy. One or two illustrations will suffice to explain the doctrine. The energy that a bullet in rapid motion possesses may be converted into heat; for example, when a bullet strikes a target it is found to be warm to the touch. Heat may again be converted into kinetic energy, that is, the form of energy possessed by a moving body; for instance, through the intermediation of a steam-engine. Chemical action, another form of energy, may give rise to heat, as when gunpowder is burned; or to both heat and kinetic energy, as when the powder is used to fire off a bullet from the gun; and it is to be noticed that if the same quantity of powder were employed in the two cases, there would be less heat obtained in the second case by an amount that corresponds to that used up in imparting the energy of motion to the bullet. Heat

is directly converted into electricity, and electricity into heat. Electricity in motion produces magnetic effects, while magnets in motion are capable of giving us electricity. The energy of electricity in motion gives rise to chemical action; and chemical action properly applied keeps up an electric current. In connection with this doctrine that of the conservation of energy ought also to be studied.

Correspondence Teaching. See HOME EDUCATION; UNIVERSITY EXTENSION.

Corresponding States. See MOLECULAR THEORY.

Corrèze, kŏr-rāz, France, an inland department, between lat. 44° 54′ and 43° 44′ N., and lon. 1° 12′ and 2° 29′ E., bounded on the north by Creuse, on the east by Puy-de-Dôme and Cantal, on the south by Lot, and on the west by Dordogne and Haute-Vienne. It is named from the river Corrèze. Area, 2,265 square miles; capital, Tulle. Surface mountainous, especially to the north and east. Soil far from fertile, except in a few of the valleys. Heaths occupy a great extent of surface, and agriculture is in a very backward state. Hay is abundant, and large crops of beet-root are grown, besides maize, barley, hemp, flax, etc., in moderate quantities. Minerals are plentiful, but little worked. The only manufacture of note is that of fire-arms at Tulle, employing about 1,000 hands. The trade is, principally in horses, cattle, wood, nut-oil, bees-wax, leather, straw-paper, iron, etc. The department is divided into 3 arrondissements, 29 cantons, and 287 communes. It forms the diocese of Tulle. Pop. 318,000.

Corrib, Lough, lŏH kŏr′rĭb, a large lake, the second in size in Ireland, between Galway and Mayo, about 23 miles in length, and varying from 2 to 6 miles in breadth, and composed of two expansions, united by a narrow channel, about half a mile wide at its narrowest part, across which is a ferry. It is about three miles distant from the sea at Galway, where it is only 14 feet above sea-level. It is separated from Lough Mask by a narrow isthmus, through which there is a subterranean channel. Corrib contains many islands and near it are pre-historic stone-circles.

Cor'ridor (Italian and Spanish, "that which runs"), in architecture, a gallery or long aisle leading to several chambers at a distance from each other, sometimes wholly enclosed, sometimes open on one side. In fortification, corridor signifies the same as covert-way (q.v.).

Corrientes, kŏr-rē-ĕn′tĕs, Argentine Republic, a province bounded by Paraguay on the north, by the territory of Misiones on the north-east, and the republic of Uruguay on the south-east, by Entre Rios on the south, and the province of Santa Fé and the territory of Chaco on the west. Area, 48,357 square miles. The Paraná River forms its boundary on the west and north; the Uruguay River on the east; and there are other streams and lakes. Thus the soil is abundantly watered and well adapted to agriculture. Sugarcane, tobacco, cotton, wheat, and maize are grown extensively; the value of the cattle and horses, however, is much greater than that of the crops, the proportion being about six to one. A railway runs diagonally through the province, from the capital, Corrientes, in the northwest, to the southeastern towns on the frontier of Uruguay. Pop. about 277,000. (For government see CÓRDOBA.)

Corrientes, Argentine Republic, the capital city of the province of the same name. It is situated on the left bank of the Paraná River, and for many years has been an active port for both steamers and sailing vessels. At several private shipyards near the city vessels are built of the wood brought from El Chaco, which is remarkably durable. The city, founded in 1588, has a national college, a normal school, and several elementary schools. Pop. about 20,000.

Cor'rigan, Michael Augustine, American Roman Catholic prelate: b. Newark, N. J. 13 Aug 1839; d. New York 5 May 1902. He made his elementary studies in a private school in Newark and at the age of 14 was sent to Saint Mary's College, Wilmington, Del. In 1855 he began his advanced studies in the historic seminary of Mount St. Mary's, Emmetsburg, Md. Here, in his preparatory course, he showed remarkable abilities, taking the class prizes in Greek, Latin, mathematics, history, and French. In the spring of 1859 he graduated from Mount Saint Mary's, and in the fall of the same year entered the American College in Rome. He was the first student from the United States who asked for admission to this now famous college. In Rome on 19 Sept. 1863 he was ordained a priest for the diocese of Newark, United States, but remained in Rome another year for further study. On 5 Sept. 1864 he began his duties in the Newark diocese, and was soon appointed by his bishop as professor of dogmatic theology and sacred Scripture at Seton Hall Seminary, South Orange, N. J. As vacancies occurred in the seminary he was promoted until in 1868 he was made president of the institution. In 1873 he was elevated to the office of bishop of Newark, remaining at the head of this diocese for seven years. In its management his executive ability proved to be equal to his charity. He liquidated debts, established institutions for the waifs, the defectives, and for the protection of the young whose morals might be in danger. The home for the sick was not forgotten, and the schools received substantial aid and encouragement. The number of organized parishes increased, and when, in 1880, he was called to the position of coadjutor of Cardinal McCloskey, archbishop of New York, he left Newark only after earnestly requesting that he might be allowed to remain; but the Pope selected him and he obeyed. In October 1880 he received the papal bulls appointing him archbishop of Petra and coadjutor to the archbishop of New York, with the right of succession. Upon the death of Cardinal McCloskey, Archbishop Corrigan became archbishop of New York, and the pallium was conferred upon him 4 March 1881. This charge he retained until his death. During the years he was at the head of the second largest diocese in the world, everything possible was done to promote spiritual and intellectual life and to care for the poor, the sick, and the homeless. Saint Joseph's Seminary, at Dunwoodie, near the city, is one of the finest ecclesiastical seminaries in the country. Its chapel was the gift of the archbishop. He was looked upon by all men who knew the forces ever agitating the metropolitan city as "a great conservative force, maintaining the social order of civi-

lization against all socialistic and anarchistic attacks, maintaining the rights of property, on which our homes and the rewards of honest toil and hopes of honorable ambition all depend.»

Corroboree, kŏr-ŏb-ō-rē′ or kŏr-ŏb′ō-rē, the Australian name for a gathering of natives, either for religious or festive purposes. The characteristic feature of these assemblages is a peculiar dance to which the name corroboree is also applied. The gatherings are held on moonlight nights, and generally last the whole night through.

Corrodentia, a group of primitive insects allied to the orthoptera, founded by Burmeister. The corrodentia, as recognized by Brauer, comprise the families *Termitidæ, Psocidæ,* and the group *Mallophaga,* or biting-lice. It is not, however, a very natural assemblage of families and by Packard the corrodentia form a sub-order of his order *Platyptera,* including the stone-flies (*Perlidæ*), the *Psocidæ, Empidæ,* and *Termitidæ,* or white ants (q.v.). In all except the *Psocidæ* the body is flattened and the head extended horizontally. The prothorax is large, broad, and more or less square, while the chest-pieces (*sterna*) are large and broad, and there are often 11 segments in the abdomen.

Corrodi, August, ow′goost kŏr-rō′dē, Swiss poet: b. Zürich 27 Feb. 1826; d. there 16 Aug. 1885. His first volume of 'Songs' (1853), exhibited graceful versification and deep sympathy with nature, while his songs and dramatic compositions in local dialect, 'Mr. Professor, an Idyll of Zürich'; 'The Vicar, a Winter Idyll'; etc.; had extraordinary success. He translated several of Burns' songs into the Swiss-German dialect, and published 'Shakespeare: Life Wisdom from His Works.' His works are numerous and possess much merit.

Corrosive Sublimate, also called mercuric chloride, $HgCl_2$, bichloride of mercury, perchloride of mercury; prepared by heating mercuric sulphate with dry sodium chloride; the mercuric chloride sublimes as a white transparent crystalline mass, having a specific gravity of about 5.43. It is soluble in about 20 parts of cold water, and very soluble in alcohol and ether. It precipitates albumen, hence white of egg is an antidote. It is very poisonous, and is used to preserve both animal and vegetable substances. It is used in pharmacy as *Liquor hydrargyri perchloridi,* and as *Lotio hydrargyri flava* when mixed with lime. Corrosive sublimate is a powerful irritant and is used externally in skin diseases. It is administered internally in syphilis, usually in conjunction with iodide of potassium. It is also much in use by surgeons in an antiseptic spray and as a cleansing agent for sterilizing their operating instruments. When used as an antiseptic wash for wounds or sores, one part of the salt is usually dissolved in from 2,000 to 5,000 parts of water.

Corro'sives (Lat. *corrodere,* «to eat away»), in surgery, medicines which corrode whatever part of the body they are applied to; such are glacial acetic acid, burned alum, white precipitate of mercury, white vitriol, red precipitate of mercury, butter of antimony, etc.

Corrugated Iron, sheet iron formed with parallel ridges and furrows, so that the cross-section is a continuous waved line. Flat sheet metal tends to buckle and get out of shape with every change in temperature. The corrugations, made in one direction, give it greatly increased stiffness, and adapt it to numerous purposes for which it would otherwise be less available. The sheet metal is corrugated by passing between ridged rollers, whose ridges are opposed like the teeth of gear-wheels. It comes out in the commercial form, and is frequently subjected to a process of coating with zinc, to protect it from oxidation, and is then known as galvanized corrugated iron.

The most important use of corrugated iron is for the flues of large steam boilers. For this purpose mechanism has been devised for forming the metal into annular corrugated flue pipes which present greatly increased resistance to collapse over the plain form. The heating surface is materially increased by the corrugations. Later, a flue was manufactured with spiral corrugations, giving increased strength. This material has also found an extensive use in the construction of cheap partitions, walls, and roofs of temporary structures, and for buildings where utility is more valued than ornament.

Corruption of Blood, in law, the incapacity to inherit, or pass an inheritance, in consequence of an attainder to which the party has been subject. In the United States it was abolished by the Federal Constitution.

Corry, Pa., a city in Erie County, about 26 miles southeast of Erie, on the Erie, the Philadelphia & Erie, and the Western New York and Pennsylvania railroads. It was settled in 1860, and developed rapidly because of the petroleum deposits which underlie the city and vicinity. It has varied manufactures of iron wares, several mineral springs, and is the location of the State fish hatchery. Pop. (1900) 5,369.

Corryvreckan, kŏr-rĭ-vrĕk′ạn, a noted strait and whirlpool, on the west coast of Scotland, between the islands of Jura and Scarba. The breadth of the strait is about one mile, and because of the noise of the water rushing through it during storms the passage is terrifying, though not very dangerous.

Corsac, kôr′săk, or **Adive** (*Vulpes canis,* or *cynalopex, corsac*), a species of fox or dog found in Central Asia, Siberia, and India, sometimes called the steppe-fox. Its color varies from reddish-yellow in summer to a whitish tinge in winter. The Kirghiz hunt the corsac for its soft, thick, warm fur. About 50,000 pelts come to market annually. It is gregarious, prowls by day, burrows, and lives on birds and eggs. The corsac stands captivity well and is often seen in zoological gardens.

Corsair, kôr′sâr (Fr., in origin identical with «courser» or «cruiser»), a term employed to denote pirates or their vessels. By the princes of the coast of Barbary the corsairs of their states were commissioned to attack the merchant ships of foreign nations, and they became the scourge of the Mediterranean. At the commencement of the present century nearly all the nations of Christendom paid tribute to the Barbary states, but the insolence of the dey of Algiers toward Capt. Bainbridge, on his arrival there in September 1800, with the annual tribute, led to remonstrances on the part of the United States. In 1801, Yussuf, bey of Tripoli, declared war against the United States, from dissatisfaction with the amount of tribute, and

a powerful squadron was sent to the north African coast. Tripoli was bombarded by the American fleet in August and September 1804; and on 3 June 1805 a treaty of peace was concluded between the two countries. In 1815 war was declared by Algiers on similar grounds; but Commodore Decatur soon appeared in its waters with a large squadron, captured several vessels, and in a few days compelled the dey to sign a treaty of his own dictation on his quarter deck. He next humbled Tunis and Tripoli; and the example of the United States was followed by European governments until the corsairs were annihilated.

Corsair, The, a poem by Lord Byron, published in 1814.

Corse, kôrs, **John Murray,** American military officer: b. Pittsburg, Pa., 25 April 1835; d. Winchester, Mass., 27 April 1893. He was a cadet at West Point for two years, and in 1860 became a lawyer, but enlisted in the Union army at the outbreak of the Civil War. He was a brigadier-general in 1864; commanded a division in Georgia, and upon the advance of the Confederates against Allatoona, Sherman telegraphed him, "Hold the fort for I am coming," which inspired Ira D. Sankey to compose the famous hymn beginning with these words. Gen. Corse repulsed the enemy and accompanied Sherman on the march to the sea. After the War he was successively collector of internal revenue in Chicago and postmaster of Boston.

Corselet, kôrs'lĕt (French), a little cuirass or armor to protect the body from injury, worn formerly by pikemen. It was generally of leather and pistol proof. More generally the term was used of body armor or of a complete suit of armor. In entomology the corselet is the thorax, or that part of a winged insect which answers to the breast of other creatures.

Corset, an article of dress worn generally by women for the purpose of keeping the form erect and trim. It is usually made stiff by whalebone or steels. The history of the corset seems to date from the times of Homer, as the poet gives an account of the girdle or cestus of Venus. It was in use in Germany in the Middle Ages, and was introduced into France about the time of the Revolution. At an early age it was in use in Great Britain and Ireland, at least in the 18th century, and was worn by little girls as a support for the body.

Cor'sica (Fr. *Corse*), an island in the Mediterranean belonging to France. It is separated from the island of Sardinia, on the south, by the Strait of Bonifacio, about 10 miles wide, and its shortest distance from the mainland is 50 miles. It is distant from France about 100 miles. It is somewhat irregular in shape, but tolerably compact, except toward the north, where it terminates in a long and narrow tongue of land about 22 miles long by about six miles broad. Greatest length, north to south, 110 miles; greatest breadth, near its centre, 53 miles; area, 3,377 square miles. The east coast is remarkable for its uniformity, presenting a line which is broken in only one or two places by comparatively small indentations. To this the west coast presents a striking contrast, a number of deep bays following each other in rapid and almost uninterrupted succession. Of these the most important, proceeding north to south, are the gulfs of St. Fiorenzo, Calvi, Porto, Liscia, Ajaccio, and Valinco. The interior is traversed by a mountain chain, which has its principal direction north to south, but throws out several lateral branches, particularly to the northwest. The highest summits are near the centre of the island, including Monte Cinto, 8,891 feet, and Monte Rotondo, 8,775, while others exceed considerably 7,000 feet, and the greater part of the year are covered with snow. The mountain masses are chiefly composed of granite and porphyry, and appear to be generally overlaid by extensive beds of limestone. From the east and west sides of the chain numerous streams descend to the opposite sides of the coast. They are mere torrents, short and rapid, and altogether unfit for navigation. The largest are the Golo and Tavignano. Along the mouth of the rivers large quantities of debris and alluvium have accumulated which, preventing the egress of the waters, have gradually formed on the east coast a series of lagoons and morasses, and made that part of the island very unhealthy; but with this exception the climate is one of the finest in Europe. The heat is sometimes excessive, but the sky is generally clear, and the air bracing. The summits of its many lofty mountains are covered with pines, evergreen oaks, cork-trees, beeches, and chestnuts. In other parts the hillsides are overgrown with dense thickets of cistus, myrtles, arbutus, and other shrubs. Numerous valleys lie between the lofty ridges, and sometimes plains of considerable extent occur, the soil of which is generally fertile and well adapted for the growth of all the ordinary cereals. Agriculture is in a backward state, and the island produces scarcely a sufficient amount for local consumption. Large tracts of land are uncultivated; the farming implements in use are of the crudest form. The slopes are covered with vineyards; and the olive tree appears to be indigenous. The mulberry, orange, and citron succeed well, particularly in the lower valleys near the coast. One of the most valuable productions of the more elevated districts is the chestnut, on which, at least during the winter months, the poorer inhabitants principally subsist. Among domestic animals, the first place for usefulness and numbers seems due to mules and goats. The principal wild animals are the boar and the fox. Deer are numerous and all the smaller game and wild fowl are common; eagles, vultures, and numerous other birds of prey frequent the mountains, and fish abound. The principal source of mineral revenue is derived from quarries of fine granite, porphyry, and marble. Neither manufactures nor trade have made much progress. The chief exports are wine, brandy, olive-oil, chestnuts, fruit, and fish.

From the Phœnicians, its first colonists, the island took the name of Cyrnos; and from the Romans that of Corsica. On the decline of the Roman empire it was seized by the Goths, and passed from them to the Saracens. In 1481 it fell under the dominion of the Genoese, who retained it, with some interruption, till 1755, when a great part of it was wrested from them and made independent by the celebrated Gen. Paoli. France, claiming it on a pretended cession by the Genoese, obtained forcible possession of it in 1768, after the inhabitants had distinguished themselves by a long and valiant

resistance. At the time of the French revolution, Paoli, who had taken refuge in England, returned to his native land, and unfurling the banner of the death's head (the old Corsican arms), he summoned his countrymen to strike for their independence. With the assistance of the British, who landed 18 Feb. 1794, he reduced Bastia in May, and Calvi in August. Corsica was constituted a kingdom under the government of a viceroy (Gen. Elliot); the constitution and laws of Great Britain were adopted, and a parliament such as Ireland had was established. But a large part of the people were averse to the British, whom they regarded as heretics, and the French party again appeared on the island in October 1796, under Gen. Gentili. Sickness had reduced considerably the effective force of the British, and their position was rendered still more critical by the French occupation of the neighboring city of Leghorn, and in consequence they evacuated Corsica. Since 1811 the island has formed a French department. For administrative purposes the department is divided into five arrondissements — Ajaccio (the capital), Bastia, Calvi, Corte, and Sartene, subdivided into 62 cantons and 364 communes. The most distinguished individuals to whom Corsica has given birth are Paoli and Napoleon. Pop. (1902) 295,589.

Cor'sican Brothers, The, a play once popular in England and the United States, translated by Boucicault from the French drama, 'Les frères corses.'

Corsicana, kôr-sĭ-kă'nạ, Tex., city, county-seat of Navarro County; on the Houston & Texas and the Saint Louis S. W. R.R.'s; 180 miles northeast of Austin. It is situated in a great oil district, having a large number of wells. The city is the seat of the State Orphans' Home and the Odd Fellows' Widows and Orphans' Home, and has street railways, waterworks, daily and weekly newspapers, and three national banks. Pop. (1900) 9,313.

Corsini (kôr-sē'nē) **Family,** a famous Florentine family, known since the 13th century. 1. ANDRÉ, Saint: b. Florence 30 Nov. 1302; d. Fiesole 6 Jan. 1373. He early entered a monastery in Florence, where he remained for 40 years; he was then made bishop of Fiesole, and sent as papal legate to Bologna, where he was successful in making peace between factions and putting an end to civil war. 2. LAURENT, became Pope as Clement XII. (q.v.). 3. THOMAS, Italian politician: b. Rome 5 Nov. 1767; d. there 1856. He was a supporter of Pope Pius IX. and was made senator (chief magistrate) of Rome; when the Pope fled from Rome, Corsini went to Florence for a time, but later returned to Rome. 4. NERI, Italian politician: b. Florence 13 Aug. 1805; d. 1 Dec. 1859. He was the younger son of Thomas Corsini, and became one of the leaders of the liberal party in Tuscany. In 1848 he was minister of war and foreign affairs; later the Grand Duke Leopold II. offered him the first place in the ministry and he immediately proposed to establish the constitution. The Duke, however, would not consent to this and went into exile. The provisional government then organized sent Corsini to London to represent Tuscany there.

Corsned, kôrs'nĕd, or **Morsel of Execration,** a form of trial or purgation formerly made use of in England. A morsel of bread, or cheese, often barley bread, said to be exorcised, was administered to a suspected person as a test of his innocence. If the person was guilty, it was held that the morsel would remain in the stomach, and produce pallor and convulsions; if the person was innocent, the morsel would act as a wholesome and nutritious food.

Cor'so, an Italian term first applied to races of riderless horses, then to the long lines of gaily decorated carriages driven through the principal streets of the cities, and afterward to the most fashionable carriage-drive in the city. The Corso, at Rome, stretching from the Piazza del Popolo to the Capitol, and dividing the city into two equal parts, is nearly 3,500 paces in length, and is enclosed by high and mostly splendid edifices; but its breadth is not proportionate; so that in most parts not above three carriages can go abreast. The higher class of citizens take the air in carriages, which form a very long row. This evening promenade, which in all large Italian cities is splendid, and is imitated in very small towns (although it may have only a few coaches), attracts great numbers of spectators on foot. The carnival is the gayest of the festivals, and at this time the Corso appears in its greatest splendor. Goethe has written a description of the Roman carnival and the Corso. See CARNIVAL.

Cor'son, Hiram, American educator: b. Philadelphia, Pa., 6 Nov. 1828. He became professor of rhetoric and English literature at St. John's College, Annapolis, in 1866, and has been professor of English language and literature in Cornell University from 1870. Among his publications are: a 'Hand-Book of Anglo-Saxon and Early English' (1871); 'An Introduction to the Study of Robert Browning' (1886); 'Jottings in the Text of Hamlet'; 'Lectures on the English Language and Literature'; 'The Aims of Literary Study' (1895).

Corson, Juliet, American cooking reformer: b. Roxbury, Mass., 14 Feb. 1842; d. New York 18 June 1897. She established the New York School of Cookery in 1876 and soon achieved celebrity by her writings on cookery and domestic science, her first success being 'Fifteen-Cent Dinners,' a manual for the poor. Her other works include: 'Cooking Manual,' 'Meals for the Million,' and 'Family Living on Five Hundred a Year.'

Corssen, Wilhelm Paul, vĭl'hĕlm powl kôrs'sĕn, German philologist: b. Bremen 20 Jan. 1820; d. Berlin 18 June 1875. After studies in philology at Berlin, and two years spent in teaching at Stettin, he was called in 1846 to lecture at Schulpforta, where he remained till 1866, when ill health compelled him to retire. His earliest important work is his treatise, 'On the Pronunciation, Vowels, and Emphasis of the Latin Language' (1858–9). It was followed by 'Critical Contributions to the Latin Etymology' (1863); 'Critical Supplement to the Latin Etymology' (1866); and 'On the Etruscan Language' (1874–5), in which he labors with great ingenuity and vast learning to prove against the world that the Etruscan language was cognate with that of the Romans.

Cort, kôrt, **Cornelius,** Dutch engraver: b. Hoorn 1536; d. Rome 1578. In his youth he worked for a printseller at Antwerp. He then went to Venice, where he was warmly welcomed

by Titian, some of whose pictures he was employed to engrave. Cort finally settled at Rome, and established a school of engraving there, and it is said had Agustino Caracci for a pupil. He made the first engraving of the Transfiguration by Raphael, and about 150 prints from the other Italian and Flemish masters. This number, considering the shortness of the engraver's life, and the size and fine style of the plates, betokens a considerable amount of industry; but although he had a complete mastery of the graver, he is reproached with deficiency in discriminating delicate shades and relative distance, or the nice varieties of expression.

Cort, Frans de, Flemish poet: b. Antwerp 21 June 1834; d. near Brussels 18 Jan. 1878. As singer of the quiet joys of home life and conjugal happiness he has few peers in any literature. His original homely lyrics appeared in 'Liederen' (1857–9); 'Zing-Zang' (1866); and a second volume of 'Liederen' (1868). He also translated into Flemish verse 'The Finest Songs of Robert Burns' (1862).

Cort, kôrt, **Henry,** English inventor: b. Lancaster 1740; d. 1800. Having at an early age conceived the idea of making England independent of foreign countries for the supply of iron, he established himself as an iron merchant at Gosport, Hampshire, and afterward erected iron works at Fontley, near that town, where he expended large sums in perfecting his processes for puddling and rolling iron. His experiments were successful, in spite of the most disheartening opposition of the most powerful iron masters of England. He took into partnership Adam Jellicoe, chief clerk in the office of the paymaster of the navy, but after his partner's death the navy board seized his iron works for claims against Jellicoe, involving Cort in law suits, and eventually in total ruin. While Cort was bowed down by disappointment at the spoliation of which he had been the victim, his inventions began to exercise a powerful effect upon the iron trade of England, and he is now commonly styled "the father of the iron trade."

Cor'telyou, George Bruce, American cabinet officer: b. New York 26 July 1862. He graduated from the Hempstead, Long Island, Institute, 1879, and the State Normal School, Westfield, Mass., 1882. Between 1883 and 1885 he was a general law and verbatim reporter in New York; and a teacher 1885 to 1889, when he entered the public service. He was private secretary to various federal officials in New York 1889–95; was appointed stenographer to the President November 1895; executive clerk February 1896; assistant secretary 1898, and became secretary to President McKinley 1 May 1900. President Roosevelt continued him in this office until the creation by Congress of the Department of Commerce and Labor, when he appointed Mr. Cortelyou its first secretary (1903).

Cortereal, kōr-tā-rā-äl', **Gasper,** Portuguese navigator: b. about 1450; d. about 1502. He was probably of a distinguished family, engaged in the colonization of the Azores. In 1500 he was appointed by the king of Portugal to command an expedition to explore the northern coasts of North America. He sailed from the Tagus in that year with two ships, ranged the shores of the country afterward called Canada, and freighted his ships with 57 Indians, whom on his return he sold as slaves; and the name Labrador (laborer), afterward transferred to a more northern region, is a memorial of his visit. Soon after he set sail from Lisbon on a second voyage to the same regions, but never returned. One of his brothers who sailed in search of him in 1502, was never afterward heard from.

Cortes, or **Cortez, Hernando,** är-nän'dō kôr-tās', **Hernan,** or **Fernando,** Spanish conqueror of Mexico: b. Medellin, Estremadura, 1485; d. Castillejo de la Castra, near Seville, 2 Dec. 1547. He went to the West Indies in 1504, where Velasquez, governor of Cuba, gave him the command of a fleet, which was sent on a voyage of discovery. Cortes quitted Santiago de Cuba 18 Nov. 1518, with 11 vessels, about 700 Spaniards, 18 horses, and 10 small field-pieces, and landed on the Mexican coast. The sight of the horses on which the Spaniards were mounted; the movable fortresses in which they had crossed the ocean; the iron which covered them; the noise of the cannon; — all these objects alarmed the natives; and the adventurer by his address gained over the Totonacs and Tlaxcalans, who were his faithful allies to the last. To keep in check another tribe he built a fort and a few houses, which formed the nucleus of the city of Vera Cruz, and in order to prevent the desertion of his soldiers, and to give them the courage of despair, he caused his little fleet to be destroyed. Cortes entered the city of Mexico 18 Nov. 1519. Montezuma, the sovereign of the country, received him as his master; and the inhabitants, it is said, thought him a god and a child of the sun. He destroyed the idols in the temples, to whom human sacrifices were offered, and placed in their room images of the Virgin and of the saints. In the meantime he made continual progress toward getting possession of the country, forming alliances with several caciques, enemies to Montezuma, and assuring himself of the others by force or stratagem. On a general of Montezuma attacking the Spaniards, in obedience to a secret order, Cortes repaired to the imperial palace, had the commander and his officers burned alive, and forced the emperor, while in chains, to acknowledge publicly the sovereignty of Charles V. The unhappy monarch added to this homage a present of a large quantity of pure gold, and a number of precious stones. But the jealousy of Velasquez was so much excited by the deeds of his representative, that he sent an army numbering about 1,400 against him. Cortes, with a force not more than 250 strong, advanced to meet it, gained over the soldiers who bore arms against him, and with their assistance again made war with the Mexicans, who had also revolted against their own emperor, Montezuma, whom they accused of treachery. After Montezuma, who had hoped to restore tranquillity by showing himself to the multitude, had fallen a victim to their rage, Guatimozin, his nephew and son-in-law, was acknowledged as emperor by the Mexicans, and gained some advantage over the Spaniards. He defended his capital during three months, but could not withstand the Spanish artillery. Cortes again took possession of Mexico, and in 1521 the emperor, the empress, the ministers, and the whole court were in his power. The unhappy Guatimozin was subjected to tortures

to make him disclose the place where his treasures were concealed, and was afterward executed with a great number of his nobles. The court of Madrid now became jealous of the power of Cortes, who had been some time before appointed captain-general and governor of Mexico. Commissioners were sent to inspect and control his measures; his property was seized; his dependents were imprisoned, and he repaired to Spain. He was received with much distinction, and returned to Mexico with an increase of titles, but a diminution of power. A viceroy had charge of the civil administration, and Cortes was entrusted only with the military command and the privilege of prosecuting his discoveries. The division of powers proved a constant source of dissension; and though he discovered the peninsula of California in 1533, most of his enterprises were frustrated, his life embittered, and he returned again to Spain, where he was coldly received and neglected. He followed Charles V. in his unfortunate expedition against Algiers in 1541 and gave signal proofs of his valor, yet the monarch continued to refuse him admission to the court. It is said that one day, having forced his way through a crowd round the carriage of his king, and put his foot on the step to obtain an audience Charles coldly inquired who he was. "I am a man," replied Cortes, "who has gained you more provinces than your father left you towns." He passed the remainder of his days in solitude, leaving a character eminent for bravery and ability, but infamous for perfidy and cruelty. Consult Prescott, 'Conquest of Mexico'; Helps, 'Life of Cortez' (1871).

Cortés, José Domingo, hō-sā' dō-mēn'gō, Chilean journalist and historical writer: b. about 1830; d. 1882. After some years spent in journalism he was for a time an attaché at Brussels, and subsequently a government director of libraries in Bolivia. He was a prolific author and among his works are: 'Diccionario biografico Americano'; 'Poetas Americanos'; 'Historia de Bolivia'; 'Estadistica bibliografia de Bolivia.'

Cortes, kôr'tĕs, the old assembly of the "estates" in Spain and Portugal, the representatives chosen by the "estates" to assist in the making and administering of the laws of Spain and Portugal. In Spain the cortes of Castile, which was composed of the higher nobility, the superior ecclesiastics, the knights of the orders of St. James, Calatrava, and Alcantara, and the representatives of certain cities, held the first rank during the time of the united Spanish monarchy. In early times the king was very dependent upon them; indeed, they were invested with the power of making war, and frequently exercised it in opposition to the throne. In the original constitution of Aragon the form of government was very remarkable, a supreme judge, called *el justizia,* selected from persons of the second class, presided over the administration of the government. He decided all questions and disputes between the king and his subjects, and confined the royal power within the constitutional limits. King Ferdinand of Aragon and Isabella of Castile succeeded in rendering themselves independent of the "estates" (*las cortes*); and afterward, when the Castilians dared to resist an unconstitutional tax, at a meeting convoked at Toledo by Charles, in 1538, the king abolished this assembly of the "estates." After this neither the clergy nor nobility were assembled; deputies from 18 cities were sometimes, however, convened, but this only in case subsidies were to be granted. Philip II. restrained the liberties of the Aragonese in 1591. After the Spanish war of succession Philip V. deprived those provinces which had adhered to the Austrian party of the privileges that still remained to them. From that time the cortes were convened only to pay homage to the king or the Prince of Asturias, or when a question respecting the succession to the throne was to be determined. But when Napoleon attempted to extend his influence over Spain he convoked (15 June 1808) a junto of the cortes at Bayonne. In their last session, 7 June 1812, a new constitution was adopted by them. The ninth article regulated the powers and duties of the cortes, and provided that they should consist of 25 archbishops, 25 nobles, and 122 representatives of the people. Napoleon afterward attempted, by offering to restore the cortes to their ancient importance, to gain over the Spanish nobility, and through them the people, but failed. The Portuguese cortes is coeval with the monarchy. In 1143 the assembly at Lamego was asked to confirm the elevation of Alphonso I. to the throne, and replied: "We resolve that he shall be king during his life, and his children after him." The general prosperity of the country made the people less interested in the cortes, their representatives; and the kings, elated with success, paid no attention to them only when in need of money. In the year 1828 Don Miguel assembled the cortes, in order to be acknowledged by them, and to give his usurpation an appearance of legitimacy. See PORTUGAL; SPAIN.

Cor'tex, that portion of an organ usually situated on the outside. Thus the cortex of the brain is the external gray portion in which most of the nerve cells are located.

Corthell, Elmer Lawrence, American engineer: b. South Abington, Mass., 30 Sept. 1840. He served in the First Rhode Island Light Artillery, rising to the rank of captain 1861–5. Returning to Brown University he graduated in 1867, adopted the engineering profession, and has had charge of or been connected with many important engineering undertakings. As an assistant under Capt. James B. Eads he built various bridges and levees along the Mississippi River. He was chief engineer of the Southern Bridge and Railway Company, building a railroad over the Mississippi River at New Orleans; consulting engineer to the Illinois Central R.R., and Atchison, Topeka & Santa Fe R.R. 1890–3; and consulting engineer to the Argentine government 1900. His publications include: 'History of the Jetties at the Mouth of the Mississippi' (1880); 'The Interoceanic Problem and Its Scientific Solution' (1885); 'An Enlarged Waterway Between the Great Lakes and the Atlantic Seaboard' (1891), etc., and the articles on jetties, levees, ship canals, and ship railways in Johnson's 'Universal Cyclopædia.'

Cortina, Juan Nepomucena, hoo-ān' nā-pō-moo-chā'nä kôr-tē'nä, Mexican adventurer: b. 1830. He took an active part in the Mexican war, organizing a band of independent guerrillas, which later became a part of the national army, and with their commander took part in many of the battles of that contest.

After the war he became a general in some of the revolutionary risings, and in 1859 set himself up as an independent ruler along the border line between the United States and Mexico, where he held sway from 1859 until 1863. He became an adherent of the unfortunate Maximilian, and after his execution again joined the national party, and received high office from President Juarez. In 1876 he was arrested and Gen. Diaz ordered his execution, but he was shut up in a military prison instead. No record of his death appears.

Cor'tissoz, Ellen Mackay Hutchinson, American journalist and author: b. New York. She is on the literary staff of the New York *Tribune*, with which her husband, Royal Cortissoz, is also connected as a literary and art editor. She is the author of 'Songs and Lyrics' (1881), and with E. C. Stedman edited the 'Library of American Literature' (11 vols. 1888–94).

Cort'land, N. Y., city, county-seat of Cortland County; situated on the Tioughnioga River; and the Lackawanna, the Lehigh Valley, and the Erie R.R.'s; about 38 miles northwest of Binghamton. It is a farming and manufacturing trade centre, and has several wire-works, foundries, machine shops, and manufactories of carriages, stoves, harness, furniture, cash registers, and steel ware; has electric lights and railways, several churches, a State Normal school, daily and weekly newspapers, and three national banks. Pop. (1902) 11,061.

Cortona, Pietro di, pē-ā'trō dē kōr tō nä, properly **Pietro Berretini,** Italian painter and architect: b. Cortona 1 Nov. 1596; d. Rome 16 May 1669. Pope Urban VIII. employed him to decorate a chapel in the Church of St. Bibiena, and also to execute the frescoes of the grand salon of the Barberini Palace. Many churches of Rome were decorated by him; and at Florence he adorned the Pitti Palace for the Grand Duke Ferdinand II. His easel pictures, although of less value than his larger works, are held in great estimation. As an architect he did some important work in church restoration.

Cortona, Italy, city in the province of Arezzo, northwest of Lake Trasimeno, about 50 miles southeast of Florence. It is one of the oldest cities in Italy, and has, in a good state of preservation, a number of the old Roman buildings. Chief of its attractions now are the cathedral, a museum of Etruscan antiquities, and portions of the old Etruscan wall. Pop. commune (1902) 29,412.

Corumbá, kō-room-bä', Brazil, a town of the state of Matto Grosso. It is situated on the Paraguay River, near the Bolivian border, and has the largest trade of any place in the state. The receipts at its custom-house for 1902 were 1,242,541 milreis. The principal products of Matto Grosso, maté, cattle, beef, hides, skins, rubber, etc., are shipped from this point. Here also is located the important arsenal of Ladario. Pop. 7,000.

Coruña, kō-roo'ña, **La,** a seaport of Spain, in the province of the same name in Galicia, on the northwest coast, on a peninsula at the entrance of the Bay of Coruña. It consists of an upper and a lower town, the former built on the eastern side of a small peninsula, and the latter on the isthmus connecting the peninsula with the mainland. The harbor, which is well protected, is deep, spacious, and safe, and many improvements have lately been made. Cattle form the chief export. The imports are nearly twice as great as the exports. There is a large government tobacco factory. There is a lighthouse 92 feet high, called the Tower of Hercules, and supposed to be of Carthaginian construction and to have been remodeled in Trajan's time. The city was founded by the Carthaginians or other Semitic colonists and under Roman rule received the name Caronium. Coruña was the port of departure of the Spanish Armada (1588), and the scene of the repulse of the French and the death of Sir John Moore (1809). Pop. 41,000. The province of La Coruña contains another excellent harbor especially adapted for a naval station, namely Ferrol. It has many mineral springs which have been little exploited. The sea-fisheries are the prime industry. Pop. 631,000.

Corun'dum, or **Adamantine Spar,** a native oxide of aluminum, Al_2O_3, crystallizing in the rhombohedral system, and also occurring massive. Its hardness is 9, and its specific gravity about 4. It is adamantine or vitreous in luster, and very variable in color. Three varieties are commonly recognized. Of these the first is known as sapphire, and includes those specimens that are used as gems (q.v.). The typical sapphire (q.v.) is blue, the red kind being known as "oriental ruby," the yellow as "oriental topaz," the green as "oriental emerald," and the purple or violet as "oriental amethyst." The colors of these gems are due to the presence of traces of certain metallic oxides. The second principal variety of the mineral is that which is known in the arts simply as "corundum," and is used as an abrasive (q.v.). It includes the less transparent varieties of blue, brown, black, gray or white colors. It is either crystallized or granular, or in masses showing distinct parting. The third variety, "emery," is not pure, but is an intimate mixture of corundum with magnetite or hematite. It has long been one of the most important abrasives (q.v.), but it is now being superseded by the greatly superior pure corundum. This usually occurs in crystalline rocks such as granite, gneiss, nepheline-syenite, granular limestone, also chlorite and mica-slate. Sapphire and ruby (qq.v.) are usually in alluvial deposits and in the beds of rivers. The Canadian corundum deposits, discovered a few years ago, are the largest and most important known. Corundum is also found in many other localities, notably in North Carolina, Georgia, Montana, and India.

Cor'us, Chomer, Homer, or **Omer,** a Jewish measure containing, as a liquid measure, 10 baths, or 75 gallons and 5 pints; and as a dry measure, 10 ephahs, or 32 pecks and 1 pint. It was most commonly employed as a dry measure, and was the largest in use among the Jews. Corus is the term generally met with in the historical books of the Bible, and omer or chomer that which is oftenest found in the prophetical ones. Corus is used by some old English writers for 8 bushels, or one quarter.

Corvallis, kôr-văl'lĭs, Ore., a town and county-seat of Benton County, situated in the western part of the State on the Willamette River and on the Southern Pacific and the

Oregon Central & Eastern railroads. It also has steamboat service for two thirds of the year, and as the centre of an agricultural district, has considerable export trade, particularly in wheat. It has saw-mills, planing-mills, a carriage factory, flour-mills, and other manufacturing industries. It is the seat of the State Agricultural College. Pop. (1900) 1,819.

Corvée, kôr-vā (Fr., from Lat. *cura viæ,* "care of the road"), the obligation of the inhabitants of a certain district to do certain labor for the feudal lord or the sovereign gratis or for pay. *Corvée* originally meant compulsory labor on roads, bridges, etc., but it is applied also to other feudal services. In some parts of Germany they still exist. In Prussia they were abolished under Hardenberg's administration. In France the first revolution extirpated this relic of the feudal times.

Corvette, kôr-vĕt', a term applied to a flush-deck vessel, ship- or bark-rigged, having only one tier of guns, usually not more than 26, either on the upper or main deck, ranking between a brig and a frigate. The term is no longer used.

Corvey, kôr'vī, or **Korvei,** a formerly renowned Benedictine abbey near Höxter in the Prussian province of Westphalia, founded in 816; an early centre of German civilization. Wittekind, the historiographer of the convent, Bruno, known afterward as Pope Gregory IV., and many other learned men, were educated here. To its library belonged the only manuscripts of the first six books of the 'Annals of Tacitus' discovered here in 1514. In the first quarter of the 19th century Corvey passed in quick succession into the possession of the House of Orange, of Westphalia, of Prussia, and of the Duke of Ratibor, to whom it now belongs. The abbey or castle of Corvey, as it is now called, has a rich and extensive library; but the ancient collection of the Benedictines is no longer in existence.

Corvidæ, kôr'vĭ-dē, a family of passerine birds containing the crows and their allies, closely related to the blackbirds (*Icteridæ*), starlings (*sturnidæ*) and larks (*Alandidæ*). The bill is strong, more or less compressed; the upper mandible to a certain extent curved, the tip notched; the nostrils are covered with stiff bristle-like feathers pointing forward; there are 12 rectrices in the tail and 10 primary wing feathers. Most ornithologists now recognize three sub-family divisions, the *Fregilinæ* or choughs, the *Ganulinæ,* or jays and magpies, and the *Corvinæ,* or crows, of which the last two are represented in North America by numerous species. About 150 species, dstributed in upward of 35 genera, are found in all parts of the world except a few islands of the south Pacific region. *Callæas* and its allies of the New Zealand islands are sometimes included as a fourth sub-family.

Corvinus, kôr-vī'nŭs, **Matthias.** See MATTHIAS I., CORVINUS.

Corvus, Marcus Valerius, Roman general: b. about 371 B.C.; d. about 270 B.C. He distinguished himself in the first Samnite war, and according to the legends, was assisted in killing a gigantic Gaul in single combat by a raven, which picked out the eyes of his antagonist.

Corwin, Edward Tanjore, American clergyman: b. New York 12 July 1834. He graduated at the College of the City of New York (1853), and at the New Brunswick, N. J., Theological Seminary of the Reformed Dutch Church. He held New Jersey pastorates at Paramus 1857–63, and Millstone 1863–88, when he became rector of Hertzog Hall, New Brunswick. He has published: 'Manual and Record of the Church of Paramus' (1858); 'Manual of the Reformed Protestant Dutch Church in North America' (1859); 'The Millstone Centennial' (1866); 'The Corwin Genealogy in the United States' (1872), etc.

Corwin, Thomas, American statesman and orator: b. Bourbon County, Ky., 29 July 1794; d. Washington, D. C., 18 Dec. 1865. He was admitted to the bar at Lebanon, Ohio, in 1817, and elected to the Ohio legislature in 1821. He became a member of Congress in 1831; was governor of Ohio 1840–2; United States senator 1845–50; secretary of the treasury 1850–3; member of Congress 1859–61, and United States minister to Mexico 1861–4. He was an eloquent orator and one of his most famous speeches was delivered in the Senate 11 Feb. 1847, in opposition to the Mexican war.

Cory, Charles Barney, American naturalist: b. Boston, Mass., 31 Jan. 1857. He is a director in many important corporations, but best and most widely known as an expert vertebrate zoologist. He is an honorary curator of the Field Columbian Museum, Chicago, and a Fellow of the Linnæan and Zoological societies of London, England. His published works include: 'A Naturalist in the Magdalen Islands' (1878); 'Birds of the Bahama Islands' (1880); 'Southern Rambles: Florida' (1881); 'The Beautiful and Curious Birds of the World' (1883); 'Birds of Haiti and San Domingo' (1884–6); 'Birds of Eastern North America'; 'How to Know the Ducks, Geese, and Swans of North America'; 'How to Know the Shore Birds of North America'; 'The Birds of the West Indies'; 'Key to the Water Birds of Florida'; 'Key to the Birds of Eastern North America'; 'Hunting and Fishing in Florida'; 'Montezuma's Castle, and other Weird Tales' (1899); 'Dr. Wandermann.'

Coryat, kôr'yat, **Thomas,** English traveler: b. Odcombe, Somerset, 1577; d. Surat, India, December 1617. He published in 1611 some of his traveling experiences, 'Coryat's Crudities,' etc., a curious book, to which quizzical verses in various ancient and modern languages, written by Ben Jonson, Donne, and other authors, are appended. The latter were afterward published separately under the title of 'Odcombian Banquet,' with an advertisement reflecting satirically upon Coryat, who was a butt of the wits with whom he associated in London. In a second volume, however, entitled 'Cramb, or Colwort Twice Sodden,' published the same year, he protested that the verses were appended to the former without his consent. In his first journey, which occupied five months in 1608, he traveled nearly 2,000 miles in Europe, about one half of which distance he walked. He departed on his second journey in 1612, explored the Levant, resided for a time at Constantinople, examined the vestiges of Troy, visited as many of the sites of the seven churches of Asia Minor

as he could discover, and reached India with the intention of proceeding thence through China, the plains of Tartary, and Ethiopia, and of "casting his eyes upon many other places."

Corybantes, kôr-ĭ-băn'tēz, beings mentioned in Greek mythology which were said to have sprung from Corybas, son of Cybele and Iasion, who appointed them to perform religious service for his mother, the goddess Cybele, in Crete and Phrygia. They engaged in wild religious dances to the accompaniment of the music of flutes, cymbals, etc. There were also Corybantes who were regarded as a class of deities resembling the Cabeiri, and of whom little is known. According to ancient traditions, they were descendants of Hephæstus (Vulcan). The name is sometimes given to the priests of Cybele, as it was said they imitated the dance of the Corybantes.

Corydalis, or **Alder-fly,** one of our largest insects, whose net-veined wings expand nearly six inches. It is a member of the neuropterous family *Sialidæ,* and is named *Corydalis cornutus* in allusion to the enormously long horn-like mandibles of the male, those of the female being large, but short, broad and toothed. The larva is called in the northern States hellgramite, and among the Mississippi fishermen it is known as crawler; it is much esteemed as bait. The larva lives under stones in brooks; is nearly three inches long, with six legs and big jaws, and along each side of the hind-body is a series of long filamentary appendages, at the base of which are short bushy or spongy gills. It breathes by the spiracles during its later larval life, when it lives out of the water. It transforms into a chrysalis in the earth on the banks of brooks. The female lays from 2,000 to 3,000 eggs in a mass. Though very ferocious in appearance, the insect, which sometimes alights on one's dress, is entirely harmless.

Corydalis, kŏ-rĭd'a-lĭs, a genus of plants of the fumitory family (*Fumariaceæ*). The name is also applied to some species of the poppy family. See FUMITORY.

Corydon, kŏr'ĭ-dŭn, Ind., a town and the county-seat of Harrison County, situated in the southeastern part of the State on Indian Creek, and on the Louisville, N. A. & C. R.R. It has several manufacturing establishments, including a furniture factory. It has a sulphur spring and is a summer resort. It was the capital of the Territory, and of the State till 1824. Pop. (1900) 1,610.

Corydon, Iowa, a town and the county-seat of Wayne County, situated in the southern part of the State, 60 miles south of Des Moines, on the Keokuk & Western Railroad. Pop. (1900) 1,477.

Cor'ymb, in botany, a form of indefinite inflorescence, in which the flower-stalks, though springing from different parts of the main axis, have their lengths such that their tops form a flat or nearly flat surface. Examples are meadow-sweet, hawthorn, candytuft, etc.

Corym'bus, in ancient sculpture, the wreath of ivy-leaves, berries, or garlands with which vases were encircled. The term is also applied to that style of dressing the hair among the Grecian women, in which it was tied in a knot on the top of the head.

Coryphæna, kôr-ĭ-fē'na, a genus of fishes of the mackerel family (*Scomberidæ*). The body is elongated, compressed, and covered with small scales, and the dorsal fin extends the whole length of the back, or nearly so. The dolphin of the ancients is the *C. hippuris.* All the species, natives of the seas of warm climates, are very rapid in their motions, and very voracious. They are of brilliant colors and are objects of admiration to every voyager.

Coryphæus, kôr-ĭ-fē'ŭs, the leader of the chorus in the ancient dramas. His functions, however, were often as wide as those of our stage-manager, conductor, and ballet-master. The name is now applied to the leaders of the different parts in operatic choruses, or the principal dancers in the *corps de ballet.* By extension it is also applied to those eminent in the arts or sciences.

Coryphodon, kō-rĭf'ō-dŏn, a fossil ungulate of the extinct order *Amblypoda* (q.v.), found in the Lower Eocene sediments of Europe and America. The feet were short and post-like, somewhat like those of elephants, while the head resembled rather that of a hippopotamus with large flaring front teeth covered by a broad fleshy muzzle, and the skeleton had many archaic and peculiar characters. The coryphodon was the largest land animal of its time, intermediate in size between the tapir and rhinoceros. A mounted skeleton has been erected in the American Museum of Natural History, New York.

Cory'za (Gr. *κόρυζα,* "catarrh"), a cold in the head. See COLD.

Cos, kŏs, an island belonging to Turkey; situated off the coast of Asia Minor, in the Ægean Sea; length about 25 miles; area about 95,000 square miles. It is noted as the birthplace of Hippocrates and Ptolemy II., surnamed Philadelphus, and it claims the honor of being the birthplace of the Greek artist, Apelles. The surface rises partly into rugged hills, but a considerable portion is fertile and well cultivated, yielding grapes, oranges, olives, pomegranates, etc. The modern town of Cos is well built, and contains a large quadrangular fortress erected by the Knights of Rhodes in the 14th century. The harbor is now so filled up that only small vessels can enter. In Cos was manufactured a fine, semi-transparent kind of silk, much valued by the ancients. Pop. about 25,000.

Coscinomancy, kŏs'ĭ-nō-măn-sĭ, or **Coskinomancy,** a kind of divination effected by means of a sieve, which was either suspended or fixed on the point of a pair of shears. The diviner then uttered a certain formula, and repeated the names of any persons suspected of a crime. If the sieve moved at the mention of any name, that person was considered guilty.

Coseguina, kō-sē-gwē'nä, a volcano in the western part of Nicaragua on a peninsula south of the Gulf of Fonseca. The mountain is cone-shaped and 4,000 feet high. It is remarkable on account of the eruption of 1835, beginning 20 January and lasting three days. The country within 100 miles was darkened by the cloud of ashes, and ashes were carried as far as Jamaica and Mexico. The volcano is now quiescent.

Co'sel, Charlotte von. See AUER, ADELHEID VON.

Coseley, kōz'lĭ, England, town in Staffordshire, near Wolverhampton, eight miles northwest of Birmingham. There are iron foundries, nail, hook, chain, and screw works, stove-grate manufactories, cement works, malting establishments, and brick-fields. There are extensive iron and coal mines in the district. Pop. (1901) 22,218.

Cosenza, kō-sĕnt'sā (anciently, COSENTIA), Italy, city of the southern part, capital of the province of Cosenza (Calabria Citeriore), situated on seven small hills, at the foot of the Apennines, where the Busento joins the Crati, 150 miles southeast of Naples. The metropolitan is the only church within the walls; but there are three parish churches in the suburbs. It contains one technical school, two academies of science and fine arts, and one college. The environs are beautiful, populous, and well cultivated, producing abundance of corn, fruit, oil, wine, and silk. This town was anciently the capital of the Brutii, and a place of consequence in the second Punic war. In 410 A.D. Alaric, king of the Visigoths (q.v.), died here, and was buried in the Busento. Cosenza has frequently suffered from earthquakes, particularly in the years 1638, 1783, 1854, and 1870. Pop. (1900) 20,000.

Cos'grove, Henry, American Roman Catholic prelate: b. Williamsport, Pa., 1834. He was ordained priest in 1857, was pastor of a Davenport (Ia.) church in 1862, vicar-general in 1882, and bishop of Davenport in 1884.

Cosh'ering, in old Irish feudal law, a custom whereby the lord was entitled to exact from his tenant food and lodging for himself and his followers at the tenant's house.

Coshocton, kō-shŏk'tŭn, Ohio, a town and county-seat of Coshocton County, situated on the Muskingum River, on the Ohio Canal, and on the Pittsburg, Cleveland, Cincinnati & St. Louis and the Cleveland, Cincinnati & Southern railroads. It has iron and steel works, paper-mill, and other establishments. Pop. 6,473.

Cosmas, kŏs'măs, surnamed INDICOPLEUSTES, Alexandrian merchant of the 6th century. After having traveled much he returned to Egypt, where in monastic retirement he wrote in Greek a work of greater interest than value, on 'Christian Topography,' extending to countries as far as India. The work is included by Montfaucon in the 'New Collection of the Greek Fathers' (Vol. II. 1706).

Cosmas and Da'mian, Saints, Arabian physicians. They were brothers, who practised at Ægæ in Cilicia in the 3d century A.D., and who were cast into the sea as Christians, but, according to the legend, rescued by an angel. Thereafter, burning and stoning having proved ineffectual, they were beheaded in 303. Their relics were translated from Bremen to Munich in 1649, and their names commemorated in the Canon of the Mass.

Cosmati (kŏs-mā'tē) **Family,** a family of architects and sculptors who flourished in Rome from the last half of the 12th century to the beginning of the 14th. The more prominent members of the family were Lorenzo, Cosma, Luca, Jacopo, and Giovanni. They won their fame by their decorative architectural work, known as Cosmati or Roman work, distinguished by the use of mosaic and colored marbles. Among their best works are the entrance to the cathedral of Civita Castellana, the cloisters of the Lateran, and the abbey-house of Saint Paul.

Cosmetics (Gr. *κοσμητικός*, from *κοσμεῖν*, "to decorate"), means for preserving or increasing the beauty of the human body. Such means are used by the most savage as well as the most civilized nations. Some tribes smear their bodies with butter, and the use of oil as a cosmetic is mentioned in the 104th Psalm, — "oil to make [man's] face to shine." The use of cosmetics is hardly to be compared with the painting of the face or body by savages in order to make them look ferocious or terrifying to an enemy. Cosmetics are rather intended to soften and beautify the features, and to act by assimilation; but this assimilation, while it may for a short while achieve the result desired, usually produces disastrous after-effects. The substances used clog the pores of the skin and arrest the perspiration, both sensible and insensible, which is so necessary to health. This check to the perspiration may lead to re-absorption into the system of those very waste and injurious matters which the skin-pores are designed to carry off. The pores may also be enlarged, resulting in a coarsening of the skin that will prove very disfiguring in after-life. Certain preparations are positively and almost immediately dangerous, as, for example, the so-called pearl powder, which is a compound of bismuth. When this is absorbed into the system, it is certain, sooner or later, to show its influence on the nervous organization by a partial paralysis of the eyelids or of the corners of the mouth. It has, further, the disagreeable inconvenience of being liable to change its color upon the skin to black, should it be exposed to any gas containing sulphuretted hydrogen; and if this should reach but one side of the face a most striking contrast would be developed in the appearance of the two cheeks. Even the eating of onions or inhaling their perfume will cause this cosmetic to change into black hydrosulphuret of bismuth. The ravages caused by the use of cosmetics are illustrated in the great numbers of manifestly not aged women who throng city streets, with a wealth of crows' feet and other wrinkles that would not be attained by women of double their age who trusted to bathing, out-door exercise, temperate living, and pure air to preserve their skins in good condition. If, by reason of a positive disfigurement or a disordered condition of the skin, it is thought advisable to use some kind of medicament, the only safe method to pursue is to consult a reliable physician and follow his advice, rather than to go to the charlatans who acquire fortunes at the expense of their vain dupes by selling compounds worth but a few cents at a price that will return a profit of as many dollars. Among the articles used in their preparations are lead, mercury, bismuth, antimony, and arsenic,—all active poisons.

Cosmic Dust, very finely divided matter precipitated upon or attracted to the earth from extra-terrestrial space. It has been found on snow-fields in high latitudes and in the ooze of deep ocean valleys. Scientists have expressed doubts as to its true origin, and certainly a large amount of the fine dust floating in the

terrestrial atmosphere is nothing but extremely fine volcanic ash. At the time of the great explosion of Krakatoa in 1883 an enormous quantity of this ash was thrown into the air, the height which it attained being estimated at over 15 miles. A similar phenomenon was observed at the time of the eruption of Mont Pelée, in Martinique, in 1902, when the ashy dust fell on the decks of ships many hundred miles from its source.

Cosmogony (Gr. κόσμος, "world," + γωνή "origin"), according to its etymology, should be defined the origin of the world itself; but the term has become, to a great degree, associated with the numerous theories of different nations and individuals respecting this event. Though the origin of the world must necessarily remain forever concealed from human eyes, there is, notwithstanding, a strong desire in the breasts of mortals to unveil it; so that we find hypotheses among all nations respecting the beginning of all things. We may divide these hypotheses into three classes: (1) The first represents the world as eternal, in form as well as substance. (2) The matter of the world is eternal, but not its form. (3) The world had a beginning, and shall have an end.

1. Ocellus Lucanus is one of the most ancient philosophers who supposed the world to have existed from eternity. Aristotle appears to have embraced the same doctrine. His theory is, that not only the heaven and earth, but also animate and inanimate beings, in general, are without beginning. His opinion rested on the belief that the universe was necessarily the eternal effect of a cause equally eternal, such as the Divine Spirit, which, being at once power and action, could not remain idle. Yet he admitted that a spiritual substance was the cause of the universe; of its motion and its form. He says positively, in his 'Metaphysics,' that God is an intelligent Spirit (νοῦς), incorporeal, eternal, immovable, indivisible, and the Mover of all things. According to this great philosopher the universe is less a creation than an emanation of the Deity. Plato says the universe is an eternal image of the immutable idea, or type, united from eternity with changeable matter. The followers of this philosopher both developed and distorted this idea. Ammonius, a disciple of Proclus, taught in the 6th century, at Alexandria, the coeternity of God and the universe. Modern philosophers, and also ancient ones (for example, Xenophanes, according to Diogenes Laertius), went further, and taught that the universe is one with the Deity. Parmenides, Melissus, Zeno of Elea, and the Megaric sect, followed this doctrine.

2. The theory which considers the matter of the universe eternal, but not its form, was the prevailing one among the ancients, who, starting from the principle that nothing could be made out of nothing, could not admit the creation of matter, yet did not believe that the world had been always in its present state. The prior state of the world, subject to a constant succession of uncertain movements which chance afterward made regular, they called *chaos* (χάος, "empty space"). The Phœnicians, Babylonians, and Egyptians seem to have adhered to this theory. The ancient poets, who have handed down to us the old mythological traditions, represent the universe as springing from chaos without the assistance of the Deity. Hesiod feigns that Chaos was the parent of Erebus and Night, from whose union sprang the Air (αἰθήρ, "the upper air," as distinguished from ἀήρ, "the lower air"), and the Day (ἡμέρα). He further relates how the sky and the stars were separated from the earth, etc. The system of atoms is much more famous. Leucippus and Democritus of Abdera were its inventors. The atoms, or indivisible particles, say they, existed from eternity, moving at hazard, and producing, by their constant meeting, a variety of substances. After having given rise to an immense variety of combinations, they produced the present organization of bodies. This system of cosmogony was that of Epicurus, as described by Lucretius. Democritus attributed to atoms form and size, Epicurus added weight. Many other systems have existed which must be classed under this division. That of the Stoics admitted two principles, God and matter, in the abstract, both corporeal, for they did not admit spiritual beings. The first was active, the second passive.

3. The third theory of cosmogony makes God the creator of the world out of nothing. This is the doctrine of the Mosaic cosmogony as contained in the first chapter of the book of Genesis, which gives a somewhat detailed account, including the creation of the heaven and the earth, and various subsequent creative acts, culminating in that of man. The immediate creation of heaven and earth by God is also emphatically asserted in some of the psalms. This has been the cosmogony most commonly accepted by Christians, though many at the present day do not consider that they are bound to accept it as literally true. Some consider it to have been derived by the Jews from some non-Jewish people, and a creation story in some respects similar has been discovered among the old Babylonian cuneiform inscriptions. Similar views were also held by the Etruscans and Persians.

Older speculators on the origin of the world had a simpler problem before them than have the modern, now that science has so greatly advanced; difficult questions regarding the origin of life and the evolution of plants and animals have made themselves felt; and the revelations of astronomy have so greatly enlarged our conceptions of the universe. Of the origin of our own globe several hypotheses have been put forward, perhaps the most common being the nebular hypothesis (q.v.).

Cosmorama, kŏz-mō-rā'ma, a species of picturesque exhibition, consisting of 8 or 10 colored drawings, executed in body colors, laid horizontally around a semicircular table, and reflected in mirrors placed diagonally opposite to them. The spectator looks at them through convex lenses placed immediately in front of each mirror. The exhibition takes place by lamplight only, and the lamps are so placed as not to be reflected in the fields of the mirror. There is nothing new in the invention, and the views exhibited are generally copies made from engraved views, such as those of Piranesi, De Nou, Le Bruyer, and other artists.

Cos'mos, about 20 species of annual and perennial herbs of the natural order *Compositæ*. They are natives mostly of Mexico, whence several have been introduced into gardens for their bright flower-heads, which appear in late sum-

mer and during the autumn. They are rather tall plants with opposite pinnate, entire, or lobed leaves, and typically, red or purple flowers (yellow in one species), but in horticultural varieties white and other colors. Their long flower-stems make the plants useful for bouquets. Cosmos is especially popular in the United States because it is easily grown from seeds started in hotbeds, and because it thrives upon almost any garden soil and with the most ordinary care. The cultivated forms are derived mostly from *C. sulphureus* and *C. bipinnatus*, the former of which often exceeds eight feet in height, the latter rarely more than four feet. The flowers are often more than two and a half inches in diameter. *C. diversifolius*, sometimes called black cosmos, is widely known as a *Dahlia*, or a *Bidens*, and seems to be upon the border line between these genera. Probably no plant introduced into ornamental cultivation during the closing years of the 19th century offers such possibilities of improvement as cosmos. Since 1885, when there were few distinct varieties, so much improvement has been wrought that plant breeders are very hopeful. Comparing the typical species of chrysanthemum with its improved varieties will give an idea of what may possibly be accomplished with cosmos.

Cos'mos, kŏz'mŏs (Gr. *κόσμος*, "order" or "harmony"), the universe as an orderly and beautiful system. In this sense it has been adopted by Humboldt as the title of his celebrated work, which describes the nature of the heavens as well as the physical phenomena of the earth.

Cosor'yx, a genus of antelope-deer (see RUMINANTS, FOSSIL) allied to *Merycodus* (q.v.), but with antlers of two equal tines. It is found fossil in the Miocene bad lands of the western United States, and is thought to be ancestral to the modern pronghorn antelope.

Cossa, Francesco, frän-chĕs'kō kŏs'sä, Italian painter: fl. 1470. He lived at first in Ferrara, and is considered one of the founders of the Ferrarese School of Painting; after 1470 he lived in Bologna. His works include: 'Madonna with Saints' (at Bologna), and frescoes in the Schifanoja palace at Ferrara.

Cossa, Pietro, pē-ā'trō, Italian dramatist: b. Rome 25 Jan. 1830; d. Livorno 30 Aug. 1881. He was for some years professor of Italian literature. At first an unsuccessful dramatist, his 'Nero' (1871) was received with the most enthusiastic approval for its dramatic power, despite certain marked technical defects of composition. His following plays confirmed the popular estimate of his powers: 'Messalina,' 'Julian the Apostate,' and especially 'Cleopatra.' He wrote also a volume of 'Lyric Poems.'

Cossacks, kŏs'äks, tribes who inhabit the southern and eastern parts of Russia, paying no taxes, but performing instead the duty of soldiers. Nearly all of them belong to the Græco-Roman Church, to which they are strongly attached, and to the observances of which they are particularly attentive. They must be divided into two principal classes, both on account of their descent and their present condition — the Cossacks of Little Russia and those of the Don. Both classes, and especially those of the Don, have collateral branches, distributed as Cossacks of the Azov, of the Danube, of the Black Sea, of the Caucasus, of the Ural, of Orenberg, of Siberia, of the Chinese frontiers, and of Astrakhan. Writers are not agreed as to the origin of this people and of their name, but they are believed to be a mixed Caucasian and Tartar race. In personal appearance the Cossacks bear a close resemblance to the Russians, but are of a more slender make, and have features which are decidedly more handsome and expressive.

Originally their government formed a kind of democracy, at the head of which was a chief or hetman of their own choice; while under him was a long series of officers with jurisdictions of greater or less extent, partly civil and partly military, all so arranged as to be able on any emergency to furnish the largest military array on the shortest notice. The democratic part of the constitution has gradually disappeared under Russian domination. The title of chief hetman is now vested in the heir-apparent to the throne, and all the subordinate hetmans and other officers are appointed by the crown. Care, however, has been taken not to interfere with any arrangements which foster the military spirit of the Cossacks. Each Cossack is liable to military service from the age of 18 to 50, and is obliged to furnish his own horse. They furnish the empire with one of the most valuable elements in its national army, forming a first-class irregular cavalry, and rendering excellent service as scouts and skirmishers. In 1570 they built their principal "stanitza" and rendezvous, called Tcherkask, on the Don, not far above its mouth. As it was rendered unhealthful by the overflowing of the island on which it stood, New Tcherkask was founded in 1805 some miles from the old city, to which nearly all the inhabitants removed. This forms the capital of the country of the Don Cossacks, which constitutes a government of Russia, and has an area of 61,900 square miles, and a population of 1,474,133. It has a military organization of its own.

Cossacks, The, a story by Tolstoi, published 1852. This Russian romance is a series of picturesque studies on the life of the Cossacks of the Terek, rather than a romance. The story is particularly interesting as showing the first germs of the altruistic philosophy which Count Tolstoi has developed into a vigorous system of self-renunciation.

Cossé, Charles de, shärl dė kŏs-sā, COMTE DE BRISSAC, French marshal: b. Anjou about 1505; d. Paris 31 Dec. 1563. He served with success in the Neapolitan and Piedmontese wars and distinguished himself as colonel in the battle of Perpignan in 1541. He rose to the rank of grandmaster of artillery of France; and subsequently obtained the office of governor of Piedmont, and the baton of marshal of France in 1550. He afterward returned to France as governor of Picardy, and rendered that province important services.

Costa, kŏs'tä, **Isaac da,** Dutch poet and theologian: b. Amsterdam 14 Jan. 1798; d. 28 April 1860. He was called to the Institute of Amsterdam in 1840, and soon acquired a high reputation both for his poetic and theological works. Poetry he continued to write up till 1857, when his last poem, the 'Battle of Nieuwpoort,' was published. Among his theological works are: a 'Refutation of Strauss' Life of Jesus'; a 'History of the Destinies of the Peo-

ple of Israel' (translated into English and German); 'Considerations on the Spirit of the Age.'

Costa, Lorenzo, lō-rĕnt'sō kōs'tä, Italian painter: b. Ferrara about 1460; d. Mantua 5 March 1535. He was employed to decorate the choir of the Church of San Domenico in Ferrara, and was invited to the ducal court, where he painted a number of portraits of princes and nobles. Shortly afterward we find him at Ravenna, at Bologna, where he executed a 'St. Sebastian Pierced by Arrows,' a 'Virgin,' a 'Saint James,' a 'Saint Jerome,' etc. At Mantua, whither he was invited by Francesco Gonzaga, he painted the greater number of the pictures in the palace, then being restored by that prince. He left behind him a reputation for keenness of observation, correctness in design, and great simplicity and grandeur in form, together with harmonious grouping.

Costa, Sir Michael, English musical composer and conductor: b. Naples 4 Feb. 1810; d. Brighton, England, 29 April 1884. He studied at the Naples Royal Academy of Music, where he showed great proficiency. In 1829 he went to England, and in 1839 became a naturalized British subject. He was conductor of the Philharmonic Society, the Sacred Harmonic Society, Her Majesty's Opera, the Handel Festivals, etc. His chief works are the opera, 'Don Carlos' (1844) and the oratorios, 'Eli' (1855); and 'Naaman' (1864), the two last having been composed for the Birmingham Festival. He composed additional accompaniments for several of Handel's oratorios. He was knighted in 1869.

Costa-Cabral, Antonio Bernardo da, än-tō'-nē-ō bĕr-när'dō dä kōs'tä kä-bräl', Count of Thomar, Portuguese statesman: b. Fornas d' Algostra, province of Beira, 9 May 1803; d. San Juan de Flor 1 Sept. 1889. He received his education at the University of Coimbra, became prime minister 7 March 1838, but relinquished this position two months afterward. In 1841, however, he was reinstated. His oppression and misgovernment resulted in his being driven from power 17 May 1846. In 1849, however, he was reappointed prime minister, but only to inaugurate a still more stringent dictatorship. Impoverishing the people by his unscrupulous system of expenditure, contracting new loans, and imposing new taxes, the outcry against him became so irresistible that his own brother Sylva, a member of his cabinet as minister of justice, would not any longer serve under him, and became leader of the opposition in the Cortes, which body was now determined on his overthrow. In the meantime, however, Saldanha set on foot a revolution at Cintra, which spread rapidly over the whole kingdom, and put an end to Costa-Cabral's administration 26 Feb. 1851. Saldanha became prime minister of Portugal, and Costa-Cabral fled to England. He was ambassador to Brazil 1859–61.

Costa Rica, a republic of Central America, bounded by Nicaraugua, the Caribbean Sea, Colombia, and the Pacific Ocean; area about 22,000 square miles.

Political Divisions.— The republic is divided into five provinces and two comarcas. Both provinces and comarcas are subdivided into cantones, and the cantones into districts. Each canton has a municipal organization elected by the people; but the political chiefs of the cantones and the governors of the provinces and comarcas are appointed by the president of the republic. The provinces are: San José, Alajuela, Cartago, Heredia, and Guanacaste. The comarcas are: Puntarenas (sometimes written Punta Arenas) and Limón.

Mountains and Forests.— The mountains do not form a continuous chain, but are divided into two main groups, that of the northwest and that of the southeast, the former including the volcanoes Irazú (11,200 feet), Turialba (11,000 feet), Barba (9,335 feet), and Poas (8,675 feet). Eruptions occurred in 1723, 1726, 1821, 1847, 1864, and 1866. The southeastern or Talamanca group, in which there are no signs of recent volcanic activity, includes the Buena Vista (10,800 feet), Chirripo Grande (11,850 feet), Pico Blanco (9,650 feet), etc. A transverse system, the Cordillera de Dota, below Cartago, renders communication between the northern and southern sections of the country exceedingly difficult. More than one half of the area of Costa Rica lies between 900 and 2,100 metres above the sea, and is covered with virgin forests, the vegetation being so dense that it is almost impossible to penetrate the interior of these regions save by way of the rivers. From the coast to a height of 900 metres are tropical forests and savannas; above 2,100 metres are the regions of oaks and chaparrales, extending up to 3,050 metres; and subalpine or subandine flora characterize the regions between 3,050 metres and the tops of the highest mountains.

Fauna.— The tapir, deer, puma, jaguar, armadillo, iguana, and many varieties of monkeys, are found in the forests, a few species being peculiar to Costa Rica, while the rest belong as well to South or North America. Of *avifauna* there are 725 known species; of *reptilia* and *batrachia* over 130 species; and the species of fish are especially varied owing to the circumstance that those of the Pacific are almost wholly different from those of Caribbean waters.

Mineral Resources.— From three mines near the Gulf of Nicoya the exports of gold in 1900 were valued at $160,000. The production up to 1902 of one of the three principal auriferous districts has reached the sum of $10,000,000. The following comment is made by a mining expert: "Considering that this sum has been produced by the crudest mining and metallurgical methods, the reward which would follow the proper application of capital sufficient to operate on a large and modern scale is surmisable." Coal deposits exist on both the Caribbean and Pacific sides of the republic. They are large and easy of operation; similar in character to those of the anthracite regions of Pennsylvania. Petroleum is found closely associated with the coal and also in large quantities. Iron, copper, and silver exist in several cantones.

Agriculture.— Coffee raising has long been regarded as the most profitable form of agriculture in Costa Rica, and the decline in the price of coffee has brought on the financial crisis from which the country is now endeavoring to free itself. The systematic cultivation of bananas has increased during recent years. About 20 steamers, each carrying from 12,000 to 20,000 bunches, clear from Limón every month for the northern markets. Indian corn, rice, and cocoa grow readily.

Imports and Exports.— In 1901 the imports were valued at $4,410,422.45, while the exports surpassed this figure by $1,172,775.46. Exports

of coffee reached a total value of $2,823,291.32; of bananas, $1,532,581.78; of gold coin and bullion, $682,409.23. The imports for 1902 amounted to $4,178,284.80, the United States sending goods to the value of $2,048,809; Great Britain, $906,679; Germany, $472,991; France, $198,690; Spain, $75,146; Italy, $65,059; Nicaragua (cattle), $288,634.80; other countries, $27,266; and in addition merchandise valued at $95,000 which arrived by parcels post. Imports from the United States include foodstuffs, machinery, tools, cotton prints, drugs, dynamite, paints, and oils. Imports of European origin classified as foodstuffs were of the value of $87,675 in 1902, as compared with $118,329 in 1901; whereas imports of foodstuffs (principally wheat, flour, and lard) from the United States increased from $493,078 in 1901 to $554,251 in 1902. At the two ports of Costa Rica, Limón on the Caribbean, and Puntarenas on the Pacific, the records of maritime movements during 1902 show: Total British tonnage, 175,000, represented by 127 vessels; total German tonnage, 171,000, represented by 115 vessels; total American tonnage, about 151,000, represented by 103 vessels.

Manufactures.— In San José, flour of excellent quality is produced. Small establishments for the manufacture of saddles, harness, shoes, hats, clothing, cigars, cigarettes, candles, soap, beer, alcoholic liquors, carbonated waters, etc., exist in various parts of the republic.

Transportation and Communication.— The Costa Rica Railway runs from Limón to the cities of the central uplands, and has several branch lines; the Pacific Railway (nearly or quite completed in 1903) connects San José with a good harbor on the western coast. Between Limón and New Orleans and Mobile there is direct communication by steamship lines several times each week. Between Limón and New York steamers run weekly. There is a regular service between ports of the Central American coast, from Colón to Belize. Sailings to Jamaica, Cuba, and England are fortnightly. French, German, and Italian steamers call at Limón once a month. On the Pacific coast there are three regular lines touching at Puntarenas: the Pacific Mail, and the Chilean and British lines. Telegraph lines are government property. There are about 100 offices, and 1,300 miles of wire.

Weights and Measures.— The libra = 1.043 pounds; manzana = 1.5-6 acres; centaro = 4.2631 gallons; fanega = 1.5745 bushels. The metric system was established by law, 10 July 1884, but has not yet displaced old weights and measures.

Money and Banking.— The gold standard was adopted in 1896; in 1900 gold certificates were redeemed and gold put into circulation. The unit is the colon (value in United States gold or silver, $0.465). The gold coins are 2, 5, 10, and 20 colons; the silver coins, 5, 10, 25, and 50 centimos. The principal banks of deposit and emission are the Banco Anglo-Costarricense, established 1863, and the Banco de Costa Rica, established 1867.

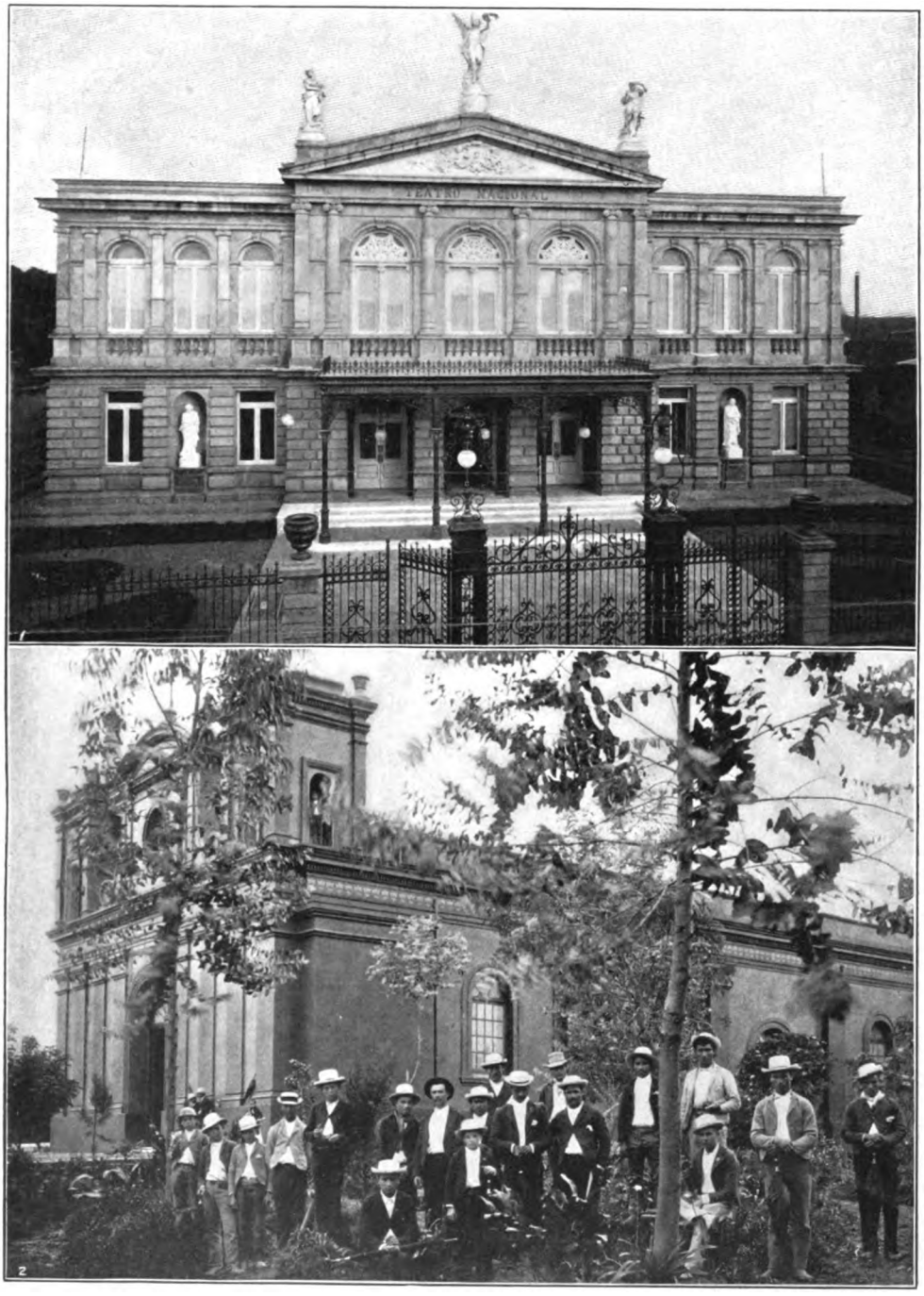
Government.— The legislative branch of the government consists of a single house, called the Constitutional Congress; its deputies, who are chosen, one for every 8,000 inhabitants, for a term of four years by an electoral college, assemble each year for a 60 days' session which may be extended for 30 days. One half of the deputies retire every two years. Members of the electoral bodies are chosen by popular vote; they elect the president of the republic, as well as the deputies. The term of the presidents, in whom is vested the chief executive power, is four years. Congress annually appoints three substitutes called *designados.* Administrative departments in charge of secretaries or ministers appointed by the president are four; that of state (including foreign affairs, public instruction, justice, and worship); that of the interior; that of finance and commerce; and that of war and marine. An assistant secretary (*subsecretario*) assigned to an important bureau(for example, public instruction) reports directly to the constitutional congress. Judges also hold office for terms of four years. The main tribunals are the supreme court of justice (five justices), and two appellate courts (three magistrates each). Subordinate courts are established in the provinces and the comarca of Puntarenas. In the chief towns of each canton the alcaldes are judges of petty offenses, act as committing magistrates, and have jurisdiction in the less important civil cases.

National Debt.— The economic problems of the government were acknowledged in the inaugural message of President Esquivel, 2 May 1902, to be "grave and complicated." The total foreign debt in 1901 was £2,080,000; it was contracted in England in 1871 and 1872. The internal debt was less than 7,000,000 pesos. In March 1901 Costa Rican bonds to the value of 642,300 colones were incinerated, having been issued in 1897 and 1899, and subsequently redeemed. The revenue of the government is derived from custom-house duties, the liquor monopoly, tobacco, stamped paper, post-office, etc., the export duty on coffee having been abolished 1 Sept. 1901. In 1900–1 the total revenue in gold colones was 8,700,833; total expenditures 9,319,192.

Army and Navy.— All male citizens between the ages of 18 and 50 may be called upon to do military service; the standing army, however, numbers only 600, with 1,200 militia. The government has a gunboat and a torpedo boat.

Population.— The population in 1826 was 61,846, and mainly by increase of the families whose ancestors came from Galicia or Catalonia before the date just mentioned, it had grown by 1903 to 310,000. In marked contrast with the other Central American states, Costa Rica's population, in the larger towns of the uplands, is almost entirely white. Only a few thousand Indians remain, and the negroes live near the coasts.

The character of the people has been tested. Their troops were conspicuously successful against the filibuster from Nashville, Tenn., William Walker, who in 1855 forced the Nicaraguans to elect him to the presidency (see CENTRAL AMERICA). This feat established Costa Rica as one of the controlling forces in a group of small states, but an aggressive policy was not adopted then, nor has it been subsequently adopted. The inaugural message of President Esquivel (May 1902) made mention especially of the obligation and "traditional" policy of Costa Rica, to solve its own problems, and to avoid complications with other countries. Since Walker's expulsion, the most important events have been the promulgation of the constitution of 1870, and the arbitration of the boun-



1. National Theatre at San José.
2. A Country Church — Native Costa Ricans in Foreground.

dary disputes. The frontier line with Colombia (Panamá) was settled by the award of the president of the French republic as arbitrator, 11 Sept. 1900. President Loubet's decision extended the Colombian frontier to Punta Carreta on the Caribbean coast, thus depriving Costa Rica of extensive territory to which she laid claim. On the basis of this award, the present area is somewhat less than 22,000 square miles. Previous estimates have varied between 23,000 and 34,000 square miles. On 20 Jan. 1902, a «Convention of Peace and Obligatory Arbitration» was signed at the Port of Corinto, Nicaragua, by plenipotentiaries of Costa Rica, Nicaragua, Honduras, and Salvador.

Education.— Costa Rica has about twice as many teachers in its schools and colleges as soldiers in its army. Elementary instruction of both sexes is by constitutional mandate compulsory and at the government's expense. More than one half of all the children of suitable age are enrolled as pupils in the primary schools. The most recent statistics available at present show 327 schools in 202 different localities, controlled by educational juntas for whose support the government has made a special loan and imposed certain taxes. Higher education is provided at several provincial institutes, and at the Liceo and Colegio Superior de Señoritas — both of the latter in the capital. There are schools of law and medicine, a national museum, a national library, the University of Santo Tomas, and the Physico-Geographical and Meteorological Institution. The government has made a practice of defraying the expenses of a number of young men who are sent as students to European universities; and by the courtesy of the Chilean government six Costa Ricans are allowed free instruction at the pedagogical institute of Santiago (Chile).

History.— An account of the Spanish settlements at the beginning of the 16th century is given in the article CENTRAL AMERICA. The Spanish crown in 1540 established the province of Costa Rica; in 1560 and 1573 defined its frontiers; in 1562 appointed Juan Vasquez de Coronado military governor of Costa Rica and Veragua. The city of Cartago, until 1823 the capital, was founded by Coronado, but it was a city only in name. During the 1st century of the existence of the province no headway was made. The Indian tribes were the most intractable of their kind; white settlers were few. A brief period of comparative prosperity began when Capt.-Gen. Sandoval in 1638–9 made a new port at Matina and opened a road from it to the capital. The value of cacao plantations near the road increased, and the eastern coast, as well as the Gulf of Nicoya, was visited by trading ships. But the buccaneers swooped down upon the coast as soon as there was anything of value to be seized, and Indians completed the work of destruction. This wretched state of things continued throughout the 18th century.

One hundred years ago Costa Rica was described as the most benighted, woeful province in the whole Spanish empire. Its colonists, ignorant and indigent, «clothed with the bark of trees,» had been reduced to such misery — generation after generation cut off from communication with the outside world — by century-long ravages of pirates from Europe and marauding bands of Indians from the Mosquito coast. But to-day, as we have seen, the republic holds a leading position among Latin-American nations in regard to public instruction, and it can no longer be called a very poor country. Every Costa Rican who cares to do so can own valuable property of some sort, and the foreign commerce of the country is far from being contemptible. The change may be described in a few words.

Less than four months after proclaiming that Spanish control was at an end (15 Sept. 1821), Costa Rica with the other weak Central American states was drawn into a union with the Yturbide empire of Mexico. This dependence lasted until 1824, and then followed the experimental union of the Central American countries. But genuine independence began with self-reliance after 1830. Even in that time of extreme poverty the state acknowledged and declared that it could not postpone and would not shirk its duty to provide for the education of the people. In better days it has devoted 10 per cent of the national revenues to this use. Thus Costa Rica's particular achievement, marking this little republic for distinction among Latin-American nations, has been the upbuilding of character through sacrifices made in the cause of popular education. During the first half of the 19th century commerce received a new impulse through the discovery of gold in the mountains near the Gulf of Nicoya, and the extension of coffee culture. Several of the presidents holding office since 1824 have been eminently patriotic and far-seeing men, under whose guidance the graduates of Costa Rican schools have begun to appropriate some of the natural resources of the land, with little aid from immigration, though not without the aid of foreign capital. Immigration up to the present time has been small.

Cities.— The capital, San José, in the province of the same name, has about 30,000 inhabitants. It is 103 miles by rail from Port Limón, and 59 miles by rail from Tivivis on the Pacific coast. Its altitude being about 4,000 feet above sea-level, the climate is agreeable, the temperature ranging from 65° to 78° F. It has three parks; three and a half miles of electric street railways, a telephone system, and electric lighting for the principal streets, which are macadamized or paved with stones. Principal buildings are: The National Theatre, National Palace, Palace of Justice, executive mansion, Episcopal palace, custom-house, mint, market, university, high schools for young men and young women, etc. There are also hospitals and asylums for orphans and the insane. The former capital, Cartago, has more than 12,000 inhabitants; Port Limón, 4,000; Heredia, about 9,000; Alajuela, 18,000; Puntarenas, about 6,000. Port Limón is about 2,025 miles (sailing distance) from New York. From San Francisco to Puntarenas the distance is given as 2,793 miles.

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MARRION WILCOX.

Costello, kŏs-tĕl'lō, **Dudley,** English novelist and journalist: b. Sussex 1803; d. London 30 Sept. 1865. He served as ensign in the West Indies in the earlier part of his career, and was subsequently foreign correspondent of several London journals. He was a magazine writer and the author of popular works of fiction, and among his writings are: 'Tour Through the Valley of the Meuse, with Legends of the Walloon Country and the Ardennes' (1845); 'Piedmont and Italy, from the Alps to the Tiber' (1859–61).

Costello, Frederick H., American writer: b. Bangor, Maine, 24 Sept. 1851. He is a commercial agent in his native city, and has written: 'The Two on Galley Island' (1893); 'Master Ardick, Buccaneer' (1896); 'Under the Rattlesnake Flag' (1898); 'On Fighting Decks in 1812' (1899); 'A Tar of the Old School' (1900).

Costello, Louisa Stuart, English writer and artist: b. Ireland 1790; d. Boulogne, France, 22 April 1870. She was a sister of D. Costello (q.v.). Her writings include: 'Songs of a Stranger' (1825); 'A Summer Among the Bocages and Vines' (1840); 'The Queen Mother,' a romance (1841); 'Gabrielle, or Pictures of a Reign' (1843); 'The Rose Garden of Persia' (1845); 'Clara Fane,' a romance (1848); 'The Lay of the Stork,' a poem (1856); etc.

Coster, kŏs'tĕr, or **Koster, Laurens Janszoon,** a reputed Dutch inventor of printing by movable types. By many he is regarded as a predecessor of Gutenberg, by some as a mythical personage. The first account of the invention which has any historical value appeared in 1499 in a book called 'The Chronicle of Cologne.' The author says that printing was invented in that city; he asserts, however, that the art was prefigured by the method used for printing certain school books or Donatuses in Holland. The next statement of importance in connection with the controversy is that of Hadrianus Junius, in his 'Batavia' (1588) to the effect that about 1460 Laurentius Joannes, surnamed Ædituus or Custos (literally sacristan, *Coster*), who lived in Haarlem, fashioned the bark of a beech-tree into letters, which he impressed upon paper. He then made a number of wooden letters, and invented an ink thicker and more viscid than the common sort, and afterward made, by the addition of his letters, explanations for pictures engraved on wood; and eventually printed books. Among these was an edition of the 'Speculum Salutis.' He subsequently changed the wooden letters for others of lead, and these again for letters of tin. An assistant stole the types and appliances, going first to Amsterdam, thence to Cologne, and finally sojourning at Mainz, where he published various books. This statement has been scoffed at as an invention or based on mere hearsay; but of recent years the trend of opinion has been in favor of the Dutch claims. There are no specimens extant that can with absolute certainty be ascribed to a printer called Coster. Many fragments of books, however, have been discovered, believed to be printed much before the date of Gutenberg's earliest work. These are known as Costeriana, and their number is being gradually added to since the attention of librarians has been called to their importance. They are printed in a variety of types of Dutch design. All are without any name, date, or place, and nearly all were discovered in the bindings of 15th century manuscripts or printed books. See Van der Linde, 'De Haarlemsche Costerlegende' (1870), translated into English by Hessels as 'The Haarlem Legend of the Invention of Printing' (1871); De Vinne, 'Invention of Printing' (1876); Hessels, 'Haarlem the Birthplace of Printing' (1887).

Costetti, Giuseppe, joo-sĕp'pĕ kŏs-tĕt'tē, Italian dramatist: b. Bologna 13 Sept. 1834. He early won fame by his dramas, 'The Malibran'; 'The Lions' Den'; etc., and heightened it greatly by his comedies, 'The Son of the Family' (1864); 'The Old Story' (1875); 'Cain's Wife' (1887); etc.

Cos'tigan, John, Canadian statesman: b. St. Nicholas, Quebec, 1 Feb. 1835. He graduated at St. Ann's College, was a member of the New Brunswick legislature 1861–7, and was elected to represent Victoria County at the first general election for the Dominion House of Commons in 1867. He still (1903) retains the seat, being the only member who has held his seat continuously since the confederation of the Canadian provinces. He was minister of inland revenue 1882–92; secretary of state 1892–4; minister of marine and fisheries 1894–6.

Cost'mary, or **Mint Geranium,** a species (*Chrysanthemum balsamita*) of the genus *Chrysanthemum,* of the thistle family (*Compositæ*). The plant is a native of Italy, whence it was introduced into England in 1568, and cultivated for its fragrant leaves, which were used in ale and various aromatic drinks; and also as a salad. In America the plant grows wild from Nova Scotia to Ohio, having escaped from gardens. Another common name is alecost or alecoast. The name is popularly supposed to mean "the fragrant plant of the Virgin Mary," but recent authorities incline to derive it from the Latin *mare,* the sea.

Costume ("custom"; and especially usage, habit, or appearance in dress, etc.), a term now restricted to external dress and its modes. The history of costume is an exceedingly difficult one to trace in any accurate detail, owing to the difficulty of interpreting the vague and scanty notices on the subject which we can collect from the earlier writers. The most interesting and profitable thing will be to attempt to work out certain general lines of development, leaving minute questions to antiquarians who have made a special study of the subject, as far as anything can be accurately known about it. It must be observed that our earliest indications on the subject come from warm or semi-tropical countries; thus eliminating as far as possible the factor in the development of clothes which originates in the necessity of protection against the weather. Considerations of modesty, which may be regarded as the outgrowth either of specifically Christian or of other highly civilized conditions, according to the point of view, appear only in a rudimentary form. The development in early times is regulated largely by the desire to make the dress tell something of the position or rank of the wearer. Thus the earliest distinction as to the amount of clothing prescribed by cusom seems to have been that the wearing many clothes was a mark of rank, while the lower classes were content with a very scanty covering. This would follow from the fact that the nobles had in those days very slight need

for active exertion; while practical considerations would dictate the minimizing of the garments which might hamper those whose employments required free movement of the limbs.

The early Egyptians seem to have worn little beyond an apron or loin-cloth; under the later dynasty it was extended into a long skirt, which was combined with the jacket that had been sometimes worn to form a complete garment. The women wore the *calasiris,* a shirt with short sleeves or none at all. Light and frequently transparent materials seem to have been most commonly used. For a headdress, both sexes wore what is known as the sphinx-cap. Here, as elsewhere, however, ordinary people paid very little attention to dress; kings, priests, and other officials were distinguished by elaborate vestures. Under the Ptolemies Greek costume was generally introduced. The Assyrians covered more of the body than the Egyptians, and used heavier stuffs — cotton, linen, wool, and possibly silk, introduced from China. They wore a long shirt with short sleeves, and confined at the waist. For the upper classes this was bright-colored and ornamented with heavy fringes. Sandals were worn. The king was distinguished by a purple mantle and a white cylindrical cap. The Persian costume was generally tight-fitting, consisting mainly of a short coat and trousers (which seem to have originated very early in Central Asia), often made of leather. When they conquered the Medes, they adopted very generally the dress of the latter, which was loose and usually woolen. The leather breeches remained in use among the lower classes.

The Greek costume was characterized by great simplicity, and fell into graceful folds. The principal parts of it were an undergarment called the *chiton* and a sort of cloak known as *himation,* which, when folded over the shoulders, ultimately originated a separate garment, the *diploïdion.* Men wore the *chlamys,* a short cloak, for the more active occupations, to which the *peplos* of the women partly corresponded. White was the usual (though not, as formerly believed, the exclusive) color of Greek garments; the material was most usually woolen among the Dorians and linen with the Ionians. Silk was introduced rather late from Asia, and employed to make the semi-transparent robes for which the island of Cos was famous. Oriental luxury increased as time went on, until in the Byzantine period, while clothes retained much the same shape, costly material and rich ornamentation distinguished them.

The Romans also commonly wore but two garments, and the hardy, vigorous life of their early days tended to keep these simple. They wore a woolen tunic for the house, only one at first, until the increase of luxury brought in the custom of wearing two or three in cold weather. Women also wore an outer robe known as the *stola,* similar to the Greek *chiton.* For appearance in public there was for men the *toga,* a large, loose, white cloak adopted by all citizens for out-door wear, and a somewhat similar garment called *palla* for women. While, however, men had a uniform manner of wearing the *toga,* women draped their robes in many graceful shapes at will. Shorter, more practical overgarments, such as the *lacerna* and the *sagum* or soldier's cloak, were worn by those engaged in more active occupations. The *torque,* or cord of gold fastened around the neck, was a fashion introduced from Gaul after the conquest.

The history of fashion in the Christian era may be divided into four periods:

First Period.— In the first, down to 486, the Gallic, Roman, and Byzantine elements were combining to form a new costume. In the second, 486 to 1300, this underwent many changes. The nobles vied with each other in introducing new fashions, though the middle class were far slower in adopting innovations, and the peasantry kept the traditional form almost unaltered down to the time of the Crusades. The third is the Renaissance period of transition, leading down to the fourth or modern era.

With the Roman conquest of Gaul came the introduction among the conquerors of the *braccæ* or breeches of the Gauls, first adopted for campaign wear by the Roman soldiers. As the empire went toward its end, extravagance in dress was unbounded among the wealthier classes. The women wore a sleeveless outside tunic confined at the waist by beautiful bands and on the shoulders by jeweled clasps. They delighted in wearing tunics of bright colors held in such a way that at least some portion of each tunic was revealed and brought into contrast with the others. A bright transparent veil sparkling with green and silver spangles fell from the head, and a short mantle hung from the shoulders. A sort of cornet or *strophium* fastened the veil on the head, and jeweled garters bound at the knee drawers of fine linen. Sumptuary laws were passed relating to the style of shoe to be worn by each class; but similar laws relating to the variety of jewels had little effect, since the general love for ornaments was too strong to be regulated.

Second Period.— During the Merovingian era (486–751) in France no important modification of the general scheme of clothing came in. The ruder element introduced by the rough Franks gradually softened beneath the enervating, refining influence of Roman fashions. The Frankish women who had been content with their simple costume of a black robe, a tight-fitting mantle, and a cap, were transformed to Merovingian ladies delighting in gay, trailing tunics of delicate tissues exquisitely embroidered. Their arms were still bare according to the ancient Teutonic fashion. Their hair fell in long braids, and was ornamented with fillets and flowing veils. As France acquired unity, the influence of both Roman and barbaric invasion visibly faded away. From the ancient shapeless tunic developed the gown, fitting closely to the waist and hips, and having the skirt full and flowing. This was the general principle of form from the accession of the Capet dynasty (987) down to the Renaissance.

Men's dress underwent little change down to the 12th century. The costume of the Frankish men of Charlemagne's time may be described as the approximate model. It consisted of two tunics, the outer one of wool or silk varying in length from the hips to the knees, according to the prevailing style. These were covered by a blue mantle, fastened on the right side with a clasp, and often highly ornamented and trimmed with beautiful furs and gold fringes. Head coverings of diverse and increasingly extravagant styles were among the first distinctive modifications; and these were sometimes combined (as

also in the development of academic costume) with a hood or cape falling over the shoulders.

Each century saw its own modification of these general types. It was a growing fashion in the 9th century for women's outer robes to stop at the knee and show a full sweep of the contrasting tunic beneath. In the 10th and 11th centuries the robe was belted by a rich girdle both above and below the waist. In the 11th century, too, the long train, in vain anathematized by the Church, became extremely popular. Sleeves reached the limit of absurdity in the dress of both sexes. At various periods the leg-of-mutton sleeve was worn, and in the beginning of the 15th century the outer sleeve widened at the wrist until it swept the ground. Commercial relations with the East were improved through the Crusades, and new varieties of costly fabrics were introduced. The splendor displayed in armor and military appointments affected the costumes of the women. Ladies of noble birth emblazoned their close-fitting gowns and surcoats. Even the dress of the middle classes, many of whom were dependents of the nobles and wore livery colors and armorial badges, acquired a heraldic character. The helmets, decked with scarfs and mantlings, suggested many grotesque varieties of feminine headgear, both in the 14th and 15th centuries. As the mantles of the knights but partly concealed their armor, so a surcoat worn by ladies only half concealed the beautiful decorated gown beneath. This surcoat was a jacket of varying shape; at one period it was only a coat without sleeves or sides; later a loose, flowing skirt was added to it, which in the 16th century stopped at the knee. The hip-girdle, of exquisite workmanship, which showed through the openings of the surcoat, was a counterpart of the military belt worn by the knights.

The end of the 14th century was marked by the excess to which the more fanciful devices of the period were carried. Robes were more fantastically cut along the edges, and decked with trailing ribbons, accompanied by a trailing tail to the hood. The pointed toes of shoes were often two or three times the length of the foot. The odd parti-colored gowns of the women blazed with heraldic impalements and quarterings. During the 13th, 14th, and 15th centuries there was great confusion about those garments which we know as stockings and trousers. One garment sometimes reaches the waist, even covering the feet. At others there were two articles, the nether stocks (Fr. *bas de chausses*) came to the thigh or knee and were continued by the trunk-hose or upper hose (Fr. *haut de chausses*). About 1600 the word breeches came into use to indicate the trunk-hose, and the term hose was confined to stockings.

Third Period.— This epoch was the transition from the mediæval to the modern style of dress. Speaking generally, up to the 14th century, long dress prevailed, loose and flowing, and offering a welcome contrast to the tight-fitting armor of the knight. About 1350 the costume of the men began to change, with the introduction of the doublet, a short jacket padded at the shoulders, plaited a few inches below the waist, and fastened with a belt. The nether stocks, now entirely exposed to view, were attached to the trunk-hose. Long, loose robes with immense drooping sleeves were indeed worn throughout the 15th century, but only by professional men or nobles on occasions of state. In women's dress the tendency appeared to cut the figure into sections instead of keeping to the girded gown. A bodice reached to the hips. The dress was somewhat shortened, and thus a step was taken toward the short hooped petticoat. During the Renaissance Period full forms became more and more popular, and petticoats and skirts spread into the form of a bell, which year by year increased in circumference.

Fourth Period.— A more distinct transition between ancient and modern dress took place in the 16th century. Men wore for show a short cloak which hung from the shoulders. The doublet was made with rather tightly fitting sleeves; beneath it was a sleeveless jerkin fitting the body and, like the modern waistcoat, so cut as to allow the beautifully embroidered shirt to be seen. The short skirt of the doublet was gored to fit the bulging trunk-hose padded with hair, while the lower hose were plain and tight, so that the figure looked broad and full above and narrow below. In this century began the wearing of the top of the nether garments loose, or slashed, with pieces of different colors let in. The arms and shoulders of the doublet or jacket were similarly trimmed. Boots were worn loose, with the upper part falling down. Ruffs, or ruffled collars, and velvet bonnets with feathers came into use.

In England the Tudor Period was characterized by great extravagance. The chronicler Hall describes several of Henry VIII.'s superb dresses, among them a "frocke" or coat of velvet embroidered all over with gold, the sleeves and breast cut and lined with cloth of gold and tied together "with great buttons of diamonds, rubies, and Orient pearls." The cloaks and mantles were of corresponding magnificence. The shirts were pinched or plaited, and embroidered with gold, silver, or silk. The shoes and buskins were of the German fashion, very broad at the toe, and of velvet and satin, slashed and puffed. A plain russet coat and a loose kind of kersey breeches, with stockings of the same piece, constituted the ordinary dress of middle-class men. The London apprentices wore blue cloaks in summer, and gowns of the same color in winter, as badges of servitude; for this was a period of domestic distinctions, relics of feudalism. The women wore long woolen gowns, worsted kirtles (hereafter called petticoats), and white caps and aprons. About this time white underlinen came into general wear.

In Elizabeth's time the men's huge trunk-hose, "stuffed with hair like woolsacks," were made of silk, velvet, satin, or damask. The doublets were very costly, quilted and stuffed, "slashed, fagged, pinched, and laced." The cloaks were of Spanish, French, or Dutch cuts; of cloth, silk, velvet, or taffeta; of all colors; trimmed with gold, silver, silk-lace, and glass bugles; equally superb inside and out. Hats now began to supersede the bonnets of the former era. They were for the most part made of felted wool, dyed. Those of beaver were exceedingly expensive.

The most conspicuous features of women's dress in the reign of Elizabeth were the farthingale and the ruff. The former consisted of an extravagant expansion of the lower garments by means of cane or whalebone. It was the predecessor of the hoop, which in its turn was succeeded by the crinoline. The widely ex-

tended ruff of fine linen, like a huge frill, is familiar from the pictures of Elizabeth and Mary of Scotland. The extravagance of the ruff reached such a point that it was anathematized from the pulpit, together with the extremely low cutting of the bodice; and the fancies of women's costume were denounced in a sermon preached before James I. at Whitehall, as "her French, her Spanish, and her foolish fashions."

England was slower than France, but ahead of Spain, in abandoning the farthingale and the ruff. In the beginning of the reign of Charles I., dress was little changed; the ruff, of thinner make, stood farther away from the throat, and looked like a framework of gauze, but the skirts were not so wide. In the middle of the 17th century there came a revolution against the entire system of padding, whalebone, starch, and wire, and for about 50 years the upper classes followed the canons of beauty and grace. Instead of the ruff, the Van Dyck collar, made of rich point-lace, was worn hanging down on the shoulder and held by a cord and tassel at the neck. Long breeches, fringed and pointed, met the ruffled tops of the boots; an embroidered sword-belt, worn over the right shoulder, held a Spanish rapier. In the flapping beaver hat hung a plume of feathers fastened by a jewel. Ladies' dresses were still made with skirt and bodice, the bodice defining but not cramping the figure, and the skirt hanging full and gracefully.

During the latter half of the 17th century, France, more than ever, gave the law to Europe in dress, and the typical style of the period is known as that of Louis XIV. — although, for accuracy, a distinction must be made between the gay and brilliant and the sombre parts of his reign, in the latter of which a tendency toward sober plainness not unlike that of the English Puritans was felt. The result of long struggles with inconveniences of dress was a nearer approach to the modern masculine dress of three pieces, coat, waistcoat, and trousers. The richly laced and embroidered doublet was long and loose, and had large puffed-out sleeves reaching a little below the elbow. The rest of the arm was covered by the full sleeves of the shirt. The long, loose, sleeveless waistcoat showed beneath the doublet, and the wide, ruffled breeches were fastened at the knees with bunches of ribbon. The doublet had buttons and buttonholes for its entire length, thus becoming a coat. Instead of the lace collar the long, square-ended cravat was worn. In the early part of the 18th century this dress became more exact in shape and sober in tone. The doublet, now a coat, fitted the body. The absurd wide "petticoat breeches" were exchanged for close-fitting garments tied below the knee. The broad-brimmed hats were turned up on two sides, later on three, and edged with feathers or ribbons. Wigs, which had been some time in use, were worn still longer than before, hanging down in front or flowing upon the shoulder. The coats of the 18th century were of velvet, silk, satin, or broadcloth, and of fanciful colors. Hogarth's favorite color was sky-blue, Reynolds' deep crimson, and Goldsmith rejoiced in plum-color. Meanwhile women's dress had also become more stiff and formal. Long bodices were tightly laced over very stiff corsets; overdresses were bunched up in the neck and on the hips; and the hoop-skirt, as outrageous as the farthingale of the 16th century, was generally worn. About the middle of the century the sacque came into style — a loose gown, resembling the mantle of antiquity, which was looped over the hoop-skirt and furbelows or left trailing behind. Heavy towering headdresses replaced the simple ringlets of the previous century. Small muffs, flowing veils, and fans were important accessories. Muffs were carried for a time by men.

The formalities of the 18th century received a severe blow from the general tendency of the French Revolution toward simplicity. In the 10 years from 1790 to 1800 a more complete change was effected in dress by the spontaneous action of the people than had taken place in any previous period in the century. The change began in France, partly to mark contempt for old court usages, and partly in imitation of certain classes in England, whose costume the French mistook for that of the nation generally. It consisted of a round hat, a short coat, a light waistcoat, and pantaloons reaching to the ankles and fastened by buttons. A handkerchief was tied loosely around the neck, with the ends long and hanging down, and showing the shirt collar above. The short hair *à la Titus* was unpowdered, and the shoes were tied with strings in place of the buckles which had before been universal. This comparatively simple form of dress found many admirers in England and soon became common among the young men. The abandonment of hair-powder followed the imposition of a tax on its use, and with the giving up of wigs and powder came the fall of the cocked hat. Pantaloons which fitted closely to the legs remained in general use until about 1814, when the wearing of looser trousers, already introduced into the army, became fashionable, though many elderly persons still held to knee-breeches against all innovations. The general simplifying of dress subsequent to 1815 was not allowed to pass without a last effort to retain the elaborate fashions of the preceding period. The *macaroni* of the 18th century was now succeeded by the *dandy*, who prided himself on his starched collars, his trouser-straps, and the flashy bunch of seals which dangled from his watch-chain. The period covered by the Regency in England was indeed the heyday of this kind of dandyism; but even later it characterized not a few leading public personages.

The end of the 18th century witnessed a signal change in the style of women's dress. The gown no longer consisted of two dresses, an under and an outer one. The formal styles which had prevailed throughout the century and brought into use stiff materials such as solid damasks, velvets, satins, and silks, were replaced by the fashion of the short-waisted clinging gown made of muslin and soft silk. This "Empire" mode characterized the dress of the first quarter of the 19th century. Large, loose, warm coats and cloaks were used for outdoor wear. Elaborate hats, turbans, and caps were worn on all occasions. In the twenties there was another revolution. Skirts were shortened and trimmed with flowers, puffs, and ruchings; sleeves became fuller, and the waist came nearer its natural position. Then the sleeves began to widen and stiffen, and the hats grew larger and more cumberous. From these wide skirts the crinoline was evolved in 1854. In the seventies the skirt became narrower again, worn with a polonaise of a different color. Meanwhile the

size and shape of the sleeve was not constant for more than a year.

But it would be both impossible and profitless to follow the minute variations of changing fashion. To return to general principles, it is safe to say that neutrality is becoming more and more the basis of costume, at least for men. Extravagance in dress, especially among the Anglo-Saxon nations, has become a note of bad taste; and man's dress, which was formerly characterized by gorgeous display, is little more than a uniform which, with certain variations prescribed by etiquette, adapts itself to different functions and amusements. As a result of the general modern abandonment of formality, and the opening of new employments for women, together with their invasion of the realm of athletic sports, the simplicity which characterizes the masculine dress has come to exist more and more also in the feminine. Fashion is forced nowadays to accommodate itself, to some extent at least, to health and convenience; and only the artist and the antiquarian will be found to regret that the picturesque costumes of bygone days are to be seen only among the peasantry of distant and isolated lands.

Bibliography.— Racinet, 'Le costume historique' (1888) is the best general work. For the pre-Christian period, consult especially Layard, 'Monuments of Nineveh' (1850); Hope, 'Costume of the Ancients' (1841); Evans, 'Chapters on Greek Dress' (1893). For later developments, Hefner-Alteneck, 'Trachten, Kunstwerke, und Geräthschaften vom frühen Mittelalter bis Ende des 18ten Jahrhunderts' (1879–89); Jacquemin, 'Iconographie méthodique du costume du IVe au XIXe siècle' (1876); Lacroix, 'Manners, Customs, and Dress of the Middle Ages and the Renaissance, and the Eighteenth Century, Its Institutions, Customs, Costumes' (Eng. trans. 1877, 1887); Chevignard and Duplessis, 'Costumes historiques des XVIe, XVIIe, et XVIIIe siècles' (1867); Planché, 'Cyclopædia of Costume' (1876–9) and 'History of British Costume' (1874); Fairholt, 'Costume in England' (1885); Earle, 'Costume of Colonial Times' (1895); Pauquet, 'Modes et costumes historiques' (1862–4); Von Heyden, 'Die Tracht der Kulturvölker Europas bis zum Beginn des 19. Jahrhunderts' (1889); Quincke, 'Handbuch der Kostüme' (1896).

Costus, or **Costus Arabicus,** an aromatic much esteemed by the ancients, is the dried root of *Aplotaxis auriculata,* a composite plant, and is not derived from the plant *Costus arabicus,* as was at one time supposed. It is a native of the moist open slopes surrounding the valley of Cashmere. The roots are there burned as incense. They have a strong, aromatic, pungent odor, and are employed in protecting bales of shawls from moths. It is also used in India as a hair wash, as a stimulant in cholera, and as a stimulating ointment.

Cot, Pierre Auguste, pē-ār ô-gŭst kōt, French painter: b. Bedaueux 17 Feb. 1838; d. Paris 18 Aug. 1883. He studied under Cogniet, Cabanel, and Bouguereau. Among his works are: 'Spring Time'; 'Prometheus'; 'Moreille'; 'The Swing'; and 'The Storm,' often called 'Paul and Virginia' (in the Metropolitan Museum, New York).

Cotabato, kō-tä-bä'tō, Philippines, a province in the southern part of the island of Mindanao; area, including dependent islands, 8,344 square miles. The chief river is the Grande River of Mindanao, known also as the Pulangui, the largest river of the Philippines. The province is the most fertile in the island, and rice, sugarcane, cotton, coffee, tobacco, corn, and vegetables are raised for home consumption. The gutta-percha trade is quite large, and is controlled by Chinese. The first United States military station was established in 1899, and in 1903 the province was placed under civil government. Pop. 4,150.

Côte d'Or, kōt-dōr, France, a department formed of part of the old province of Burgundy; area, 3,383 square miles. The surface is in general rather elevated, and is traversed by a chain of hills forming the connecting link between the Cevennes and the Vosges. A great part of the department is covered with forests. The valleys and plains are fertile, and there is good pasture land; but the vine culture is by far the most important branch of industry. To this department belong the first-class wines of Clos Vougeot, Romanée, Chambertin, Corton, Richebourg, Volnay, Pomard, Beaune, Montrachet, and Meursault. Côte d'Or is watered by the Seine, which rises in the northwest, and by several of its branches; by the Saone, and by Arroux, a tributary of the Loire. The climate is temperate; iron, coal, marble, gypsum, and lithographic stones are found, the first in large quantities. Côte d'Or is divided into four arrondissements, namely, Beaune, Châtillon-sur-Seine, Dijon, and Semur, with Dijon for its capital. Pop. (1891) 376,866.

Côte-d'Or (hill or hillside of gold), a chain of mountains in Burgundy, so called from the abundance of excellent wine which they yield. Their height varies from 1,400 to 1,800 feet. The chain runs from north-northeast to south-southwest, and is about 150 miles long, beginning at the plateau of Langres, and extending to the sources of the Bourbince and the Dheune.

Cotes, Roger, English mathematician: b. Burbage, Leicestershire, 10 July 1682; d. Cambridge, England, 5 June 1716. He was educated at Trinity College, Cambridge and in 1706 became first Plumian professor of astronomy and natural philosophy in his university. In 1713 there appeared a new edition of Newton's 'Principia,' thoroughly revised by the author with the assistance of Cotes, and containing an able defense of Newton's system from the pen of the latter. Cotes published only one independent work, an essay entitled 'Logometria' (1713); but after his death there appeared a volume entitled 'Harmonia Mensurarum' (1722). His name is still given to a theorem discovered by him relative to the circle. The correspondence of Newton and Cotes was published in 1850. Newton is reported to have said: "Had Cotes lived we might have known something."

Cotes, Sara Jeannette Duncan, Canadian author: b. Brantford, Ontario, Canada, 1862. She entered journalism as a correspondent for several Canadian and American newspapers at the Cotton Centennial in New Orleans in 1884–5; served on the staff of the Washington *Post,* Toronto *Globe,* and Montreal *Star;* married in 1891 Everard C. Cotes, of the Indian Museum; and has lived for several years in India. Her books include: 'A Social De-

parture' (1890); 'An American Girl in London'; 'A Daughter of To-day'; 'Vernon's Aunt, an Oriental Story'; 'The Simple Adventure of a Mem Sahib'; 'His Honor and a Lady'; 'A Voyage of Consolation' (1898); 'The Path of a Star' (1899); 'On the Other Side of the Latch' (1901); 'Those Delightful Americans' (1902).

Cotes-du-Nord, kōt-dü-nōr, France, a maritime department in the north, forming part of ancient Brittany; capital, Brieuc; area, 2,659 square miles. The coast extends about 150 miles; the herring, pilchard, and mackerel fishing is actively pursued. One of the main branches of industry is the rearing of cattle and horses; and in manufacturing, the spinning of flax and hemp, and the weaving of linen and sail-cloth. Among the minerals are iron, lead, and granite. Pop. (1901) 597,032.

Coteswold (kōts wōld) **Hills,** or **Cotteswold** or **Cotswold,** a range of hills in the county of Gloucester, England. They extend north and south about 55 miles; the greatest elevation, Cleeve Cloud, near Cheltenham, is 1,134 feet. The Severn and Thames rivers have their rise on the eastern slopes.

Cot'grave, Randle, English lexicographer: b. Cheshire; d. probably 1634. He was secretary to William Cecil, Lord Burghley, to whom he dedicated the French-English dictionary by which alone he is remembered. This work appeared in 1611, and is important not only as being the first of its kind, but as a valuable source of material for the elucidation of the philology of the English and French languages. It was remarkably accurate and reliable for its time, and has been several times reissued. Of Cotgrave's life very little is known.

Cothurnus, kō-thėr'nŭs, with the ancients, a kind of boot laced high, such as Diana and her nymphs are represented as wearing. The tragic actors also wore a cothurnus which differed from the hunting cothurnus in that it had a sole at least four fingers thick. See BUSKIN.

Cotidal, kō-tī'dal, having the tides at the same moment of time. Cotidal lines are imaginary lines marked on the surface of the globe, indicating where the tides are in the same state at the same time.

Cotil'lion, a lively dance of French origin performed by eight persons together, resembling the quadrille which superseded it. The name is now given to a dance which often winds up a ball, and which is danced with any number of dancers and with a great variety of figures, the pairs of dancers following in this the leading pair, and partners being successively changed.

Cotin, Charles, shärl kō-tăn, French author: b. Paris 1604; d. there January 1682. He is indebted for his notoriety, in a great measure, to the satires of Boileau. Among his poems are some which rise above mediocrity. It has often been supposed that Boileau introduced the name of Cotin into his satires because it furnished a convenient rhyme, and Moore refers to this in his 'Life of Byron.' But Boileau had good reasons for complaining of Cotin, who had represented him as a dangerous man. Unluckily his follies drew upon him a new enemy in Molière, who, in his 'Femmes Savantes,' introduced him on the stage, and exposed him to ridicule under the name Trissotin, which Molière at first wrote 'Tricotin.' The sonnet to the Princess Urania was by Cotin; and he engaged in a dispute respecting it with Ménage in the presence of a select society, in which the disputants used the same kind of language that Molière places in the mouths of Trissotin and Vadius. His 'Œuvres Mêlées' appeared in 1659, and his 'Œuvres Galantes' in 1663.

Cot'man, John Sell, English landscape artist and etcher: b. Norwich, England, 16 May 1782; d. London 24 July 1842. In 1798 he went to London to study art, and there made Turner's acquaintance. In 1807 he returned to his native city, where he taught drawing and published: 'Specimens of Norman and Gothic Architecture in Norfolk' (1817); 'A Series of Etchings Illustrative of the Architectural Antiquities of Norfolk' (1818); etc.

Cot'ner University, located at Bethany, Neb., was founded in 1889 under the auspices of the Disciples of Christ. It was named in honor of one of its most liberal patrons. The first building was erected on a prairie farm about five miles from Lincoln (q.v.), and the place was called Cotner. By the sale of lots a fund was obtained for the school, and the village of Bethany, which has grown up around the university, has a population of about 500. It has a preparatory and a college department, and, at present, grants only the degree A.B. In 1903 there were connected with the school 17 professors and instructors, and, in the college department, 100 students. The library contained about 3,000 volumes; the grounds and buildings were valued at $134,000.

Co'to, the reddish-brown, aromatic and slightly bitter bark of *Palicourea densiflora,* order *Rubiaceæ,* a tree of South America.

Cotoneaster, kō-tō-nē-ăs'tėr, a genus of plants of the natural order *Rosaceæ.* There are some 20 species, mostly natives of Europe and western Asia. The plant is a shrub or small tree, some of the species being evergreen. It has been introduced and cultivated in the United States and England as an ornamental shrub, having bright red fruit which remains throughout the winter. The evergreen or fire-thorn (*C. pyracantha*) is a species which has escaped from cultivation and is found wild among the thickets about Philadelphia and Washington. Several species, among which are *C. microphylla* and *C. rotundifolia,* come from India, and are especially used for covering walls and rock-work. The seeds of these are said to contain prussic acid. Cotoneasters thrive in any good well-drained garden soil not too shadily situated.

Cotopaxi, kō-tō-pä'hē or kō-tō-paks'ī, the most remarkable volcanic mountain of the Andes, in Ecuador, about 60 miles northeast of Chimborazo; lat. 0° 43′ S.; lon. 78° 40′ W. Its upper portion, a perfect cone 4,400 feet in height and perpetually snow-covered save near the crater, shows conspicuously. This covering of snow conceals from the eye of the observer the inequalities of the ground. No point or mass of rock penetrates the coating of snow and ice, or breaks the exact regularity of the conical figure. The crater is surrounded by a small circular wall, which, when viewed through a telescope, appears like a parapet. Its height above the sea is 19,550 feet. Remarkable eruptions, spreading destruction over the surrounding plains, took

place in 1698, 1738, 1742, 1744, 1766, 1803, and 1877. In 1698 the eruption destroyed the city of Tacunga, with three fourths of its inhabitants, and other settlements. In 1744 its roarings were heard as far as Honda, on the Magdalena, 600 miles distant. With respect to the explosion of 1803, Humboldt observes: "At the port of Guayaquil, 52 leagues distant in a straight line from the crater, we heard day and night the noise of this volcano, like continued discharges of a battery; and we distinguished these tremendous sounds even on the Pacific Ocean." A similar eruption took place in 1885. Part of a neighboring village was overwhelmed; and at Guayaquil a sound was heard like the incessant discharges of heavy artillery, shaking the earth and causing doors and windows to rattle. Humboldt found it difficult to ascend the mountain as far as the limit of perpetual snow, and he pronounced it impossible to reach the summit. It has been ascended, however, at least twice, on the latter occasion by Mr. Whymper in 1880, who remained 24 hours on the top. He reports that more or less smoke and steam are always issuing from its crater.

Cotswold. See SHEEP.

Cotta, Johann Friedrich, yō'hän frēd'rĭH kŏt'tä, BARON COTTENDORF, German publisher: b. Stuttgart, 27 April 1764; d. there 29 Dec. 1832. He began business at Tübingen, but in 1811 removed to Stuttgart. He was the publisher for many great writers in Germany, including Goethe, Schiller, Wieland, Richter, Uhland, Fichte, Hegel, the Humboldts, and others. He founded the 'Horen' (1795) and the 'Allgemeine Zeitung' at Augsburg (1798).

Cot'tage, originally a small house with no land attached to it. Such erections were discouraged by old English law. No one was allowed to erect a cottage unless four acres of freehold land were attached to it; and no more than one family was to inhabit it.

Cottage Grove, Ore., a city of Lane County, at the extreme head of the Willamette Valley, near the foothills of the Calipora mountains. It is located on the Willamette River and on the Southern Pacific R.R., 144 miles south of Portland. It is the terminus of the Oregon & Southeastern R.R. Cottage Grove was first settled about 1850. The principal industries are lumber, stock-raising and farming, planing and sawmills, etc. The city has a national bank, and a well-equipped electric light plant. Water is supplied by a gravity system owned by the city. There are many gold and quicksilver mines in the vicinity of Cottage Grove, and the surrounding country is covered with forests of fir and cedar timber, constituting one of the best remaining tracts of timber on the Pacific Coast. Pop. (1904) 2,200.

Cottage City, Mass., a town in Dukes County, situated on the coast in the northeastern part of the island of Martha's Vineyard. It was formerly a camp-meeting ground, and is now a popular summer resort. Pop. (1900) 1,100.

Cottar's Saturday Night, a famous poem by Robert Burns, first published in 1786.

Cotter, Joseph B., American Roman Catholic prelate: b. Liverpool, England, 1844. He came to the United States in 1850, studied theology at St. John's University, Collegeville, Minn., was ordained priest 1871, and was pastor of St. Thomas' Church, Winona, Minn., 1871–89, when he was consecrated first bishop of the Roman Catholic see of Winona. He is a pronounced advocate of total abstinence, and has been three times president of the Catholic Total Abstinence Union of America.

Cot'tier Tenure, a system of tenure according to which laborers rent small portions of land directly from the owner, or from a farmer, often giving personal service as part of the rent, and holding by annual tenancy.

Cottin, kŏt-tăn, Marie (called also **Sophie) Risteau,** better known as MADAME COTTIN, French novelist: b. Paris 22 March 1770; d. 25 Aug. 1807. In 1790 she married M. Cottin, a banker of Bordeaux, who died in 1793, and thenceforth she followed literature. Her best-known work is 'Elizabeth, or the Exiles of Siberia' (1806); other novels are: 'Claire d'Albe'; 'Malvina'; 'Amélie'; and 'Mathilde.'

Cot'tle, Joseph, English bookseller and author: b. 1770; d. Bristol 7 June 1853. The earliest poems of Southey and Coleridge were published by him, and these two poets in later life expressed their appreciation of his assistance and kindness to them. He also published Coleridge's periodical, 'The Watchman,' and the 'Lyrical Ballads of Coleridge and Wordsworth' (1798). He then retired from business. His own works include: 'Malvern Hills'; 'John the Baptist'; 'Alfred, an Epic'; etc. Cottle's poems, and those by his brother, Amos, are satirized in Byron's 'English Bards and Scotch Reviewers.' A prose work, 'Early Recollections,' chiefly relating to Samuel Taylor Coleridge (1837), is marked by glaring bad taste, though it has some value as containing many details of the early life of the poet. A second edition appeared (1847), entitled 'Reminiscences of Coleridge and Southey.'

Cotton, Charles, English poet: b. Beresford Hall, Staffordshire, 28 April 1630; d. Westminster February 1687. In 1658 he inherited his father's estates, near the river Dove, on the banks of which he built a fishing house, in which he entertained for years his friend, Izaak Walton. His works are numerous, including: 'Scarronides, or Virgil Travestie' (1664–70), being the first and fourth books of Virgil's 'Æneid,' in rather indelicate burlesque; and a translation of Montaigne's 'Essays' (1685). After the death of Cotton a volume was published, entitled 'Poems on Several Occasions.' He also translated 'Horace,' a tragedy of Corneille (1671); but the work by which he will be best remembered is the part which he added to the fifth edition of Walton's Complete Angler — 'Instructions How to Angle for a Trout and Grayling in a Clear Stream.'

Cotton, Charles Stanhope, American naval officer: b. Milwaukee, Wis., 15 Feb. 1843. He entered the Naval Academy 1858, served on the frigate St. Lawrence, which captured the Confederate privateer Petrel, in July 1861; on the flagship Minnesota 1861–3; took part in the battle between the Monitor and Merrimac 8–9 March 1862; and as lieutenant, served on the Oneida during the battle of Mobile Bay and subsequent operations to the surrender of Fort Morgan. He was promoted commander, 25 April 1877, and was on the Asiatic station 1880–3; captain 28 May 1892, and commanded

the flagship Philadelphia on the Pacific station 1894–7. During the war with Spain he commanded the auxiliary cruiser Harvard. He is now (1903) rear-admiral and has been commandant of the Norfolk Navy Yard since July 1900.

Cotton, John, American Puritan clergyman: b. Derby, England, 4 Dec. 1585; d. Boston, Mass., 23 Dec. 1652. He was educated at Trinity College, Cambridge, and was afterward Fellow of Emmanuel and employed as lecturer and tutor. About 1612 he became vicar of St. Botolph's Church in Boston, Lincolnshire, where he remained 20 years, noted as a preacher and controversialist, and inclining in his doctrines and practices toward the Puritan worship. He was at length informed against for not kneeling at the sacrament, and cited to appear before Archbishop Laud in the high commission court. Upon this he sought safety in flight, arriving in Boston 4 Sept. 1633. In October he was ordained on a day of fasting, by imposition of hands by the minister and two elders, teacher of the church in Boston and colleague with Mr. Wilson the pastor. In this connection he remained over 19 years, with such influence and standing that he has been called the patriarch of New England. His reputation for learning was very high, and, as was frequent among the ministers of that time, was sustained by an accumulation of obscure and professional knowledge. He was a critic in Greek, wrote Latin with elegance, and could discourse in Hebrew, and spent 12 hours a day in reading, his favorite author being Calvin. His pulpit eloquence was famous for its simplicity and plainness, and his discourses were exceedingly effectual in exciting attention to religion. His publications were numerous, consisting of sermons and controversial works upon most of the subjects discussed in his time. The most important are those published in the course of his controversy with Roger Williams, 'The Bloody Tenent Washed and Made White in the Blood of the Lamb' (1647), etc., and 'The Keys to the Kingdom of Heaven and the Power Thereof,' on the nature of church government. He maintained that the church is constituted of elders and brethren; that the elders are intrusted with the government to the extent of admissions and excommunications, yet that there is so much liberty left among the brethren that nothing of common concern can be imposed upon them without their consent. Against Williams he defended the interference of the civil power in religious matters for the support of the truth, maintaining the duty, for the good of the church and of the people, of putting away those who, after repeated admonitions, persist in rejecting fundamental points of doctrine or worship. A tablet, with a Latin inscription by Edward Everett, was erected in Saint Botolph's Church in 1857, in honor of Cotton, chiefly by contributions from his descendants in Boston, Mass. Consult Cotton Mather, 'Magnalia' (1702); McClure, 'Life of John Cotton' (1846); Tyler, 'History of American Literature' (1878).

Cotton, Sir Robert Bruce, English antiquary: b. Denton, Huntingdonshire, 22 Jan. 1571; d. London 6 May 1631. He settled in London, devoting his time to antiquarian pursuits, and employing himself especially in collecting ancient deeds, charters, letters, and other manuscripts of various kinds, illustrative of the history of England. He was one of the earliest members of the Antiquarian Society; and not only promoted the general objects of that learned association, but also assisted, with his literary treasures as well as with his purse, Camden and others writers on British archæology. He sat in Parliament under James I. and in the first and third Parliaments of Charles I.'s reign, his sympathy being against the growing power of the king. In 1629 he was falsely accused of having written an obnoxious political tract, and was thrown into the Tower; yet although he succeeded in establishing his innocence, his library was sequestrated, and his death seems to have been partly due to his being deprived of the company of his books. See Cottonian Library.

Cotton. This important vegetable fibre is readily distinguished from all other commercial fibres by its spiral twist, a character that renders it especially valuable for spinning. The wide-spread distribution of the plant, its adaptability to a great variety of soils and climates, and its comparative cheapness, all tend to make it one of the great staples of agricultural production, and it is probably used by more people and for a wider range of purposes than any other fibre. The country in which cotton was first used has not been definitely determined. It had long been known in India before the conquest of that country by Alexander. The writings of Herodotus and Pliny tell us that the excellence of its fibre was known to the Greeks and Romans. Columbus found it in use by the natives of the New World and in the conquests of Mexico and Peru cotton cloth was found to be in use. Ancient Peruvian tombs have yielded mummy cloths of cotton but those obtained from Egyptian tombs appear to be linen, although it is probable that cotton was known in that country from quite early times. While the principal commercial value attaches to the beautiful fibre that surrounds the seeds, the seeds themselves have important uses aside from that of producing a new crop. The stems and roots are also of value and the so-called by-products now utilized add fully 20 per cent to the value of the commercial cotton crop.

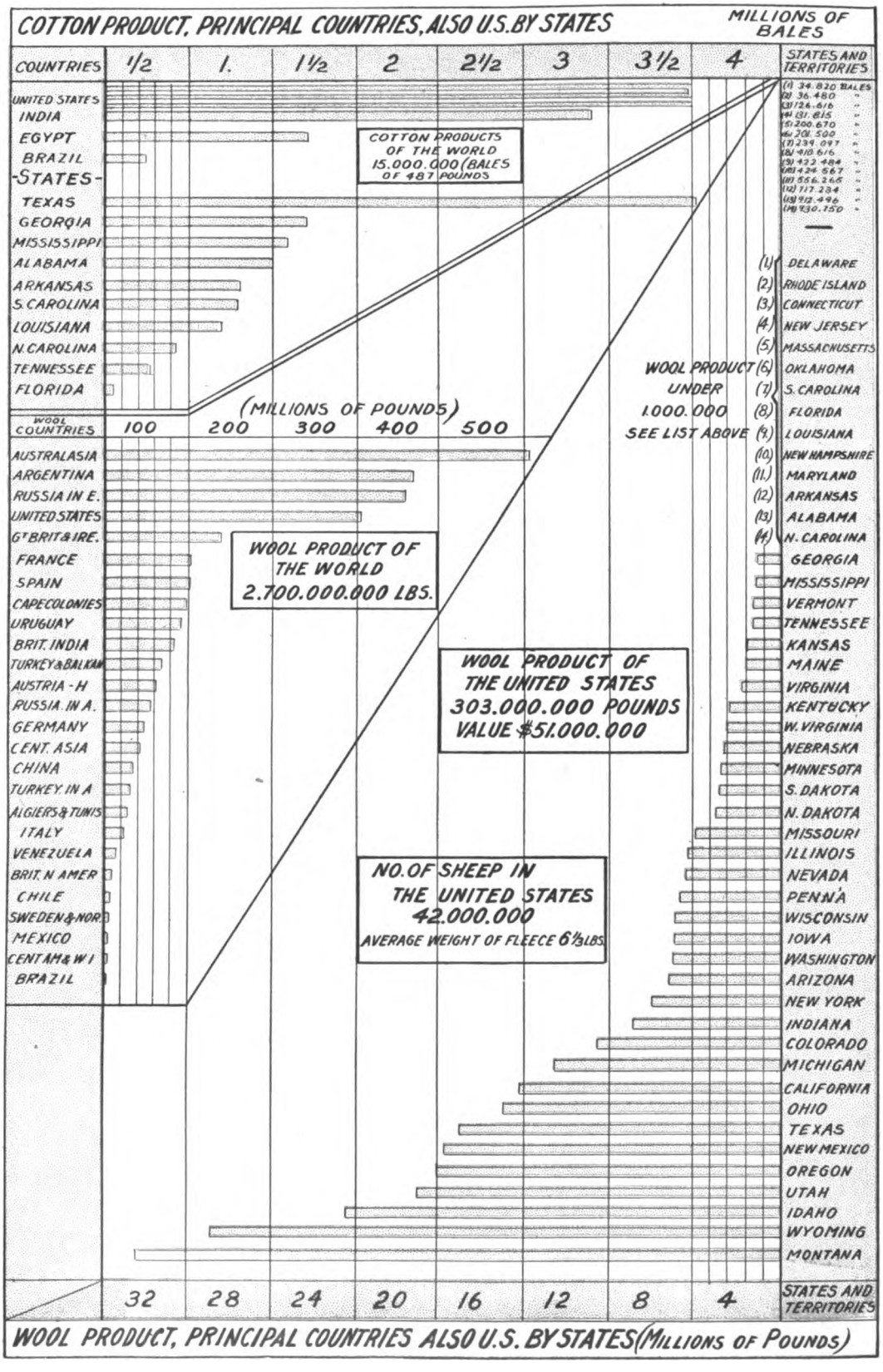
Botany, Commercial Classification, etc.— The cotton of commerce is a product of plants of the genus *Gossypium,* a member of the *Malvaceæ* or Mallow family of plants. There have been many attempts to classify and limit the species of *Gossypium,* but no two authorities agree. In a recent widely known catalogue of plants, about 50 species are recognized, and probably four or five times as many names combined or rejected. While this list of names is quite large there are only five or six species whose product enters into commerce and the bulk of the production is the product of two species, *G. herbaceum,* which furnishes the Upland cottons, and *G. barbadense,* the source of the Sea Island cotton. All the species are of tropical origin. They are small trees, shrubs, or herbaceous plants, enduring for one, two or more years, dependent upon the species. There has been much discussion regarding the origin of the many varieties of cotton grown in this country, but by almost common consent they are all attributed to the two species mentioned above or to some of their numerous hybrids. The Sea Island cotton

is undoubtedly indigenous to America and was the type observed by Columbus, but the evidence for the American origin of the species to which the Upland cottons are referred is less conclusive. These two classes of cotton differ materially in their seed characteristics. The Sea Island has a small black seed from which the lint separates readily, while the Upland cottons have large seeds which are greenish in color and surrounded by a short dense fuzz beneath the longer and more valuable lint. Both of the species are perennial in climates without frost, but in cultivation they are treated as annuals. The plants are shrubby, 3 to 10 feet high, more or less branched and bear large, alternate 3- to 5-lobed leaves which when held to the light show numerous pellucid dots. The flowers, which resemble to a degree those of the hollyhock, mallow and hibiscus, are white when newly open in the varieties of Upland cotton, turning red with age, and a creamy yellow in the Sea Island, with a purplish spot at the base of the petals. The flowers are usually single in the axils of the leaves except in those varieties designated "cluster types" in which a number are produced together. Surrounding this conspicuous flower are three or more heart-shaped, fringed or deeply cut bracts which constitute the so-called "squares." The indentations of the squares are deeper and more numerous in the Sea Island varieties than in the Upland forms. The capsules within the squares are the "bolls." They are 3- to 5-celled and contain the seed covered with the white or slightly tawny lint. The bolls of Sea Island cottons are uniformly smaller and more sharply pointed, contain fewer and smaller seeds and longer lint than the Upland bolls. The lint of the Sea Island cotton is from one and one half to two and a half inches in length, while the Upland cotton of the *G. herbaceum* type seldom exceeds one and a half inches in length and much of it is shorter. There are numerous hybrids between these two types as is shown by the character of the seed and lint. The Sea Island cotton flourishes along the coast region of South Carolina, Georgia, and Florida, and also in Egypt, the famous Egyptian cotton being a development from American Sea Island cotton seed sent to Egypt a number of years ago. The varieties of Sea Island cotton furnish the finest and most valuable fibre, but their production is restricted by the soil and climatic requirements of the plants. The Upland varieties, while not furnishing so fine a quality of fibre, are grown over a much wider territory and the total production far exceeds that of the Sea Island. In India there is a perennial species to which the name *G. arboreum* is given. It is a small tree and grows about the temples, but is not cultivated to any considerable extent. It produces a fine silky staple, but its former high value is now believed to have been overrated. This cotton usually called Nurma, from its growing about temples, is also known as Deo cotton. From South America are received a number of varieties of cotton that have usually been attributed to *G. peruvianum*. They have a short, strong, curly fibre somewhat resembling wool and their smooth black seeds adhere in an oval mass, on which account they are called kidney cottons. The plant which produces this cotton is a small short-lived tree and like the Nurma cotton of India will not mature in the United States.

When considered commercially the fibre produced by the seed is the most valuable product of the cotton plant. Viewed under a good microscope it appears to be an irregular, flattened, twisted tube, the edges of which are somewhat thickened and corrugated. This twist distinguishes cotton from all other fibres and it is to this character that its superior value for spinning is due. The fibre of some of the wild species of cotton does not possess this twist and such as do not are of little value. If not thoroughly matured the fibre is more flattened, less twisted and thinner walled. Such fibres, if abundant in a sample, depreciate its value as they curl up, do not spin well nor dye evenly. Among the leading commercial types of cotton the fibre varies from ½ inch to 2 inches or more in length and is exceedingly fine, the extreme diameter measurements being 0.0084 to 0.0064 inches, the longest and finest fibre being of the Sea Island types. The commercial grading of cotton is as follows: Samples, the average fibre of which is under 0.98 inch (25 millimeters) in length are called "short staple"; those between 0.98 and 1.17 inch (25 to 30 millimeters) are called "medium" and from 1.18 to 1.57 inch (30 to 40 millimeters) are called "long staple." Those exceeding 1.58 (40 millimeters) are "extra long." The "long" and "extra long" fibre produced in the United States are all from Sea Island varieties and their hybrids, the shorter ones being usually Upland cottons of the *G. herbaceum* type. Other classifications adopted by the New York Cotton Exchange are: What are known as "full grades" are designated by the words "fair," "middling fair," "good middling," "middling," "low middling," "good ordinary" and "ordinary."

To designate qualities of staple a half grade above the grades mentioned, the prefix "strictly" is used. Quarter grades between the half grade and the next higher full grade are referred to as "barely" prefixed to the full grade term and the quarter grade below the half grade is designated by the prefix "fully" to the full grade below. As examples a staple graded as "barely middling" is a quarter grade below middling, "strict low middling" is a half grade between middling and low middling and "fully low middling" is the quarter grade between the last and low middling, a full grade. This classification is generally adopted in this country, while for Europe that of Liverpool is followed. This differs from that of the New York Exchange in being somewhat higher in the low grades and lower in the high grades. These classifications are based not only upon the length of staple, but its fineness, color, freedom from dirt, etc., and are more or less subject to differences in judgment, although little variation will be noticed in determining the quality of a sample when presented for sale.

Like every crop of wide cultivation many varieties of cotton have been produced and named. Some of these achieved a wide reputation for some superior quality, flourished for a time and then disappeared. In 1880 the Census Report named 58 well known varieties, but in less than 15 years only six were still in common cultivation. In 1896, in a publication of the United States Department of Agriculture, more than 130 varieties were described, but



within half a dozen years many of them had disappeared from seedsmen's lists. While particular varieties may cease of cultivation in a short time, the general type remains and types of cotton can now be readily recognized that have been in cultivation for more than half a century. The well-known tendency of the plant to vary is responsible for the production of so many varieties. There is perhaps no cultivated plant that responds so quickly to changed conditions of soil, climate, and cultivation as the cotton plant, and to this can be ascribed the improvement and deterioration of many varieties. The most successful planters keep up the quality of their crop by continued selection of seed and for a crop that depends so much on the quality of the staple this is one of the most important considerations. The practice of planting seed purchased from gins and mills does more to depreciate the quality of the lint than any other factor.

Cultivation.— Cotton is grown under a wide range of climatic conditions and in a great variety of soils. Ideal conditions for its growth are a deep, mellow, rich soil, a warm steamy atmosphere with abundant moisture until the bolls are well developed, with drier atmosphere and soil while the fibre is ripening and being gathered. These conditions are more nearly approximated in the cotton districts of the United States than over any other large area. Dr. Wight, who has investigated the subject for India, says for the best development of fibre an increasing daily temperature during the period of greatest growth is required and the reason for the inferiority of Indian-grown cotton from American seed, as compared with that grown in the United States, is due to the fact that in India cotton planting depends upon the monsoons and the plant develops in a constantly decreasing temperature from seeding to gathering. Too cool weather in the spring stunts the plant; too much rain during the growing season makes the plants develop at the expense of boll production, renders the soil difficult of cultivation, and promotes the growth of weeds; drought stunts the plant and causes early maturing and a small crop of inferior quality; and frosts and cold nights cause the plants to turn brown and die. If the soil is too moist it should be drained.

The method of cultivation varies somewhat in the different countries where cotton is grown, but it is believed the system practised in the United States is the most nearly perfect. The methods adopted for the cultivation of Sea Island and Upland cotton differ somewhat in detail, but in general features they are alike. In the United States bedding up the land previous to planting is almost universally practised. Where manures or chemical fertilizers are used this is indispensable if economy is practised. The beds are raised 18 inches to 2 feet in case of Sea Island and less for Upland cotton. The fertilizer and drainage thus secured make a warm seed bed in the early spring. The beds are usually arranged to stand over the furrow of the previous year in which the old stalks and trash are thrown and covered deep enough to be out of the way of the plow. The seed is generally drilled in rows 4 feet apart and when the plants attain their first true leaf and the shoots are 2 to 4 inches high, they are thinned 8 to 14 inches in the row. The date of cotton planting in the United States extends from March 1 to June 1, the most of the crop being in by May 20. The earlier date marks the beginning in southern Texas and it grows later as one goes farther northward. The young plants begin to appear in about 2 weeks and the first true leaf is gained in 8 or 10 days. After the appearance of the true leaves the plant is no longer dependent upon the seed leaves for its nourishment and is less liable to injury by cold. The first blooms appear in southern Texas about May 15, and in Tennessee and North Carolina about July 10, with intervening dates for the intermediate regions. The first bolls open after an interval of about 6 weeks from blooming and picking begins about July 10 in southern Texas, August 15 in the coast region of South Carolina and Georgia, with corresponding later dates elsewhere, and continues until after frost has killed the plants, the last picking often being made as late as December 10. For the Sea Island cotton in South Carolina and Georgia planting is usually done between April 1 and May 1, and picking begins about September 1 and continues until December. The reason for the prolonged picking season is the unequal ripening and opening of the bolls on the plant. The fields must be gone through a number of times and the ripe cotton gathered from the open bolls, or great loss will be occasioned by the shedding of the cotton. Cotton picking is the most tedious and expensive operation in cotton growing. It is mostly picked by hand into bags or baskets hung from the laborers' shoulders and all available laborers are given steady employment. The usual payment for picking cotton is from 30 to 50 cents a hundred pounds of seed cotton, expert laborers earning from $1.00 to $1.50 per day. After picking, the cotton is spread to dry and then ginned to remove the seed and baled for shipment to market.

Yield and Cost of Production.— The yield and cost of production of cotton varies widely with different localities. Differences in soil, available labor, methods of culture, etc., all exert varying influences upon the production and its profitableness. The yield of Sea Island cotton is seldom more than ⅓ bale to the acre and its cost of production is estimated at from 14 to 21 cents a pound. The yield of Upland cotton, which is by far the bulk of the crop, averaged 211 pounds per acre for the crop of 1900–1. According to Hammond the yield of lint cotton is from ⅓ to 1 bale per acre in the Pine Levels Region, ⅓ to 1¼ bales per acre in the Prairie Region of the Southern States, and ¼ to ½ bale per acre in the Table Land region. The cost of production is estimated by the same writer to average 5.88 cents per pound of lint cotton in the eastern cotton-producing States, and 5.68 cents per pound in the western States. Watkins has compiled, in 'The Cost of the Production of Cotton,' replies from 3,335 plantations representing nearly every cotton-producing county in the cotton belt, showing that the Upland cotton crop produced in 1896 cost an average of 5.27 cents per pound and sold at 6.70 cents per pound. Of those reporting, 2,659 were operated at a profit, the average cost of production being 4.90 cents per pound, and the average selling price was 6.78 cents per pound; 676 reported losses, the average cost of production being 7.62 cents per pound with the

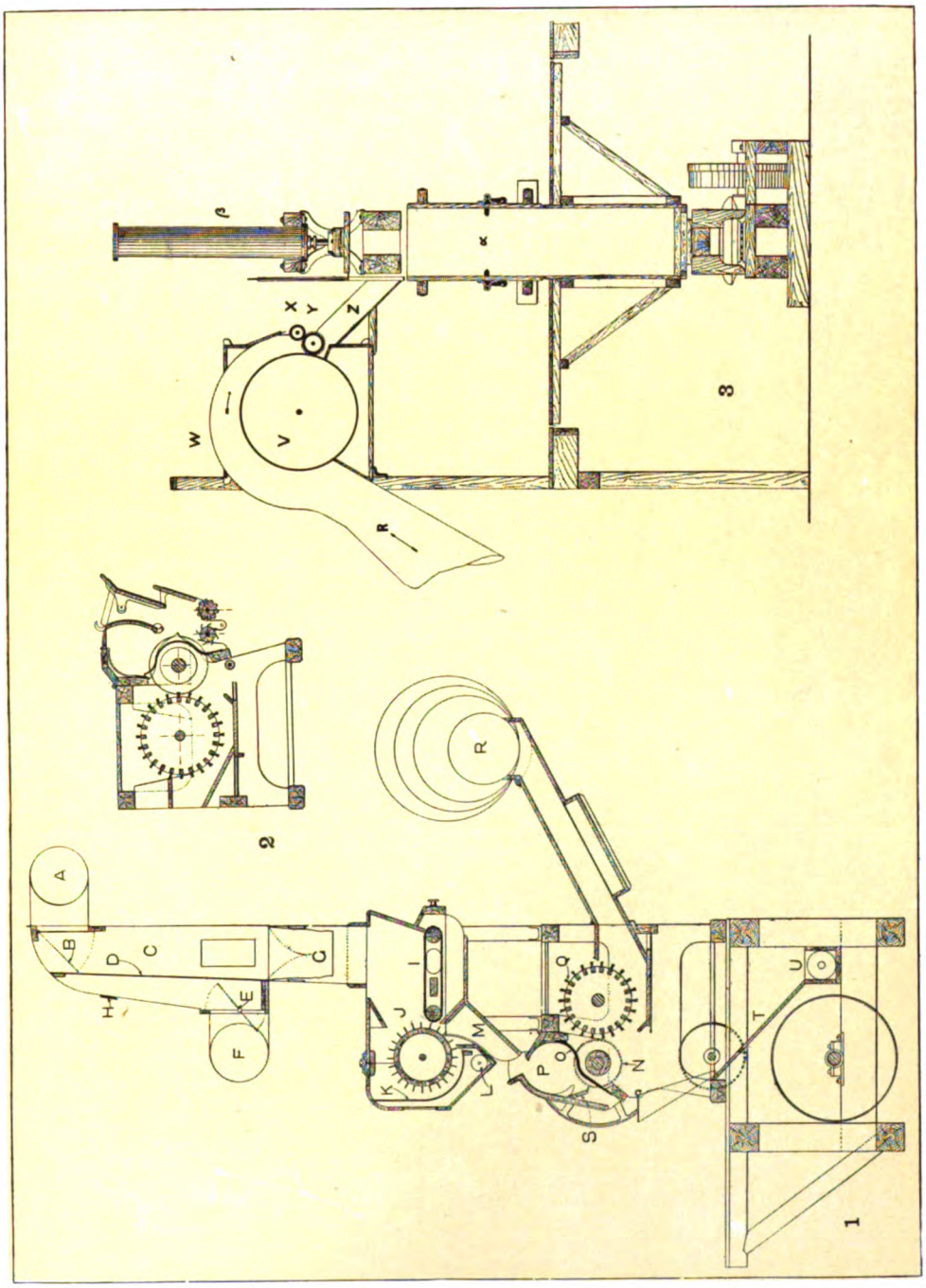
selling price averaging 6.52 cents. These figures include all expenses of planting, cultivation, fertilizers, rents, ginning, marketing, etc., and while probably approximating the average cost of production under the present system of cotton culture in the South, can not be taken to show the minimum cost under improved methods.

Cotton Diseases and Insects.— Recent investigations have revealed the causes of a number of well-known diseases of the cotton plant. Some of these are due to disturbances in the nutrition and assimilation of the plant, others are caused by the attack of fungi, while still others are caused by the production of galls on the roots by minute worms called nematodes. Of the first class the mosaic disease or yellow leaf blight, the red leaf blight, and the shedding of bolls are the most serious. These can be remedied to a great degree by better attention to the nutrition of the plants and drainage of the soils. Experiments conducted for a number of years at the Alabama Experiment Station indicate that liberal applications of kainit as a fertilizer would greatly reduce the liability to loss from the mosaic disease. The diseases due to fungi are of a different nature. The fungi find their way into the tissues of the plant, where they live parasitically, robbing the plant of its much needed nutriment and often causing destructive changes resulting in the death of the plant. Among the more destructive diseases of this kind are: Wilt or Frenching, soreshin or damping off, anthracnose, leaf blight, and rootrot. The wilt disease is caused by the fungus *Neocosmospora vasinfecta.* This fungus lives in the soil from which it gains entrance to the cotton plant through the roots. Once in the plant the fungus develops rapidly and plugs the water-conducting vessels, cutting off the water supply of the plant and causes it to wilt suddenly. This is the most conspicuous symptom of the disease and the wilting is usually followed by the death of the plant. The fungus lives for quite a while in the soil and where abundant necessitates the abandonment of cotton growing for a time. Some varieties of cotton, especially the Egyptian ones, seem more resistant than others and where adapted should be planted to the exclusion of susceptible varieties. Cowpeas and watermelons are subject to attacks of the same or similar fungi and should not be planted in rotation upon known infected soils. Soreshin, or damping off, is due to the fungus *Pythium debaryanum,* which causes the young plant to rot off at or near the surface of the ground. Anthracnose is due to *Colletotrichum gossypii.* It attacks the stems, leaves, and bolls. It begins as small red spots which spread and darken for a time, when the centres become grayish and a pinkish color appears on the spots. These areas are usually sharply defined and give to the bolls in particular an appearance sometimes called «bird eyes.» The affected bolls either die outright or fail to open. The root rot is caused by the fungus *Ozonium auricomum* attacking the roots, causing their decay and the consequent destruction of the plant. The leaf blight due to *Sphærella gossypina,* and the mildew caused by *Ramularia areola,* attack the leaves and when abundant cause the partial or total defoliation of the plants. A bacterial disease of the bolls causes the destruction of the seed and lint within them. The nematode gall disease may readily be recognized by the presence of numerous galls upon the roots. These are caused by the widely distributed nematode, *Heterodera radicicola,* which lives in the soil and attacks the roots of a wide range of plants. Long periods of rotation and the cultivation of varieties not subject to attack are the only practical means of relief known.

Cotton is often seriously injured by insects of various kinds. Cutworms, plant lice, caterpillars, grasshoppers, stalk borers, etc., injure different parts of the plant, but the greatest damage done to the cotton crop by insects is caused by the attacks of the cotton worm or cotton caterpillar (*Aletia argillacea*), the cotton bollworm (*Heliothis armiger*), and the Mexican cottonboll weevil (*Anthonomus grandis*). See COTTON, INSECTS INJURIOUS TO; WEEVILS.

Manufacturing.— When cotton has arrived at the mill, the processes through which it must pass before being turned out as finished cloth are varied and more or less intricate. The most important step in the process of producing cloth from the raw materials is the spinning. This may be variously divided, each division embracing a group of separate manipulations. The fibre must first go through a preparatory process. The bales have their ties cut and the bagging removed when the contents of a number are thoroughly mixed to secure a more uniform product. The cotton is then run through an «opener» which cleanses the cotton from impurities, such as broken seeds, fragments of leaves and stalks, dirt, etc., and the individual fibres are thoroughly separated. It then goes to a machine that arranges the cotton into laps or rolls of an approximately uniform weight. From here it goes to the carding, combing, and drawing machines which straighten out the tangled mass, extract the very short fibres and secure the regular and uniform distribution of the fibres in parallel series. The «roving machine» draws the «sliver,» as it is called, to a more uniform size and gives it a slight twist, after which the yarn is still more attenuated and twisted in the process technically known as spinning. In some mills the process stops with the production of the yarn, while in others it goes to the loom and after various manipulations becomes the finished product. In all the processes the manipulations are rather complicated and a minute description of them should be sought under the technical topics of spinning and weaving, the process being quite similar for all fibres. Many different kinds of machines are employed, some of them of great complexity, yet so skilled do the operatives become that a single person can readily attend to the almost automatic workings of a number of the most intricate spinning mules. Just as the bale is generally considered the unit of the cotton crop, so the number of spindles and looms is taken to indicate the relative capacity of the mills manufacturing it. Great Britain leads the world in the number of its spindles, having had in 1901 over 46,000,000, followed by the continent of Europe with 32,000,000, the United States with 21,000,000, Asia (Japan, India and China) with about 7,000,000, and Canada and Mexico with 1,100,000. In the United States the greatest development in cotton manufacturing during recent years has taken place in the Southern States. Prior to the Civil War and

COTTON GINNING MACHINERY.



1. Vertical cross section of elevator, feeder, plain gin flue, and platform.
2. Cross section of Huller gin.
3. Vertical cross section of condenser and press.

for a number of years following it, but a very small proportion of the cotton crop was manufactured within the States where it was produced. During this time the development of the industry in the New England and other Northern States was constant, the rate of increase being steadily maintained. In 1860 there were about 300,000 spindles and 6,700 looms in operation in the Southern States as compared with 3,900,000 spindles and 93,300 looms in New England. In 1880 the same regions reported 542,000 spindles and 11,900 looms and 8,630,000 spindles and 184,700 looms respectively. About this time the question of transportation of the raw product to the northern mills and of the finished cloth to the southern markets became important considerations and the general industrial development of the South led to the rapid growth of the cotton manufacturing in the cotton-producing States. By 1895 the number of spindles in operation in the South was nearly 2,500,000, and for the next three or four years the increase reported was nearly 400,000 per annum. In 1899 there were more than half a million more set in operation, while the increase for 1901 was over 1,200,000, making the total for the Southern States at the close of that year 5,819,835 spindles, as compared with 15,050,000 spindles for the remainder of the United States. These figures are given from Latham, Alexander & Company's Report for that year. The increase in the number of mills and looms was about the same proportion, there being a total of 531 mills and 122,902 looms in the South at the same date. According to Shepperson the mills of the United States now consume about one third of the crop produced, those of the North taking in 1901–02, 1,996,000 bales and those in the South 1,912,000 bales. While the mills in the New England States and the Southern States consume nearly the same proportion of the crop, yet the value of the products varies widely. In 1900, according to the Twelfth Census, the New England States produced from 1,829,678 bales materials valued at $191,690,913, while the Southern mills from 1,479,006 bales turned out products valued at only $95,002,059. This difference is due largely to the character of the products, the staple goods of the southern mills being those classed as brown sheetings, while the northern mills turn out a finer product at a correspondingly increased valuation. The class of goods turned out by the southern mills requires the "middling" grades of cotton which produce a relatively heavy cloth. This difference in the product of the two regions follows the general trend of all enterprises, the coarser products being first attempted, the finer ones following after a time. While some effort has been made to increase the fineness of the southern product, the profit in the cheaper grades has thus far prevented any great development along that line. There does not seem to have been much of a demand on the Sea Island cotton crop by the home mills, that cotton being exclusively used in the very finest grades of cotton weaves.

Of recent years there has been considerable interest in what are called "mercerized cottons." This process is an important adjunct to cotton manufacturing. The process consists of subjecting cotton or other vegetable fibres to the action of caustic soda dissolved in water, after which they are treated with pure water followed by dilute sulphuric acid and again washed. This treatment with chemicals causes both a physical and a chemical change in the fibre. The cotton after treatment instead of a flattened, twisted fibre, is swollen, thickened, becomes cylindrical and the cell wall is greatly thickened, with its cavity correspondingly reduced. This process, which was discovered by an Englishman, John Mercer, and patented in 1850, was designed by him to strengthen the goods and render them more uniformly subject to certain dyes. The process fell out of use to a great degree, but recently new attributes of the treated fibre were discovered. The treatment causes a decided shrinking of the goods, a fact now taken advantage of in making certain kinds of crepe cloth. It was also found that if the yarn or cloth be treated and kept under sufficient tension to prevent shrinking without being stretched, the fibre becomes translucent, and acquires a lustre similar to and but little inferior to that of silk. While apparently very simple the process is one requiring great care and skilful manipulation while the yarn is passed through the various chemical baths under heavy rollers. In practice it has been found that Sea Island and Egyptian cottons are best suited to mercerization. These fibres are already long and silky and are more uniformly acted upon. The extent of this industry is already quite important; the additional value acquired by cotton so treated in 1900 is given in the Twelfth Census Report at $697,490, more than 7,973,000 yards of cloth and 1,600,000 pounds of yarn having been mercerized.

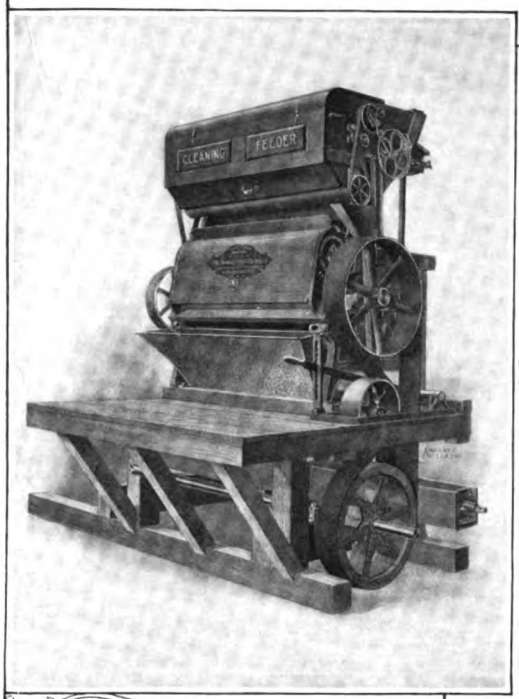
Cotton By-products.— In the early days of cotton growing the lint was considered the only valuable product of the cotton plant. Modern ingenuity, however, has found a use for nearly every part of the plant, and if fully utilized the commercial value of the available by-products of the cotton crop reported upon in the Twelfth Census would have been more than $80,371,000, or about one fourth the total value of the crop. The cotton stalks and leaves have a considerable value as forage and if plowed under without having been burned the bare stalks aid materially in maintaining the fertility of the soil. The average yield of stalks and other refuse from an acre of cotton weigh about 850 pounds. If returned to the soil together with a portion of the seed or its equivalent in meal, the growing of cotton exhausts soil fertility very slowly, the drain on the soil of a cotton crop being less than that of any of the staple crops of the United States. The air-dried plants rank as forage with such coarse fodders as corn stover, corn shucks, rye, oat, and wheat straw, etc. It has also been proposed to extract from the stalks the strong, coarse bast fibre which they contain. If a suitable machine could be obtained for decorticating this fibre in an economical manner it could doubtless be used as bagging for the bales. A process of this kind has been patented, but it is said not to prove altogether satisfactory. A ton of stalks should yield about 300 pounds of fibre if properly extracted. In Egypt and other countries where fuel is scarce the stalks are collected and used for fuel. The bark of the root, recognized in the United States Pharmacopœa under the name *Gossypii radicis cortex,* is an active emmen-

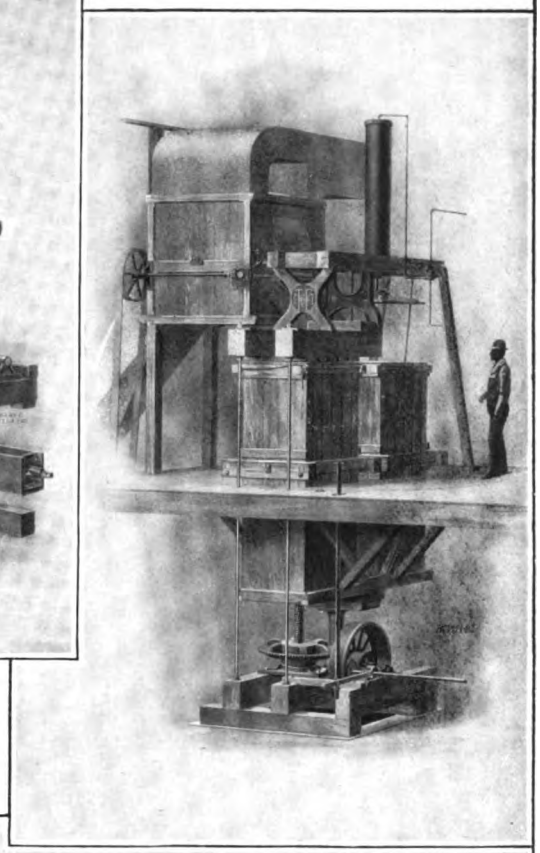
agogue, having an action similar to that of ergot.

In computing the money value of cotton by-products none of those just mentioned are included, but only the more important products of the seed are considered. Next to the lint the most valuable commercial product of the cotton plant is its seed. As picked from the plant cotton consists approximately of ⅓ lint and ⅔ seed by weight, that is a crop of 9,000,000 bales yields about 4,500,000 tons of seed. About 7 per cent of the seed is used for planting, the remainder for oil, stock feed, fertilizer, etc. Prior to the era of cotton-seed oil mills, part of the seed was fed either raw or cooked to stock, a larger portion was plowed under as fertilizer, and the balance burned, thrown into rivers or disposed of in the easiest manner possible. The true value of the seed was not appreciated until about 25 years ago, but since 1880 the crushing of cotton seed and the extraction of the oil has become a large independent business. A ton of Upland cotton seed as it comes to the mill yields on an average 20 to 40 pounds of linters, about 1,000 pounds of meats and 890 pounds of hulls. When crushed and pressed the meats yield about 300 pounds of oil and 700 pounds of oil cake. The first process involved in reducing the seed to its products is that of removing the "linters" as the dense short fuzz is called. The yield of linters varies with the thoroughness of the ginning, sometimes amounting to 70 or 80 pounds to a ton of seed. These are removed as well as possible, for their presence would absorb considerable oil during the subsequent manipulations. Their chief use is as cotton batting. The hulls are removed next and they were formerly burned, but are now utilized as a coarse feeding stuff for cattle, and as such have a value of $2.50 to $4.00 per ton. At this rate cotton seed hulls are cheap substitutes for hay. The ashes of burned hulls have lately come into considerable demand as a fertilizer for tobacco, their value depending almost entirely on the relative abundance of potash and phosphoric acid which are present on an average of 23.40 and 9.08 per cent respectively. The cake residue from the presses, or the oil meal which is the crushed and ground cake, is extensively used both as stock food and as fertilizer. It is very rich in protein, nitrogen free extract, and fat, and can only be used to advantage as a feeding stuff when mixed with some coarser fodder. Analyses of the hulls and meal show that they supplement each other quite well as cattle feed, the hulls furnishing the necessary carbohydrates and the meal the required protein for a well-balanced ration. It was not until about 1883 that the possibility of feeding them together was definitely known, and in 1894 it was estimated that fully 400,000 cattle were fattened and 150,000 milch cows fed on rations made up very largely of cotton-seed hulls and meal. For fattening cattle, sheep, and other ruminants four pounds of hulls to one pound of meal is a successful ration, while for feeding to milch cows seven or eight pounds of hulls to one pound of meal is recommended, although an exclusive diet of this kind is not now considered advisable. In feeding cotton-seed products they should be fresh, since they appear to undergo changes after a time that render them deleterious, especially to calves and pigs. Even when fresh, for some unexplained reason, their use by young animals is attended with great danger. Cotton-seed meal is also extensively used as a fertilizer. It contains, in addition to potash and phosphoric acid, a large amount of nitrogen, and upon land that is not too dry may be compared with fish guano in its efficiency. Its value for this purpose, computed in the usual way that fertilizers are estimated, is from $20 to $25 per ton. It is an excellent fertilizer for sugar cane, corn, and cotton, and for tobacco it may be substituted for barn-yard manure.

Of the remaining constituents of the seed the oil is the most important. The report of the Twelfth Census shows there were 357 oil mills in operation which produced over 93,325,000 gallons of oil, valued at $21,390,000. The common method of oil extraction is to crush the decorticated meats and cook them in large heaters for 15 to 45 minutes, dependent upon the quantity, temperature of the vats, etc. This is one of the most important steps in extracting the oil, as too much or too little cooking diminishes the amount of oil and depreciates its quality. When in the judgment of the operator the meats are sufficiently cooked, they are folded in a camel's hair press cloth and gradually subjected to hydraulic or steam pressure that finally amounts to 3,500 pounds per square inch. Cold process oils are made, in which there is no preliminary cooking, and by some this quality of oil is preferred. When first expressed the oil is odorless, dark in color, and with a specific gravity of 0.92. This oil is then treated with alkaline solutions which precipitate the mucilaginous and albuminoid matter, together with the dark coloring matter, leaving a clear yellow oil which is drawn off, the residue being used for the manufacture of soap. With further refining this oil becomes what is technically known as "summer yellow oil." Ordinary "summer yellow oils" become cloudy at temperature of 28° to 40° F., rendering them unfit for many purposes, and "winter oils" are prepared that remain clear at 32° F. This is done by cooling the summer oils until the stearin or palmatin becomes crystallized. The hardened substances are pressed out and the remaining oil is used for salad oils, etc. "Summer yellow oil," bleached by the addition of about three per cent of fuller's earth, is changed to summer white oil, which is the basis of compound lard, cottolene, etc. "Miner's oil," which is used with kerosene as an illuminant, is made from "summer yellow oil" by treating it with sulphuric acid. In these various processes there is left considerable residue, which consists mainly of various fatty acids, and is used for making soaps. Cotton-seed oil is a slowly drying oil, on which account it is not equal to linseed oil when used with paint, although it is used to some extent in that way. It is also used as a lubricant, is employed in pharmacy, and to some degree in other arts. The coloring matter in the freshly expressed oil has also been separated, purified, and used as a dyeing material. Two important dyes have been separated, one, which is an oxydizing agent, giving a fine purple or violet blue color; the other, a non-oxidizing material called gossypin, affords a golden yellow to silk and wool.

Distribution and Production.— Cotton may be cultivated in nearly all portions of the globe between lats. 35° N. and S. or in a broad zone running around the earth and embracing the





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tropics and portions of the temperate zones. Its most profitable cultivation at present is between lat. 20° and 35° N., although it is grown in Turkestan as far north as 45°. During Colonial times cotton was profitably grown in Pennsylvania, Delaware, and Maryland, and some is now grown in Kansas and Utah; however, the present limits of economic production in the United States is south of lat. 37° N. or a line running through southern Virginia, southern Kentucky, Missouri, and the northern boundary of Oklahoma. It is also grown extensively in India and Egypt, these two countries and the United States supplying fully 95 per cent of the world's crop. The estimated world's crop for 1900–01 was 13,858,000 bales, of which the United States produced 10,218,000 bales, India, including other Asiatic production, 2,390,000 bales, Egypt 1,100,000 bales, and South America 150,000 bales. For the countries other than the United States and possibly Egypt, the estimates of production do not represent the total crop, but only that portion that is marketed, and the most of it exported. India is known to have a large domestic consumption of cotton, but the amount cannot be estimated with any degree of accuracy. During the American Civil War, on account of the blockade of the southern ports, the price of cotton reached almost fabulous figures, and cotton culture was given quite a stimulus in Italy and other parts of southern Europe, as well as in Australia and elsewhere, but within less than 10 years the United States re-asserted her supremacy in cotton production and was again supplying the bulk of the requirements of the world's trade. The limiting conditions of profitable cotton growing seem to be temperature and distribution of rainfall or ability to irrigate. An average summer temperature of 73° to 75° F. and a winter temperature of 45° to 48° F. seem to furnish the proper temperature requirements, and the average distribution of rainfall of the Southern States, the moisture needed for the production of the best quality of fibre. Elevation and proximity to the sea are important factors to be considered for producing certain types of cotton, as may readily be seen in the wide variation in the quality of staple produced in contiguous regions.

The beginning of cotton culture in the United States is a matter of much speculation, but that it was carried on in a desultory way for a century or more, before becoming an important industry, seems quite probable. In some of the earlier accounts of Virginia, the writers claimed that cotton would grow in that colony as well as in any part of the world. Bancroft tells us that an experimental planting of cotton was made in Virginia in 1621, and the result was a subject of interest in America and in England. The industry spread rather slowly to the other colonies, but cotton growing had become important before the Revolutionary War in the region now known as the Cotton States. This was upland cotton. The history of the introduction and development of the culture of Sea Island cotton is better known. Sea Island cotton seed was brought from some of the West Indies, where it was indigenous, to Georgia in 1786, and it was at once found to be adapted to the coast region of that State. The following year, 1787, saw the introduction of this crop along the shores of South Carolina and Georgia, but its first recorded extensive production was in 1788, when Thomas Proctor raised 5,000 pounds upon a plantation near Savannah, Georgia, and reported it to the Philadelphia Society for the Encouragement of Manufactures.

During the early days of upland cotton-growing, the lint was separated from the seed by hand, about four pounds being considered a day's task. This slow process precluded the rapid extension of cotton production. The roller gin in use for ginning the Sea Island cotton did not differ essentially from that known in India 2,000 years before, and it was not adapted to upland cotton. In 1794 Eli Whitney patented his famous saw gin and made possible the enormous crops of later years. In estimating the cotton crop it is usual to begin the cotton year with September 1, the year being represented by figures that include portions of two calendar years, and the total yield is expressed in bales that may or may not be calculated to an uniform basis. Within 100 years, 1790 to 1890, the cotton production of the United States increased from about 5,000 bales to more than 10,000,000 bales of 400 pounds each. The cotton production of the United States by decades as given by Watkins in the United States Department of Agriculture, Division of Statistics, Miscellaneous Bulletin No. 9, was as follows:

PRODUCTION OF COTTON IN THE UNITED STATES.

Year	Crop	Net Weight of Bales
	Bales	Pounds
1790-91	8,889	225
1800-01	210,526	228
1810-11	269,360	297
1820-21	647,482	278
1830-31	1,038,847	341
1840-41	1,634,954	394
1850-51	2,454,442	416
1860-61	3,849,469	477
1870-71	4,352,317	442
1880-81	6,605,750	460
1890-91	8,652,597	473
1900-01	10,383,000	507

The largest crop produced in the United States was that of 1898–9, which was 11,275,000 commercial bales, and the smallest during the past 75 years was that of 1864–5, which was estimated at about 250,000 bales. The Sea Island crop, which is almost exclusively produced in the coast region of South Carolina, Georgia, and Florida, and on the adjacent islands, has averaged about 80,000 bales a year for the past 10 years, the crop of 1901–2 being estimated at 84,524 bales. The estimated total crop for 1902–3, according to the United States Department of Agriculture, was 10,417,000 bales of a net weight of 490.7 pounds, produced on 27,114,103 acres, or an average of 188.5 pounds of lint cotton per acre. The United States Census Bureau has been recently charged with the collection of statistics regarding the annual cotton production, and the estimate of that bureau for the crop of 1902–3 as shown by returns received from 32,753 ginneries, was 10,630,945 gross bales of 500 pounds each. The production of commercial bales by States was as follows: Alabama, 1,011,325; Arkansas, 999,629; Florida, 67,287; Georgia, 1,509,199; Indian Territory, 409,591; Kansas, 45; Kentucky, 1,308; Louisiana, 911,953; Mississippi, 1,451,626; Missouri, 49,552; North Carolina, 586,884; Oklahoma, 218,390;

South Carolina, 948,200; Tennessee, 328,019; Texas, 2,587,299; Virginia, 16,575. Of this large production about two thirds are exported, the mills of the United States only consuming about one third. While a large exporter of cotton, the United States imports considerable, taking annually about 100,000 bales of Egyptian cotton, most of which is used in the manufacture of Balbriggan underwear, hosiery, silk and cotton mixtures, and wool and cotton mixtures, etc.; and about 25,000 bales of Peruvian cotton, which is used exclusively to mix with wool to cheapen the cost of underwear, hosiery, etc.

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Cotton Famine, the destitution caused by the outbreak of the American Civil War (1861–5) in the English cotton manufacturing districts, especially in Lancashire. The cotton supply failed on account of the blockade of the southern ports of the United States, and in consequence the mill-owners finally closed their mills entirely, nearly 2,000,000 of people being reduced to great distress. A Cotton District Relief Fund was started, and a Relief Act passed by Parliament, by which loans were granted to the guardians of the poor for the purpose of instituting relief works. In 1863, in the midst of the war, three ship loads of provisions and supplies were sent to England from New York. Gradually the difficulties were overcome, and by June 1865 the distress was at an end, greatly increased supplies of cotton having been received from Brazil, Egypt, India, and elsewhere.

Cotton Ginning Machinery, machinery for preparing the raw or seed cotton for the cotton mills. Its primary object is separating the fibres of cotton from the seed. At present no successful mechanical means is in general use for harvesting or picking seed cotton from the stalks in the fields. The bolls begin to open in the latter part of July. When ripe they burst at the top and the locks of cotton streaming out are filled by the wind with sand and dust, and wet by the rains and dew. So to keep the cotton clean, picking must commence as early as possible and continue until the last of the crop is gathered. A day's work for an adult varies from 200 to 300 pounds, and of this weight about a third is lint and two thirds seed. Picking is done by contract at so much per hundred pounds, and the seed cotton is either stored in houses located in the fields, or carried in wagons to the gin houses where it is either stored temporarily or ginned at once from the wagons.

The earliest gin probably dates back to the days when the market price of animal skins became so great that man had to look around for a cheaper substitute for clothes. A primitive machine called the churka is an early gin. It is used to-day by the Hindus and Chinese. It consists of two plain rollers mounted on a frame and revolved in contact. Between these rollers the cotton is drawn and torn from the seed.

In most parts of the cotton belt of the United States the saw gin which Eli Whitney invented in 1794 is still the machine used to gin cotton. This cotton gin is one of the few mechanical inventions which seemed to spring spontaneously from the brain of the inventor a perfect machine. Evolution has done comparatively little to change its three essential elements, the saws, ribs, and brush. These have been retained in nearly all modifications intended to meet modern ideas, methods, means, and material of construction, and improve the quality and quantity of the staple of the cotton, but thus far no machine has been invented which can excel the saw gin in capacity. As the fibres of the cotton were found to be injured by the action of the saws, the McCarthy roller gin was introduced. It consists of a leather covered roller to which a knife is tightly held tangentially, and a moving blade that moves up and down in a plane just behind and parallel to the fixed knife. As the cotton is drawn between the rollers and the knife, the seeds are forced loose by the moving blade. The capacity of this gin is so limited that only the small part of the cotton crop which is of long fibre, like that raised on the sea islands of the Carolinas and Georgia and some parts of the river bottom lands, is ginned on it, and its limited capacity has prevented its general introduction throughout the South.

Until 25 years ago the average ginning plant consisted of one gin stand having a gang of 60, 70, or 80 saws, capable of turning out from 8 to 10 500-pound bales of cotton in a day. The isolated cotton plantations did not require a greater capacity than this size of plant, and each planter did his own ginning. But after the development of the Southwest with its large areas capable of raising cotton and the large number of small farms located close together, system gins were erected at railroad stations capable of ginning for the entire neighborhood. The scarcity of labor required that labor-saving apparatus be installed to get the cotton to the gins, and the product of ginning away. Thus this section of the country became the home of these labor-saving devices, and as the community grew, the competition of the gins with each other required a perfection of machinery never attempted in the older portions of the cotton belt. Then, as the development of the Southwest increased its competition with the Southeast, in self defense this latter section was compelled to adopt the methods which had grown up in the former. Small plantation gins were not rebuilt as they wore out or burned, but larger gins owned by a company of planters or merchants were built at the railway stations. Thus the entire cotton handling business underwent a revolution, until, for economy, speed, and

efficiency, cotton handling machinery grew and developed until it is on a parity with the machinery for handling the grain crops of the Northwest.

The constant danger of fire which hangs over all cotton gins has caused the different buildings which go to make a complete establishment to be separated. The cotton is stored in an isolated house at least 60 feet from the gin house, and its contents drawn into the gin by the inlet current of an exhaust fan. In most cases, however, at large gins it is not stored in the house at all, but taken directly from the wagons as they arrive at the gins, and each wagon hauls its cotton away, selling the seed to the ginner, who usually buys for some oil-mill and ships direct to them. The gin building proper is only large enough for the machinery which does the ginning; no cotton is in the building except that which is undergoing the process of ginning. The seed house in which the seed is stored is also detached from the gin building and usually located on a spur of the railway. In some cases an additional building is used to store the bales until they are shipped. Further to avoid the risk of fire and to insure better running of the machinery, the gins are located on a low platform three feet high. The floor of the building is brick or cement, and the building is made of brick, stone, or sheet iron.

The line shaft is carried directly under the gins where all of its journals are in sight; it can be easily oiled and hot-boxes instantly detected. At the end of the row of gins a higher platform is built to surround the press. Bales are taken out on this platform and can be thrown into the wagons thence without further expenditure of labor. After the mechanical processes of carrying by the exhaust fan and dropping the cotton into each gin, blowing it from the gins to the presses and its packing there by a steam tramper, the operation of putting on the bagging and tying the hoops is the first manual labor necessary after the feeding from the wagon into the telescope.

The principal machines used in a modern cotton ginning establishment, in the order in which they are used, are the telescope, the elevator, the exhaust fan, the feeder, the gin, the seed conveyer, the flue, the condenser, and the press.

The machine which makes the separation of fibres from the seed is known as the gin; all the other machines in the gin house, except the engine and boiler, are intended to either get the seed cotton to the gins, or to take care of the seed and lint after they leave the gin.

The telescope is an extensible tube which hangs from the inlet cotton pipe; it is counterbalanced and so arranged that its tube can be pulled down and kept close to the pile of cotton as it decreases in size.

The pneumatic elevator, which is now the apparatus most generally used to distribute cotton to the gins, is arranged as follows: *A* is the cotton pipe leading from the telescope. *B* is a valve which swings away from *A* and allows the cotton to enter chute *C*. *D* is a screen which prevents the cotton getting into the air pipe, and *E* is a valve which separates the chute *C* from the air pipe *F*. *G* is a flexible valve which prevents the air from entering the chute from below. *H* is a valve for admitting outside air. A chute is mounted over each gin feeder, all of the cotton pipes are connected to the common pipe *A* which extends to the telescope, and all of the air pipes are joined to the common pipe *F* which connects to an exhaust fan. The valves *E* are opened in rotation. In a system using four gins each valve is open a fourth of the time and closed three fourths. When air valve *F* in the first chute is open a vacuum is formed in the chute, the outside air carrying with it the cotton, rushes in from the telescope through valve *B*. The air is drawn through the screen into the fan, while the cotton strikes against the screen with enough force to take out a large part of dirt and dust, no cotton being ever allowed to get into the blades of the fan on account of the danger of fire which a spark might cause. As long as valve *E* remains open cotton continues to enter this chute and valve *G* remains closed, but when valve *E* in this chute is closed the corresponding valve in another is opened and the stream of cotton and air is deflected to the second chute, and the cotton in the first dropped from the screen and into the feeder below. Valve *H* is opened to allow fresh air to get in above the cotton and thus break the vacuum and blow the cotton off the screen.

The feeder which is located just below this elevator, and over the gin, has for its object the cleaning of the seed cotton, breaking up the lumps and then feeding the locks evenly and regularly into the gin. Its parts are as follows: A slowly moving apron *I* receives the cotton from the elevator and carries it to the picker wheel *J*. This wheel revolving with great rapidity picks up the locks of cotton and throws them against the screen *K*. The particles of dirt and trash go through this screen and are carried away by helical conveyer *L*. The cotton is rubbed over the screen and thrown on an inclined apron *M* which carries it into the roll boxes of the gins.

The gin used on upland cotton is practically the same in design as the one invented by Whitney. It consists of a gang of circular saws *N*, usually 70 in number, mounted about five eighths of an inch apart on a mandrel. A grating of cast-iron ribs *O* sits over these saws. The saws project through the spaces between the ribs and into the roll box *P*. The seed cotton from the feeder drops into this roll box and coming into contact with the teeth of the revolving saws, its fibres are stripped from the seed and carried between the ribs and out of the roll box, then the brushes *Q* clean the lint from the teeth of the saws, and at the same time generate enough air to blow the lint through the flue *R* to the condenser. Seeds freed from the lint are unable to go out through the space between the ribs, and so work out of the roll box to the adjusting board *S*, whose function is to hold them back until sufficiently cleaned or stripped of lint. Different varieties of cotton clean more or less easily, requiring different adjustments of this board. The seed rolls down an apron *T* into a helical conveyor *U* which runs under the line of gins and carries the seed into the blast of the same fan that draws the cotton to the elevator. The gin used on cotton grown in the river bottom or alluvial lands is modified from the plain gin for the following reasons: The cotton contains more woody bolls or hulls, either from the indifference of the picker or because the bolls do not open as

freely as the upland bolls do. It is necessary to extract these hulls to prevent their becoming mixed and cut up with the cotton fibres. This is accomplished as follows: The cotton is dropped from the feeder upon two small rollers. These feed it to the saws which drag it through a set of guards or fins which are located on the lower part of the rib and whose function is to strip off the hulls and prevent them getting into the roll box. The operation is then identical with the plain gins.

The flue which conducts the cotton from the gins is made of sheet metal and shaped like a long funnel with the larger end near the condenser. Cotton and air is blown from the gins into the main flue tangentially, thus insuring long, easy, spiral lines of travel, and as a layer of air is always between the walls of the flue and the flying cotton, friction is reduced to a minimum.

The condenser which is located at the end of this flue acts as a collector of the bunches of cotton that fly through the flue like snow, and makes them into a bat or sheet of cotton. It consists of a large revolving drum *V* covered with wire netting. The drum is surrounded by a rounded top *W* set eccentrically with it, with the wide part at the back where the flue enters. Each end of the drum opens into a dust flue leading to the outer air. The air and dust blown against this drum escapes out of the building while the cotton remaining on its circumference is carried around to the front where there are two doffing rollers *X* and *Y*. These wipe the cotton off of the drum, making it into a sheet or bat and also prevent the escape of the air into the house. This bat of cotton drops down the incline *Z* into the press.

The press used in all square bale system of gins, consists of two boxes mounted together on a turntable. Cotton from the condenser is allowed to drop into the first box and when enough cotton has been forced into it by the steam tramper the turntable is revolved and the other box comes in its place. The loaded box comes into position over a ram where it receives the final pressure. This ram is operated by a large direct acting steam cylinder, a hydraulic ram or a screw which is raised and lowered by a revolving nut. The bales turned out by this square press usually weigh 500 pounds gross. Of this weight about 30 pounds is the weight of the bagging which covers it, and of the steel ties which bind it. These bales average 28 x 56 x 42 inches in size and thus have a density per cubic foot of about 14 pounds. They are usually shipped from the gin house to some concentrating point where they are assorted and compressed and their size is reduced to 28 x 56 x 18 inches, giving them a density of 28 to 30 pounds per cubic foot. They are then ready to be shipped to the cotton mills.

The large compresses which do this pressing are usually located at large concentrating centres. They are enormous machines weighing in some cases as much as 200,000 pounds, and are operated either by direct acting steam cylinders coupled to the jaws of the press by multiplying levers, or the jaws of the press are brought together by a large link moved by hydraulic rams sitting directly over the press. These rams receive their charge of high pressure water from generators located in the engine room, which are large direct-coupled steam pumps capable of filling the press ram at one stroke of the piston. The capacity of this press ranges from 800 to 1,200 bales in 10 hours. The bales while in the press are recovered and their bands are shortened to suit the reduced bulk. They are then loaded directly on the cars and shipped to their destination.

The round bale presses, which have been introduced within the last 10 years, are intended to take the place of the gin house presses, and to make a bale from the cotton as it comes from the gins, and at the same time pack it with sufficient density per cubic foot to allow it to be shipped direct to the mills without further compressing. They are a mechanical success and are sure to become universally adopted in time. There are two types of round bale presses, the older or round lap press, making a bale by wrapping layers of cotton batting around a spindle and then extracting the spindle, the bale growing in diameter as it is formed, and reaching a density of 35 pounds per cubic foot, measuring 35 inches long, about 22 inches in diameter and weighing about 250 pounds, and another type of press which makes the bales on end. The diameter, 20 inches, is constant, and the length varies as the weight, but averages about three feet. As high as 40 pounds per cubic foot density can be attained with this press. The bales weigh 250 pounds. The bales of the round lap press will unwind directly into the lapping machines of the cotton mills, thus doing away with one process through which all bales made on the square presses, or on the end-packed round bale presses have to go. In fact the round lap bale press is nothing more than a large, heavy lap machine used at the gin-house in place of the lighter one used at the mill.

The influence of improved machinery on handling cotton can best be illustrated by the following figures. In 1792 the exports of cotton from the United States was 138,342 pounds, scarcely more than 276 bales of 500 pounds each. Ten years after Whitney had invented the saw gin the exports amounted to 18,000,000 or 36,000 500-pound bales. Again in about 1876 the cotton crop was a little over 5,000,000 bales, then modern machinery began to be introduced, causing a saving in labor, and therefore the reduced cost of ginning acted as such a stimulus to cotton raising that at present the crop is about 11,000,000 bales. It is estimated that the introduction of the round lap bales which save the charges of compressing, and the expense of concentrating the bales, will make a net saving to the grower of almost $3.00 per bale, or $33,000,000 annually.

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Manufacturer Cotton Ginning Machinery.

Cotton-Grass, a genus of the sedge family (*Cyperaceæ*). About 10 species are distributed in the bogs and moist places throughout the northern hemisphere. The fruit of the cotton-grass is clothed at the base with a silky or cotton-like substance, which is employed in making paper and candle-wicking, also used for stuffing pillows. The plant was formerly used for medicinal purposes. A more recent attempt to employ the soft bristles as a substitute for cotton has naturally failed, as the fibre is less readily spun and not so durable.

Cotton-gum (*Nyssa aquatica*), belongs to the natural order *Cornuceæ*. Besides this species there are three others, natives of eastern North America. It is a large tree, which sometimes reaches the height of 100 feet, with a circumference of four feet, abounding in deep swamps and ponds from Florida to southern Virginia and westward to Texas, Missouri, and Illinois. The wood of the *N. aquatica* is soft, though hard to split, and of a light brown, nearly white color. It is also called tupelo-gum.

Cotton Industry. The production of the cotton plant was very limited until the invention of the saw-gin. A number of cotton machinery improvements made prior to Whitney's invention of the gin had brought about an increasing demand in England for cotton, and there was considerable anxiety on the part of mill owners there as to whether production could be so stimulated as to cause it to keep pace with the growth of the demand. The total crop of the South in 1791 is estimated to have been 2,000,000 pounds, or 4,000 bales, of which about one tenth is supposed to have been exported to England. A shipment of eight bags had been made to Liverpool in 1784, though there are reports of small shipments prior to that date, which were probably West Indian cotton exported via Charleston. This shipment of eight bags was sold to an English firm in whose mill was employed a Samuel Slater, who in 1790 built in Pawtucket, R. I., a mill for Almy & Brown of Providence. It is supposed that the first mill built in the South was in the same year, 1790, and that it was in South Carolina. An early report states that a mill was then established in that State, driven by water and having "spinning machines with 84 spindles each." Thus the South built its first cotton-mill probably the same year that the foundation of New England's textile industry was laid by the building of the mill for Almy & Brown.

The spinning and weaving of cotton for domestic use, or, as it was called, the making of "homespun" goods, was almost universal throughout the South at that period. It is related of Jefferson that in his own household he "employed two spinning jennies, a carding machine and a loom with flying shuttle, by which he made more than 2,000 yards of cloth which his family and servants required yearly."

"The four southernmost States," said Mr. Jefferson in a letter written in 1786, four years before Slater built the small mill in Pawtucket for Almy & Brown of Providence, "make a great deal of cotton. Their poor are almost entirely clothed in it in winter and summer. In winter they wear shirts of it and outer clothing of cotton and wool mixed. In summer their shirts are linen, but the outer clothing cotton. The dress of the women is almost entirely of cotton manufactured by themselves, except the richer class, and even many of them wear a great deal of 'homespun' cotton. It is as well manufactured as the calicoes of Europe."

This domestic manufacture was very general throughout the South. The cotton for the spinning process was prepared in general by the farm laborers, who picked the seed from the lint by hand. The necessity of some improved method of ginning the cotton was so generally appreciated that many efforts were made to devise a method which would overcome the necessity of hand-picking. In 1792 Eli Whitney, a native of Massachusetts, while in Georgia, had his attention called to this need, and in 1793 he perfected the saw-gin.

In view of the discussion which has been going on for many years as to whether Whitney or Holmes is entitled to the credit for this invention, Mr. D. A. Tompkins, of Charlotte, N. C., in his 'Cotton and Cotton Oil,' gives a very complete and comprehensive history of the gin, and in closing says:

The real facts about the cotton gin are:

1. Eli Whitney, of Massachusetts, a graduate of Yale College, invented a cotton gin, consisting of spikes driven in a wooden cylinder, and having a slotted bar through which these spiked teeth passed, and having a brush to clear the spikes. He obtained a patent 14 March 1794, signed by George Washington, president; Edmund Randolph, secretary of state, and Wm. Bradford, attorney-general.

2. Hodgen Holmes, of Georgia, a resourceful and practical mechanic, invented an improved gin, using circular saws properly spaced, passing through spaces between ribs. For this invention he obtained a patent 12 May 1796, signed by George Washington, president; Timothy Pickering, secretary of state, and Chas. Lee, attorney-general.

3. Whitney's invention, consisting of a wooden cylinder carrying annular rows of wire spikes, with a slotted bar and clearing brush, was fundamental.

4. The practical application of the fundamental idea was Holmes' invention of the saw-gin, which consisted of a mandrel or shaft carrying collars separating circular saws which pass through narrow spaces between ribs.

5. Whitney went South without money, business experience or mechanical training. He received from the Southern States the following amounts:

From South Carolina	$50,000
From North Carolina (at least)	30,000
From Tennessee (about)	10,000
Royalties from Southern States	$90,000

6. In Georgia, his firm (Miller & Whitney) attempted to monopolize the ginning business. This brought on long and vexatious litigation, and the object was never successfully accomplished.

With the invention of the saw-gin the growth of the cotton business of the South became very rapid. The production advanced from 2,000,000 pounds in 1790 to 10,000,000 pounds in 1796, and to 40,000,000 pounds in 1800, while the yield of 1810 was 80,000,000 pounds, and that of 1820, 160,000,000 pounds. The rapid increase in the demand for cotton and the profitableness of its cultivation caused a concentration of the energy and capital of the South in cotton planting, and industrial interests which had been flourishing declined. According to Donnell's 'History of Cotton' the tariff on cotton goods was largely increased in 1816, the measure being strongly supported by the South on the ground that it would promote the consumption of its cotton, and opposed by some of the northern States because of their large shipping interests. From a crop of about 400,000 bales in 1820, production rapidly increased, the growth of this industry probably surpassing in extent and wide-reaching importance any other crop in Europe or America. The energy of the South was turned into cotton-raising with such vigor that production gradually increased more rapidly than the world's consumptive demand. Other agricultural interests were not, however, neglected. Diversified farming was the rule, and the South was more nearly self-supporting in the way of foodstuffs, such as corn, bacon, etc., than it has ever been since, notwithstanding the very marked growth in diversified farming during the last few years. In general, cotton prices were well maintained for 40 years, though gradually tending down-

ward at the beginning of the century. In 1801 the average New York price was 44 cents a pound, and from this it slowly declined (often with an upward spurt of a year or two) to 13½ cents in 1839. With prices ranging from 13 cents to 44 cents per pound, and averaging for 40 years, from 1800 to 1839, a fraction over 17 cents per pound, cotton cultivation was so profitable that it is not to be wondered at that the people of the South concentrated their efforts more and more on cotton cultivation, to the neglect of industrial interests. By 1840 cotton production had advanced beyond the requirements of consumption, and there commenced a period of extremely low prices, the cotton States suffering very much from this decline. In that year the average of New York prices dropped to 9 cents, and this was followed by a continuous decline until 1844–5, when the average was 5.63 cents — the lowest average price for a year ever known to the cotton trade. Moreover, in 1844–5 the seed was without market value, while now the sale of seed adds largely to the value of the crop, and transportation is likewise very much cheaper than at that period. In 1847 the crop was short, and prices advanced sharply, only to drop back to 8 cents, and then to 7½ cents. These excessively low prices brought about a revival of public interest in other pursuits than cotton cultivation, and the natural tendency of the people to industrial matters, which had long been dormant, was again aroused, and for some years there was a very active spirit manifested in the building of railroads and the development of manufactures. In 1850 a period of much higher prices began, and for the next 10 years the average was about 12 cents a pound. The wonderful prosperity which cotton production at the prices prevailing up to 1860 brought about, except for the decade from 1840 to 1849, is illustrated in the statement that though the South had only one third of the total population of the country, and only one fourth of its white population, the assessed value of its property was, according to the census of 1860, $5,200,000,000, out of a total of $12,000,000,000 for the entire country, or 43⅓ per cent. With the coming of the War the cotton trade was completely demoralized, and the small amount produced during that period could only get to the markets by running the blockade. Prices rapidly advanced until in 1863–4 the New York average was 101½ cents. When the War ended the world was almost bare of cotton, the demand was pressing, and prices continued very high. But the South was bankrupt. It had but little capital on which to operate, its planters were burdened with debt, their houses and fences destroyed, their labor system disorganized; and in this condition they were in no position to buy or to produce foodstuffs and live stock. Money-lenders, however, seeing the world-hunger for cotton, were ready to make advances on mortgages on unplanted cotton, but not on other crops. Most of them were factors or commission merchants, who would agree to advance money or to grant credit at their stores for merchandise of all kinds against every acre planted in cotton. Under these circumstances diversified agriculture had to be abandoned, and the planter was forced to buy western corn and bacon, and devote all his time to raising cotton. By the time he had paid nearly double the cash values for his supplies, and had paid commission, storage, and drayage, and insurance on his cotton when marketed, the planter usually ended the year in debt to his factor. The profits of the factor, though, were sufficiently large to justify him in continuing his credit, and by doing so the average farmer was kept in debt from year to year, though, of course, the better class of farmers gradually worked their way to an improved financial condition. The negroes and the tenant class of whites could borrow money on cotton in the same way, and thus developed a tenant system for raising cotton, which prevented any attention being given to the improvement of the land. Year after year the farmer was forced into cotton-raising to the exclusion of everything else, until it became a common saying that "the South kept its corn-crib and smoke-house in the West." By 1880, although still heavily in debt, southern farmers had commenced to give more attention to the cultivation of grain and to raising early fruits and vegetables. The agricultural progress made by the South since that year has been very remarkable, but, despite the great increase in the production of corn and of foodstuffs, the yield of corn in the central Cotton States per capita does not yet equal the average prior to 1860, while the possibilities of wheat cultivation, shown notably in Virginia, Tennessee, Kentucky, and Texas, have yet hardly begun to be touched.

In the meantime the cotton crop has steadily increased, advancing from 5,456,000 bales in 1881–2 to 11,274,000 bales in 1898–9 — the largest crop ever produced, though the crop of 1900–1 of 10,383,000 bales yielded larger aggregate returns to the farmers, the total value of that crop having been $494,567,000.

According to the table of consumption of cotton in 20 years, it will be noted, the takings of northern mills have increased from 1,573,997 to 1,966,897, while the consumption of southern mills has increased from 221,337 to 1,620,931 bales. In 1880 the consumption at southern mills represented about 12 per cent of the total consumed in the whole country, but in 1900–1 the consumption of southern mills had increased to more than 45 per cent of the total consumed in the country. The actual consumption by northern mills since 1880 has increased very slowly and with many fluctuations, while that by southern mills has steadiiy progressed from 221,000 bales in that year, or less than one seventh as much as at northern mills, to over 1,600,000 bales, as against 1,960,000 bales at northern mills in 1900–1. With this progress in the number of bales consumed has come a tendency of southern mills to turn their attention to the finer goods. Moreover in the last decade the number of spindles in the South increased from 1,500,000 to more than 5,000,000. The South practically controls the trade in cheap goods from this country in China, and with the development of our commerce with that country southern mills may be expected to enjoy even a greater share of the trade than at present, while the campaign for diversification of products of the mills is likely to give the southern mills greater importance than ever and lead to the consumption in this country of a greater proportion of American-grown cotton.

Summing up in tabular form the statistics of the cotton crop since 1840 we have:

COTTON SINCE 1840.

Year	Crop Bales	Cons'mp'tn in U. S. Bales	Exports Bales	Average Price per lb. Middling Uplands in N. Y. Cents
1840–41	1,634,954	267,850	1,313,500	9.50
1841–42	1,683,574	267,850	1,465,500	7.85
1842–43	2,378,875	325,129	2,010,000	7.25
1843–44	2,030,409	346,750	1,629,500	7.73
1844–45	2,394,503	389,000	2,083,700	5.63
1845–46	2,100,537	422,600	1,666,700	7.87
1846–47	1,778,651	428,000	1,241,200	11.21
1847–48	2,439,786	616,044	1,858,000	8.03
1848–49	2,866,938	642,485	2,228,000	7.55
1849–50	2,223,718	613,498	1,590,200	12.34
1850–51	2,454,442	485,614	1,988,710	12.14
1851–52	3,126,310	689,603	2,443,646	9.50
1852–53	3,416,214	803,725	2,528,400	11.02
1853–54	3,074,979	737,236	2,319,148	10.97
1854–55	2,982,634	706,417	2,244,209	10.39
1855–56	3,665,557	777,739	2,954,606	10.30
1856–57	3,093,737	819,936	2,252,657	13.51
1857–58	3,257,339	595,562	2,590,455	12.23
1858–59	4,018,914	927,651	3,021,403	12.08
1859–60	4,861,292	978,043	3,774,173	11.00
1860–61	3,849,469	843,740	3,127,568	13.01
1861–62	War Period	War Period	War Period	31.29
1862–63				67.21
1863–64				101.50
1864–65				83.38
1865–66	2,269,316	666,100	1,554,664	42.30
1866–67	2,097,254	770,030	1,557,054	31.59
1867–68	2,519,554	906,636	1,655,816	24.85
1868–69	2,366,467	926,374	1,465,880	29.01
1869–70	3,122,551	865,160	2,206,480	23.98
1870–71	4,352,317	1,110,196	3,169,009	16.95
1871–72	2,974,351	1,237,330	1,957,314	20.48
1872–73	3,930,508	1,201,127	2,679,986	18.15
1873–74	4,170,388	1,305,943	2,840,981	17.00
1874–75	3,832,991	1,193,005	2,684,708	15.00
1875–76	4,632,313	1,351,870	3,234,244	13.00
1876–77	4,474,069	1,428,013	3,030,835	11.73
1877–78	4,773,865	1,489,022	3,360,254	11.28
1878–79	5,074,155	1,558,329	3,481,004	10.83
1879–80	5,761,252	1,789,978	3,885,003	12.02
1880–81	6,605,750	1,938,937	4,589,346	11.34
1881–82	5,456,048	1,964,535	3,582,622	12.16
1882–83	6,949,756	2,073,096	4,766,597	10.63
1883–84	5,713,200	1,876,683	3,916,581	10.64
1884–85	5,706,165	1,753,125	3,947,972	10.54
1885–86	6,575,691	2,162,544	4,336,203	9.44
1886–87	6,505,087	2,111,532	4,445,302	10.25
1887–88	7,046,833	2,257,247	4,627,502	10.27
1888-89	6,938,290	2,314,091	4,742,347	10.71
1889–90	7,307,281	2,390,959	4,955,931	11.53
1890–91	8,652,597	2,632,023	5,847,191	9.03
1891–92	9,035,379	2,876,846	5,933,437	7.64
1892–93	6,700,365	2,481,015	4,402,890	8.24
1893–94	7,549,817	2,319,688	5,287,887	7.67
1894–95	9,901,251	2,946,677	6,926,025	6.50
1895–96	7,157,346	2,504,972	4,751,384	8.16
1896–97	8,757,964	2,847,351	6,088,521	7.72
1897–98	11,199,994	3,443,581	7,674,065	6.22
1898–99	11,274,840	3,589,494	7,454,000	6.00
1899–00	9,436,416	3,665,412	5,935,499	8.69
1900–01	10,383,422	3,587,828	6,641,281	6.67

A study of the foregoing figures will show that there has been slight increase in price followed by fall in price. In the summer of 1903 the rate went up to 13c. There has also been a steady increase in the cotton crop, with occasional deviations by reason of unfavorable seasons. The average total value of the crop and the average yield per acre since 1875 have been as follows:

COTTON AVERAGES, 1875–1901.

Year	Acres	Total Value of Crop	Net Lb. Per Acre	Bale Per Acre
1875–76.....	11,635,000	$399,445,168	177	0.39⅞
1876–77.....	11,500,000	252,602,340	171½	0.39
1877–78.....	11,825,000	255,768,165	181¾	0.40⅛
1878–79.....	12,240,000	236,586,031	185¼	0.41⅛
1879–80.....	12,680,000	313,696,452	206¼	0.45½
1880–81.....	16,123,000	356,524,911	188½	0.41
1881–82.....	16,851,000	304,298,744	145⅝	0.32⅛
1882–83.....	16,276,000	327,938,137	200⅜	0.42⅞
1883–84.....	16,780,000	288,803,902	157½	0.34
1884–85.....	17,426,000	297,253,972	150½	0.33
1885–86.....	18,379,444	313,723,080	165½	0.36
1886–87.....	18,581,012	298,504,215	162½	0.35
1887–88.....	18,961,897	336,433,653	173½	0.37
1888–89.....	19,362,073	344,069,801	167⅞	0.35¾
1889–90.....	19,979,040	373,161,831	173¾	0.36½
1890–91.....	20,583,935	429,792,047	200⅜	0.42
1891–92.....	20,555,387	391,424,716	209⅜	0.44
1892–93.....	18,057,924	284,279,066	176	0.37
1893–94.....	19,684,000	294,495,711	182	0.38
1894–95.....	21,454,000	288,918,504	223	0.46
1895–96.....	18,882,000	292,234,437	181	0.38
1896–97.....	22,341,000	327,547,854	187	0.39
1897–98.....	24,071,000	338,432,458	224	0.47
1898–99.....	23,572,000	282,772,987	232	0.48
1899–00.....	22,583,055	363,773,836	210	0.44
1900–01.....	23,805,629	494,567,549	222	0.43

In 26 years, from 1875–6 to 1900–1, cotton brought into the South more than $8,600,000,000. This sum is so vast that the profits out of it ought to have been enough to enrich greatly the whole section. Unfortunately, however, the system given an impetus by the abject poverty following the War, of putting all energies into the single crop and turning to other sections for provisions and grain, left but little surplus money out of the cotton crop for the cotton farmer during the first part of the period mentioned. The West and the North drained the South of several hundred million dollars every year, because it depended upon them for all of its manufactured goods as well as for the bulk of its foodstuffs. During the past 10 or 12 years, however, diversified farming has become more general, and the raising of home supplies, the development of truck farming and the building of factories of many kinds are combining to

SIXTY YEARS OF COTTON MANUFACTURE.

Year	Capital Employed	Number of Spindles	Cotton Consumed Reduced to Bales of 400 Lbs.	Hands Employed	Wages Paid	Value of Products
1830.....	$44,914,941	1,246,503	184,000	62,208	$12,155,723	$32,036,760
1840.....	51,102,350	2,284,631	340,000	72,119	14,000,000	46,350,453
1850.....	74,500,931	3,633,693	721,393	92,286	17,276,112	65,501,687
1860.....	98,585,269	5,035,798	1,056,762	122,028	23,940,108	115,681,774
1870.....	140,706,291	6,621,571	995,770	135,369	39,044,132	177,489,739
1880.....	208,280,346	10,768,516	1,875,859	174,659	42,040,510	192,090,110
1890.....	354,020,843	14,088,103	2,794,864	221,585	69,489,272	267,981,724
1900.....	460,842,772	19,008,352	3,639,495	297,929	85,126,310	332,806,156

keep at home the money which formerly went North and West.

The destruction by the War of the industrial interests which were developing in the South prevented the taking up by that section of manufacturing undertakings until about 1879–80, when there were marked signs of a tendency toward the building of cotton mills in the South. In the North, on the contrary, the cotton-mill business developed very rapidly in the decade following the War. Of late years the chief increase has been in the South. The number of spindles in the whole country at present is estimated at about 21,000,000, and the South has 6,500,000. The progress of cotton manufacturing in the United States by census years since 1830 is shown in the table on preceding page.

The consumption of cotton in northern and southern mills, as reported by the New Orleans Cotton Exchange, has been as follows:

CONSUMPTION OF COTTON IN AMERICAN MILLS IN THE NORTH AND SOUTH.

Crop Years	Northern Mills	Southern Mills
1900–01	1,966,897	1,620,931
1899–00	2,068,300	1,597,112
1898–99	2,190,095	1,399,399
1897–98	2,211,740	1,231,841
1896–97	1,804,680	1,042,671
1895–96	1,600,271	904,701
1894–95	2,083,839	862,838
1893–94	1,601,173	718,515
1892–93	1,687,286	743,348
1891–92	2,190,766	686,080
1890–91	2,027,362	604,661
1889–90	1,799,258	546,894
1888–89	1,785,979	479,781
1887–88	1,804,993	456,090
1886–87	1,710,080	401,452
1880	1,573,997	221,337
1870	806,690	90,000
1860	786,521	178,107
1850	475,702	87,067

The cotton production of the United States, which is now averaging over 10,000,000 bales, or about three fourths of the world's supply, can be indefinitely extended to meet the increasing consumptive requirements of the world. Hon. Charles W. Dabney, late assistant secretary of agriculture, in a careful study of the cotton potentialities of the South, has indicated that this section can, whenever the demand justifies it, produce as much as 50,000,000 bales of cotton without intrenching on the area necessary for diversified agriculture, and that by intensive farming it may some day be possible even to double this. Supplying, as the South now does, about 75 per cent of the world's cotton crop, and thus holding almost a monopoly of this important staple, southern mills, notwithstanding the very rapid growth of recent years, consume only about 15 per cent of the crop. There are about 105,000,000 cotton spindles in the world, of which the United States has about 21,000,000. The consumption of cotton in this country is now about 3,500,000 bales a year, or 35 per cent of the average crop of late years. It has been estimated that the capital invested in the cotton-manufacturing business of the world, which, as stated, depends for at least three fourths of its supply of raw material upon the South, aggregates not less than $2,000,000,000, of which this country has probably about $500,000,000.

There is practically no limit to the possible extension of cotton-growing and cotton-manufacturing in the United States. With the power to increase its cotton crop to 50,000,000 bales, should the world ever demand such a yield, and with every natural advantage for manufacturing, the limit of profitable cotton-mill business in the United States will not be reached until its own mills consume its own production. The increase in the textile industry must naturally centre mainly in the South. Consult: Young, 'The American Cotton Industry' (1903).

Richard H. Edmonds,
Editor 'Manufacturers' Record,' Baltimore, Md.

Cotton Insects. The cotton worm and boll-worm are the chief enemies of the cotton plant in the United States; in other countries different insects prey upon it. Various caterpillars and other insects attack this plant wherever it is grown. In Egypt a noctuid larva, in Greece various kinds of cut-worms, in India a small tineid boll-worm (*Depressaria*), while in Australia a red-bug, allied to the cotton-stainer (*Dysdercus suturellus*) affects it. This insect, by sucking the buds, causes the bolls to blast or become diminutive, and also stains the cotton fibre by its excrement.

The cotton worm is by far the most serious pest. It is the caterpillar of a noctuid moth (*Aletia xylina*), which often feeds in vast numbers on the leaves of the cotton-plant. It has a loping gait; is slightly hairy, green, dotted with black along a subdorsal yellowish line, with black dots beneath, and changes to a pale reddish-brown moth. The insect, as shown by Riley, "never hibernates in either of the first three states of egg, larva, or chrysalis, and it survives the winter in the moth or imago state only in the southern portion of the cotton belt." "The moth," he adds, "hibernates principally under the shelter of rank wire-grass in the more heavily timbered portions of the South, and begins laying its eggs (400 to 500 in number) on the ratoon cotton when this is only an inch or two high." The localities where it hibernates, and where, consequently, the earliest worms appear, seem to be more common in the western part of the cotton belt (Texas), than in the Atlantic cotton States. It is inferred that from this region the moths emigrate east and north, laying their eggs later than the original Texan brood, as in Alabama and Georgia. The recently hatched worms of different sizes were found late in March on ratoon cotton in southern Georgia and Florida, and in late seasons from the middle of April to the middle of May, though they do not attract the attention of planters until the middle or last of June. In midsummer the period from hatching to the time when the moth lays her eggs is less than three weeks, but in spring and late autumn twice that time may be required. There are thus in the northern cotton States at least three "crops" or broods of caterpillars in a season, while in Texas there are at least seven annual generations. The first generation is only local, but in Texas, says Riley, "the third generation of worms may become, under favoring conditions, not only widespread, but disastrous, and the moths produced from them so numerous that they acquire the migrating habit. This generation appears in southern Texas during the latter part of June, and in southern Alabama and Georgia somewhat later," and this is the first brood which attracts general attention. When

the worms are very abundant and the cotton well "ragged," the moths, driven by need of food and with favoring winds, migrate to distant points, and thus spread late in summer, having been seen as far north as Massachusetts and the Great Lakes.

Another insect, destroying great numbers of cotton buds, is the boll-worm, the caterpillar of another noctuid moth (*Heliothis armigera*), well-known for its injuries to tomato and tobacco plants and to corn in the ear. The adult is a tawny, yellowish moth, about an inch and three quarters across the wings, which may be seen toward evening, in summer and autumn, hovering over the cotton blooms, and depositing a single egg in each flower; the egg is hatched in three or four days, and the worm eats its way into the centre of the boll, causing its premature fall; the insect instinctively leaves the boll when it is about to fall, and enters another, and finally attacks the nearly matured bolls, rendering the cotton rotten and useless. The caterpillars have 16 feet, and creep with a gradual motion, unlike the true cotton worm; they vary much in color, some being green, others brown, but all more or less spotted with black, and having a few short hairs. A single moth will lay 500 eggs, and, as three broods are produced in a year, a whole field will be very soon infested with them.

These are the two greatest enemies on the cotton plantations, and the same remedies are effectual in both. The natural enemies of the cotton worms are numerous and abound in proportion as the worms are abundant. Certain kinds of ants are most efficacious in reducing their numbers, as well as ground beetles, bugs, and ichneumon flies (q.v.). The general and most practical remedies against this troublesome pest are the insecticides, especially Paris green and kerosene emulsions. The dry preparation is one pound of the green to from 20 to 35 pounds of cheap flour, or, instead of flour, land plaster (gypsum) or cotton-seed meal. The best preparation of Paris green consists of one pound to 40 gallons of water. London purple may be applied dry, using two pounds to 18 of flour, etc.; or wet, one half a pound to 50 or 55 gallons of water.

A fine spray of kerosene oil applied to the leaves will kill all the worms in a remarkably short time, but as petroleum in any form injures the plant, the oil must be so diluted as to injure only the worm and not affect the plant. The use of milk as a diluent has been suggested.

Consult: Riley, 'Report IV.' of the United States Entomological Commission (1885); and Bulletin 18 of the Entomological Division of the United States Department of Agriculture (1898).

For cotton-boll weevil, see WEEVILS.

Cotton-mouse, a small field mouse (*Peromyscus gossypinus*), native to the southern portions of the United States, and destructive to cotton-plants. It is dark brown in color, with grayish feet. Its habits are like those of the white-footed deer-mouse (q.v.), common in the North.

Cotton-seed-oil Industry. The utilization of one waste product does more to enrich the world than an increase of many millions of dollars of product in some old and well-established industry. Perhaps there is no single thing that more forcibly illustrates this truism than the utilization of the once despised cotton-seed. In the process of ginning seed-cotton the result is a little more than two pounds of seed for every pound of cotton produced; and 40 years ago, aside from the small amount of seed that might be reserved for the next season's planting, and such small quantities as were consumed by the cattle on the plantation, there was absolutely no use to which it could be applied. At the gins the great seed heaps grew, as the sawdust heaps rise to-day around the portable sawmill, until, as a last resort, the gin would be moved from the base of the seed mountain it had reared up to itself. Thus was cotton-seed, in 1840 and 1850, a source of actual expense and an encumbrance. That there was an oil that might be made useful contained in the cotton-seed was known, of course, ever since 1783, when that august and venerable body, the London Society for the Encouragement of Arts, Manufactures, and Commerce, first called public attention to it. The real value of this oil, or a method for its extraction, was, however, not known to the society; and while it declared that the seed-cake resulting from the manufacture of the oil was good cattle-food, and though the society offered gold and silver medals of reward for the first successful process of making the oil and cake, it never had occasion to bestow its honors. Later on, when the seed of the Egyptian cotton was introduced into Europe, the manufacture and refining of the oil was begun and carried on quite extensively. The use of the product for food purposes was also learned abroad before any advance whatever had been made by this country in that direction.

The dilatoriness of Americans in availing themselves of this great wasted asset was undoubtedly due to the fact that the South, where cotton was king, was not a manufacturing community, and had neither taste nor inclination to develop along any but agricultural lines. Her population, further, embraced but few of the operative class needed for the labor of the manufactory. The first recorded attempts in this country to extract the crude cotton-seed oil were made at Natchez, Miss., in 1834, and at New Orleans in 1874. Both were complete failures from the standpoint of practicability, and it was long a lugubrious jest with a well-known citizen of New Orleans, who was active in the second attempt, to show a small bottle of the crude cotton-seed oil, which he stated had cost him just $12,000. Abroad the seed of the Egyptian cotton continued to be used more or less successfully, and experiments — rather desultory in their nature, perhaps — were continued on this side of the water. The greatest difficulty encountered by the pioneers in this field was the total lack of appropriate machinery. Foremost as Americans have been in the invention of mechanical appliances, they were singularly backward in developing machinery for the expression of the cotton-seed oil. At the time now under discussion each mill that was attempted had its own mechanical ideas, and these were uniformly crude and unsuccessful. In fact, the introduction of improved or even fairly practicable methods of extracting and refining cotton-seed oil did not come until some of the American manufacturers — notably Paul Aldigé of New Orleans — had visited the great European

works, including those at Marseilles, and patterned from them, in the early years after the Civil War.

Prior to this, however, the industry had gained a foothold on a small scale, and crude cotton-seed oil was put on the market in limited quantities. Its appearance as a domestic product dates from about 1855, and to Paul Aldigé, of New Orleans, later one of the most prominent cotton-seed-oil manufacturers in the country, is due the credit for the first successful attempt at crushing the seed in a mill. He had to contend with many difficulties, not the least of which was procuring the cotton-seed. The wealthy planters of those ante-bellum days, when their cotton crop was picked, ginned, and baled, were quite disposed to regard the business as completed. To be troubled about selling the waste seed product of the gins was not worth their while; and as the small planter did not exist to any extent, it was more than difficult to secure the needed seed. It was harder to get one ton then than it is to get 100 to-day. Furthermore, the transportation facilities for bringing in the seed from the outlying districts were of the poorest. These obstacles, together with crude machinery and little knowledge concerning the valuable by-products to be obtained from the manufacture of the oil, all operated to keep the industry at the lowest point.

Singularly enough it was in the State of Rhode Island that the first firm foothold for this peculiarly southern industry was obtained. A mill was started at Providence, R. I., in 1855–6, and the seed was shipped from the South, principally from New Orleans. While but a small affair compared with the huge works of to-day, this mill continued to be operated until the outbreak of the Civil War put an end to southern seed shipments. During the years of the War that followed, the cotton-seed-oil industry made little headway here, although abroad it was rapidly coming into prominence. There were a few small mills and refineries in the cities along the Mississippi, notably at Vicksburg and New Orleans; and after the blockade of that river began to shut off supplies, their product came into demand as an illuminating oil, despite the fact that it could not be burned in chimney-lamps. In the accumulation of the seed-cake resulting from this blockade, which prevented all exportation, the South first came to use it, in default of anything better, as a food for cattle. It had never been used for such a purpose here before, although it had been exported, and its valuable properties were well known on the continent of Europe. The hulls, also, were discovered at this time, in the same forced way, to be good food-stuff for cattle, and their use for this purpose, in a limited way in the South, dates from this time. These hulls, mixed with a certain percentage of the meal of the seed-cake, make a compact form of fodder, and were used in the timber regions and other localities where hay was hard to obtain and difficult to transport.

It is not many years ago that every cotton-seed mill in the country utilized, as far as possible, its hulls for fuel to operate the mills; but this demand fell short of the production, and the larger mills were put to an expense for hauling the hulls away or for erecting furnaces to convert them into ashes. Gradually the value of the hull became known to the dairyman, and then to the feeder of stock for the butcher, till at the present time practically all the hulls produced are utilized as cattle-food, and that which was only lately an expense to the crusher has become a source of revenue.

This and many other most valuable by-products were, however, almost unknown here until after the War had ended. In New Orleans and at Vicksburg the crushing of the seed was continued in a small way during the years between 1860 and 1865, when peace, with the consequent return of the people to their agricultural pursuits, again brought larger crops and increased activity. In 1866 there were in the whole United States just seven mills for the crushing of the cotton-seed. Though the diverse usefulness of the cotton-seed oil was manifesting itself almost daily in some new form, the growth of the industry was comparatively slow. Twenty-six mills in 1870 increased in the next 10 years to only 45. These represented a capital invested of $3,862,300, through which was turned out an annual product valued at $7,690,921. In wages the cotton-seed mills in 1880 paid out $880,836 to 3,319 employees, and the value of the material consumed by them in the processes of manufacture was $5,091,251. These figures, while of respectable amount, considered with due allowance for the short time the industry had been known, still sink into insignificance by contrast with those representing its condition to-day. The 15 years that followed 1880 have seen the most wonderful change in the status of the cotton-seed-oil business among the commercial and industrial interests of the country. While the total product of the country in 1880 was less than $8,000,000, that of a single concern, the American Cotton Oil Company, 10 years later, was over $20,000,000, and 5,000 employees were carried on the rolls of this one company.

One of the great factors in this wonderful growth has been the continued bringing to light of new uses and value for the product. What the discovery of the by-products of petroleum did for that mineral oil was done for cotton-seed oil, when the manifold uses of the refined product began to be understood. As an oil, that of the cotton-seed possesses in high degree all the properties common to the best vegetable oils, with the exceptions that for household illumination, or as a lubricant, it cannot be used to advantage. As ordinarily known in the phraseology of the market, refined cotton-seed oil is of four varieties, namely, summer and winter yellow, and summer and winter white. From the summer yellow are derived many valuable products. The well-known lard compound, "cottolene," and similar products, which have so largely superseded hog-lard for cooking purposes, take a great deal of this grade of oil, the bulk of which, in fact, may be said to be consumed in culinary channels. When cheaper than tallow, "summer yellow" is also used in great quantity in the manufacture of laundry and toilet soaps, and a large amount of it, made from selected crude oil, is exported for use abroad in the making of butterine, a substitute for butter much used in Holland, Belgium, France, and other European countries. This grade of oil is of the finest quality, and in many places has supplanted olive-oil as a dressing for salads or the general uses of the table. Druggists find in it a reliable and excellent substi-

tute for olive-oil in many preparations for external application, such as salves and liniments. Not being inflammable, cotton-seed oil is used by the salt manufacturers to float on top of their tanks, and the papermakers find a similar use for it. By a process of bleaching, "summer yellow" is converted into "summer white." "Winter yellow" and "winter white" will stand a cold test at 32° F., without chilling. These oils are produced from the summer oils by extracting a large percentage of the stearine contained therein. Winter oils are largely used as a substitute for whale and lard oils in miners' lamps, and considerable quantities are used in foreign countries. Cotton-seed soap-stock, as known to commerce, is the residuum of the refining-kettle, and is utilized in low-grade laundry soaps and in wool-scouring soaps.

Besides these uses of the refined oils, the crusher of cotton-seed sees his product and by-products bring him returns from various other sources. The cotton-seed cake, or solid residuum of seed remaining after the expression of the oil, finds sale as cake, principally in Great Britain; but by far the larger portion of the cake is converted, by grinding, into cotton-seed meal, which is of such high repute at home and abroad, both as a food for cattle and sheep and as an ingredient of ammonial fertilizers, that the entire production finds a ready sale. The "linters" or short staple cotton, ranking relatively as of about half-value with "middling cotton," is another by-product which the cotton-seed crusher gains through a careful reginning of the seed.

The process of extracting the oil from the cotton-seed is a rather complicated one in its preparatory stages, but is simplified to the last degree by the employment of machinery at each and every step. The seed, on reaching the mill, is first screened, to remove sand, dirt, bolls, and foreign substances, and finally a draft of air is used to complete the cleaning process. The seed is now ready for the linters, which machines are an elaboration of the ordinary cotton-gin; and whatever staple remains upon the seed is stripped off in passing through them. From the linters the seed passes to the huller, a high-speed cutting-machine, which cuts it up most thoroughly. The hulls, by screens and beaters, are now separated from the meats, which latter are, by screw-conveyers, conducted to bins contiguous to roller-crushers, and as fast as required are passed through the crushers, where the mass is reduced to a uniform consistency, and is known to millmen as "uncooked meal." The first step is cooking this meal, which is done in steam-jacketed kettles. When heated to a proper degree the meal is drawn from the kettles, formed into cakes, enveloped in camel's-hair cloth, and placed in boxes of an hydraulic press, when by the application of proper pressure the crude oil is speedily extracted. The solid residue remaining in the press-box is the decorticated cotton-seed-oil cake of commerce.

In the practical methods by which these mills are supplied and operated all the improvements of modern industrial enterprise have been laid under tribute. In the distribution of the oil product, tank-cars on the railroads and tank-steamers on the high seas are used for transportation in bulk; and the American Cotton Oil Company, in its immense export business to Rotterdam, has a tank-steamship capable of carrying 4,200 tons of oil in bulk, thus saving the heavy item of cooperage. This steamer can thus carry, without injuring, even the finest quality of the food-oil, which is in great demand in Holland and Belgium. As an evidence of the amount consumed there it is shown that Rotterdam alone imported in one year, recently, no less than 8,356,676 gallons of cotton-seed oil, of which 5,973,760 were from this country. The diversity of the industry requires factories other than the crude-oil mills, as refineries, lard and cottolene plants, soap factories, cotton-ginneries, cotton-compressors, and fertilizer-mixing establishments. The supply for all these is derived directly from the crude-oil mills, which in their turn are operated immediately from the raw material, in providing which there has grown up a most important branch of the agricultural system of the South.

With the development of the industry in later years have come, of necessity, radical changes in the methods of collecting the seed and covering the country. The commission merchant, who, in the early days after the War, did almost all the business for the large cities, has disappeared. With New Orleans as a centre for the large milling interests, these seed buyers formerly laid only the Mississippi River bottoms under contribution for their annual supply. They acted as middlemen, and to them the mills sent as many bags as they desired to have filled for their season's supply. These bags were in turn sent out by the agents to the planters to be filled, and on their return were forwarded to the mills, where they were reweighed, inspected, and, if found defective in any way, a charge was entered against the commission merchant, who was furthermore responsible for the bags, and was duly charged with any shortage of return. As the mills increased, however, and competition became keener, buyers from the various great concerns supplanted the commission merchant. They represented their particular mills, and scoured great districts of the cotton-growing sections, hundreds of miles distant, buying up all the seed they could find. This arrangement entailed upon the mills the necessity of direct dealing with the planters, which sometimes has resulted in more or less pecuniary loss. Where 25 years ago the commission merchant stood between the mill and short weight, poor-quality seed, or shortage in the bags, there is no one to do so to-day, and the petty losses in the individual dealings make up an aggregate sum that adds materially to the annual expense account.

As collections are now made, everything has been systematized to a point that insures the greatest possible expedition of business. In the small inland towns the seed is brought in entirely by wagons, drawn by the inevitable southern mule; and every Saturday morning during cotton-picking time a long string of these wagons can be seen waiting in the sun outside the seed depot to be weighed and unloaded. All is grist that comes to a cotton-seed buyer nowadays; that is, until he begins to grind. Foreign substances and poor-quality seed mix with the wagon load, and are shoveled in to him at the same market price as the good product. He has no time to object, as the early cotton-seed grinder would most certainly have done. He now knows the machinery in the mill will sort all that mass of seed as intelligently as he him-

self could do it, and with infinitely more rapidity. He knows that he and his colleagues are now buying from 1,250,000 to 1,500,000 tons per year, where a few thousands only were bought 25 years ago, and if the expediting of this vast business involves some increased expense, it must be borne. This buying in bulk is also practised where the seed is transported by rail to the mills. Immense tracts are laid under contribution in this way, and remote districts reached by the mills in their ever-extending hunt for the seed. Much of the product brought in by the railroads is transported for several hundred miles, and statistics place the average expense to the mills of this single transportation item at $2 per ton, which, supposing that only one half the total seed-supply was carried over the railroads, would run into large figures.

The third and most favored method of collecting the cotton-seed is by boat along the rivers. In this form of collection it is found necessary to sack the seed, and for this purpose the mills supply the bags. A steamboat carrying several thousands of empty bags will leave New Orleans or Vicksburg, as the case may be, and steaming slowly up the river, stop at each small town and at the various plantations along the levees. At each stopping place as many bags are left as each planter thinks he can fill; and when the last bag has been given out, the steamboat is turned and headed down the river to pick up the freight by the dozen or by the hundred bags as it returns. The great drawback to this system is that the bag used for cotton-seed is altogether too popular an article among the planters. The planters to-day are small holders, and for the most part negroes, to whom a cotton bag has a varied utility that would scarcely be believed at first sight. It makes an excellent pair of trousers or a coat for plantation work, a good saddle-cloth for the road, and can even be found as bedding in not a few of the houses along the levees. That the loss entailed in this seemingly petty way is really a heavy one may be gathered from the fact that the mills have had a shortage of as many as 1,500,000 bags in a single season.

The effect upon the cotton-growing interests of the South of the great industry that has sprung up from this seed has been undoubtedly great. In the face of a declining market the total production of the plantations has more than tripled during the past 32 years. A crop of 3,154.946 bales in 1870 had increased to a total production of 10,979,805 bales in 1902. Cotton-seed oil solely, has not been, of course, responsible for this advance, nor is such a claim advanced. It can be stated, however, that since the small planter, with his 5- to 10-bale crop, became common throughout the cotton belt, the additional revenue which he has been able to derive from the sale of the cotton-seed has done much to aid his progress.

The quality of the cotton affects little or not at all the quality of the seed, and soil so poor as to yield a hardly marketable cotton will still grow a plant whose seeds are as good as the best. In the making of the cotton-seed oil there has already been utilized a large amount of the seed of the almost worthless "bumblebee" cotton. This cotton is stunted, either from poor soil or lack of cultivation, and grows so near the ground that only the very smallest negro children, known as "bumblebees," are able to pick it without becoming exhausted by stooping. Finally, when it is considered that the seed of the cotton-plant more than pays the entire expense of ginning, baling, and tying the crop, the economy it effects is plainly seen. Even the slave labor of the ante-bellum days cost its own maintenance, and, little as that cost was, the financial interests of the plantation to-day are better served because of the added value of the seed. In fact, the whole agricultural life of the South has been benefited by this formerly despised gift of old King Cotton, and it is only just to say that the people are becoming appreciative of this fact.

To return to the history of the industry from the point at which we left it in 1880. The 15 years which have intervened between then and now have formed the period in which cotton-seed crushing may fairly be said to have taken its place among the great American interests. Forty-five mills in 1880 had increased to 60 within two years, or at the rate of 33⅓ per cent. Since then the increase has been steady, both in the number of mills and in the capacity of those already in operation. In 1890 there were 119 establishments, and this number exactly tripled in the decade following. The average consumption of seed per establishment for the year ending 31 May 1900 was 6,945 tons.

The prejudice against cotton-seed oil — so rampant in the early eighties as to induce Spain at that time to begin a war against its importation, in which Italy, moved to the defense of her olives, speedily joined — has largely disappeared. Since 1889 the exportation of cotton-seed cake and meal has become an important item of our foreign trade, and one which bids fair largely to increase. The amount exported in 1902 was 735.757 tons, about four times the amount exported in 1892. Likewise the exports of cotton-seed oil in 1901 were 49,356,741 gallons against 11,003,160 gallons in 1891. The value in 1901 of this export was $16,541,321 against less than $4,000,000 exported in 1891.

In the year 1900, with a cotton crop of nearly 10,000,000 bales, there were about 2,500,000 tons of seed crushed. This means that at least $25,000,000 were distributed among the planters of the South in cash payments for cotton-seed; the railroad and transportation companies received as much more in freights. From this resulted a product approximating 93,000,000 gallons of crude cotton-seed oil, besides about 900,000 tons of oil-cake and meal. Wages and the legitimate expenses of the industry further circulate millions annually. Its prosperity reacts beneficially upon the country, and its product adds to the comfort and conveniences of the time. With it the South takes her place among the other sections in the manufacturing interests which will bring wealth to her and commercial honor and credit to the American nation.

THOMAS R. CHANEY,
Ex.-Pres. American Cotton Oil Co.

Cotton State, a nickname for Alabama.

Cotton Supply of the World. Of the cotton now consumed by the mills of Great Britain, continental Europe and the United States, about 80 per cent is the growth of this country. In the five years ending 31 Aug. 1860, the average proportion was 84½ per cent. The high prices resulting from our Civil War and the disorgan-

ization of the agricultural interests of the South, which continued for some years thereafter, induced such an increase of cultivation in other countries that it was not until 1882 we furnished as much as 75 per cent of the total consumption of the mills of Europe and the United States. For the five years ending with 1890 we furnished within a fraction of 77 per cent; in the five years ending with 1895 we had increased our proportion to 79½ per cent, and for the five years ending with 1900 we had furnished to the mills of Europe and America 83⅓ per cent of their entire takings of cotton.

We have now regained our absolute supremacy in the field of cotton production, and an impartial consideration of the entire situation fully justifies the belief that we will retain it indefinitely. Our chief competitors in cotton production for the European markets are India and Egypt. In the year ending 30 Sept. 1902 the deliveries of cotton to the spinners of Great Britain and continental Europe were 8,292,000 bales, consisting of 6,404,000 bales of American, 759,000 of East Indian, 772,000 of Egyptian, and 357,000 from Brazil, Peru, Turkey, and all other countries. Taking into consideration the weight of the bales of each country, the proportion of each growth was about as follows: American, 77 per cent; Egyptian, 14 per cent; East Indian, 7 per cent, and the total of all other kinds, 2 per cent.

The consumption of cotton by the mills of India has increased from 34 per cent of the crop in 1882 to 59 per cent of the crop of 1898, the latter being the largest crop recorded. The crop of India in 1881 was 2,390,000 bales, of which 814,000 bales were consumed in the country. In 1898 the crop had increased to 3,502,000 bales, and the home consumption to 2,088,000 bales. While the production had increased during this period 1,112,000 bales, or 46½ per cent, the home consumption had increased 1,274,000 bales, or 156½ per cent. The exports of cotton from India had decreased, however, from 1,576,000 bales in 1881 to 1,414,000 in 1898. The largest annual exports of cotton ever made from India were 2,023,000 bales in the season of 1871–2. During the season of 1901–2 the total exports were 1,618,000 bales, including 860,000 to Japan and China, while in the season of 1899–1900 the entire exports were only 303,000 bales to Europe and 607,000 to Japan and China. Of the total deliveries of cotton to European spinners during the five years ending in 1865, India furnished an average of 45 per cent. During the five years ending in 1875 India's proportion of the deliveries to Europe had fallen to 26 per cent. In the five years ending with 1885 it had fallen to 20 per cent, and in the five years ending in 1895 to 13 per cent. In the five years ending with 1900 the proportion had dropped to 7½ per cent.

There is in India an abundance of suitable land which could be added to the area now devoted to cotton, and while some extension of cotton cultivation may be expected, it seems quite evident that the increased production will be fully absorbed by the growing requirements of the Indian cotton-mills. The general uncertainty in regard to the rainfall and its actual insufficiency in many sections of India are serious drawbacks to any considerable increase in cotton cultivation, especially when it is considered that the average yield per acre is only about 75 pounds of lint cotton of a quality and market value much lower than American cotton.

In China cotton is grown in a small way by a great many people who grow other crops as well, but it is rarely, if ever, made an exclusive crop, and no statistics are obtainable of the quantity actually grown. With the exception of a small quantity exported to Japan, it is all consumed in China, none having been exported to Europe since 1867. The production of China and Korea is estimated as equal to about 1,300,000 bales of 500 pounds net. The quality of Chinese cotton is undesirable, the staple being coarse and harsh, and quite short.

The formal opening, 9 Dec. 1902, of the newly constructed irrigation works at Assouan and Assiout on the Nile has attracted attention to Egypt as a source from which increased supplies of cotton might be expected. Egypt is an almost rainless country, the average yearly rainfall at Alexandria for the last 30 years being only about eight inches. No crops of any kind can be grown without irrigation, and the river Nile is the only source of water supply. The cultivable soil of Egypt consists only of the land which can be reached by the water of the Nile. Beyond this limit there is only a barren waste of sand and desert utterly impossible of cultivation. The cultivable portion of Egypt is embraced in the delta of the Nile and the valley of the Nile, comprising together about 6,000,000 acres. The Nile delta is a triangular-shaped section of land, having its apex at the old irrigation works near Cairo, and its base on the Mediterranean, between the Rosetta and Damietta branches of the Nile. The valley of the Nile runs along the river from Cairo southward, and is quite narrow, ranging from five to nine miles in width — a mere strip of green verdure in a desert of sand. From the conditions existing in Egypt a "low Nile" therefore, has always meant small crops, and a failure of the annual flood a failure of the crops. The chief purpose of the new irrigation works was undoubtedly to safeguard the crops of the land already under cultivation. (See ASSOUAN.) There will be some extension of acreage, but this will be chiefly in upper Egypt, where the cotton is much inferior to that of lower Egypt, and brings a considerably lower price. The best opinion is that the increase in acreage will be gradual, as it will depend upon the construction of canals to take the water to the new fields.

There are people who think the new irrigation works will cause an addition of 25 per cent to the cultivable land of Egypt. I am not so sanguine about it, though such an increase may be reached some years hence. About 1,800,000 acres are now given to cotton, but wheat, barley, maize, rice, sugar, tobacco, beans, onions, and other crops are grown. The system of rotation of crops is general, and the new acreage, like the present, will be devoted each year to the crop which then promises to be the most profitable. Less than a third of the cultivated land of Egypt is now devoted to cotton, and it is unlikely that cotton will get this proportion of the increased acreage.

Assuming, however, an increase in the acreage of 1,500,000 acres, and that cotton will get a third of it, or 500,000 acres, this would

add about 250,000 bales to the present cotton yield of Egypt. This would probably mark the maximum of the Egyptian cotton crop for some years to come, and it would not be so large in the seasons when other crops promised a greater profit. Egyptian cotton commands a much higher price than our upland cotton, because of its special adaptability to certain purposes and the comparatively small crops which are grown. Should the supply be largely increased, however, the price would inevitably decline, and this would naturally curtail the production.

As much has been written recently respecting the increase in cotton cultivation in Egypt, a comparison of the Egyptian crops with those of the United States discloses some facts of interest. As practically the entire cotton production of Egypt is exported, it is usual to take the total exports as representing the commercial crop of each season, and therefore each season's exports from Egypt will be compared with the commercial crop of the United States for that season. In the season of 1873–4 the United States crop was 4,130,000 bales, and the last crop (1901–2) was 10,768,000 bales, showing an increase of 6,638,000 bales, or equal to 160 per cent. The Egyptian crop of 1873–4 was 410,000 bales, and that of 1901–2 was 859,000 bales, showing an increase of 449,000 bales, or 110 per cent. In the season of 1897–8 the United States crop had grown to 11,216,000 bales, being an increase of 7,086,000 bales over the crop of 1873–4, while the Egyptian crop had increased to 843,000 bales, being 433,000 bales in excess of the crop of 1873–4. During the entire period under review the largest commercial crop of the United States was that of 1898–9, which exceeded the crop of 1897–8 by a few thousand bales, while the largest Egyptian crop was that of 1901–2. The percentages of increase in Egypt look very large and compare favorably with the United States, but in actual results the progress of cotton cultivation in Egypt is a mere bagatelle compared with the enormous increase in actual production in our country. Percentages are very misleading. The increase in production in America since 1873 has been 7,000,000 bales, while the increase in Egypt during the same period has been only 433,000 bales. It is the actual cotton alone which can keep the spindles of the world at work, and the matter of increased percentages of production in any country is merely an academic question of no practical importance whatever.

The equivalent of about 200,000 bales of 500 pounds is now grown in Brazil, but the greatest part of it is consumed in Brazilian cotton-mills, the annual export being sometimes only about 50,000 bales. While there is a vast quantity of land in Brazil suitable for cotton, and the yield is good, the rainfall is too great near the coast, while in the interior it is uncertain, and in many sections entirely insufficient. The conditions are, therefore, not favorable for an extension of cotton culture in Brazil beyond the increasing requirements of its cotton-mills, and especially as there are other crops better adapted to the country and doubtless more profitable.

In Mexico and Japan cotton is grown to a limited extent, but the entire production is consumed in these countries. Peru, Greece, Turkey, and Persia each grow a limited quantity of cotton, but their combined contribution to the European supply is so small as to be scarcely worthy of consideration. There is no probability of increased production in either of these countries.

Since 1889 very energetic efforts have been made to increase the cultivation of cotton in the Asiatic provinces of Russia, and the government has aided the movement by the construction of irrigation works and the imposition of a higher duty on cotton imported into the empire. From a production in Turkestan, etc., equivalent to about 100,000 bales of 500 pounds net in 1889, a total of 344,000 was reached in 1897 and 414,000 in 1899, that being the largest crop grown. In 1898 the crop was 255,000 bales, being the same as in 1892, while the crop of 1901 was 354,000 bales. This cotton is all consumed in Russia, and takes the place of that much cotton which would otherwise have been imported from America, India, and Egypt. The Turkestan cotton is nearly all grown from American seed, and the description is generally of excellent staple and quality. As the season for maturing and picking is rainless, the cotton is usually bright, clean, and of good color. The cotton grown from native seed is quite similar to India cotton, the staple being harsh, uneven, and brittle, and only about five eighths to three quarters of an inch long. There is rarely any rain from 10 April to 1 November, and the needed moisture for the crops is supplied from the rivers by means of irrigating canals. Labor is in ample supply, and cheap. Except along the watercourses, the land in Turkestan is for the most part composed of mountain ridges or sandy plains, and in consequence of the insufficiency of rainfall during the season of growth, cotton cannot be produced anywhere without the aid of irrigation. If all the cultivable strips of land in the Asiatic provinces of Russia could be placed together they would about equal the area of North Carolina, but of necessity by far the greater part of this territory must be devoted to food crops. From the facts presented, it looks as if the limit of cotton production had been reached in Turkestan until more extensive irrigation works are constructed by the Russian government. Even then, in view of the limited area of suitable land, it is doubtful if the production of cotton in Russia's Asiatic provinces will ever be sufficient to fully meet the requirements of the Russian mills. It is very questionable if the increase in production will keep pace with the increase in the consumption of cotton by the Russian mills. I am confident it will not exceed the increasing requirements of the mills.

I think I have now reviewed with perfect fairness the probabilities of an increase of the production of cotton in all of the foreign countries in which it is now cultivated as a regular crop. The conclusion reached is that except for a small increase from Egypt, no greater contribution to the cotton supply of Europe can be expected than at present. It is quite possible to grow cotton in many countries in which it is not now cultivated, but whether it can be produced in large quantities and at low cost, and as profitably as the other crops which it would replace, is a very different matter.

There are vast possibilities for the extension of cotton cultivation in the United States. According to the last United States census, there were in 1899 in Louisiana, Texas, Arkansas, Indian Territory, and Oklahoma 40,000,000 acres

of improved land, of which 10,600,000 acres were devoted to cotton. New land is being constantly brought under cultivation in each of these States and Territories, and the soil is the most productive in tne cotton belt. These five States and Territories have the requisite area, soil, and climate to enable them to produce as much cotton as is now grown in the entire country. To my mind, it is only a question of time when this will be done. It may be urged that the laboring population now in this territory would be insufficient to cultivate such increased crops of cotton in addition to the necessary food and forage crops. Without discussing this matter, it need only be stated that the population is increasing rapidly, and that labor is invariably attracted to the fields where it is most needed. The southern States of this country will stand between Europe and a cotton famine.

ALFRED B. SHEPPERSON,
Cotton Statistician.

Cottontail. See RABBIT.

Cotton Whigs, or **Conscience Whigs.** See WHIGS.

Cotton-wood, a species of *Populus*, belonging to the willow family (*Salicaeæ*). There are two very common species in this country, *P. monilifera* and *P. angulata*. Besides these there are some 10 others, which occur under the names of poplar and aspen. The cotton-wood is a large tree, found along the banks of rivers from Florida northward to Quebec and the Northwest Territories, and westward in the United States to New Mexico and Colorado. The wood is soft and weak, of a dark brown color, and weighs about 24 pounds to the cubic foot. It is also known by the names of Carolina poplar and necklace poplar.

Cotton-worm. See COTTON INSECTS.

Cottonian Library, a valuable collection of ancient manuscripts, books, and coins, begun by Sir R. Cotton (q.v.), and much augmented by his son and grandson. His grandson Sir John wishing to make the library a public one, an act of Parliament was passed in 1700 for this purpose; in 1707 another act authorized the purchase of Cotton House and library on behalf of the queen and her successors; and in 1730 it was deposited in a house in Westminster. The next year a fire broke out there, whereby 114 volumes of manuscripts were burned, lost, or entirely defaced, and 98 rendered imperfect. It was then removed to a new building in Westminster, and in 1753 finally removed to the British Museum.

Cottonmouth, a common name in the southern States for the moccasin (*Ankistrodon piscivorus*), so called because of the whitish streak along the lips. The name is also sometimes applied to the copperhead snake (q.v.).

Cottony Cushion Scale. See SCALE INSECTS.

Cotyledons, kŏt-ĭ-lē'dŏnz, the seed-leaves or seed-lobes of the embryo plant, which serve it as organs of nutrition until the young vegetable is established in the soil and develops its true leaves. In flowering plants there are two kinds of embryos — one in which there is only a single cotyledon, and the other in which there are two cotyledons. This difference, being associated with several others of an important character, serves as the basis for the primary division of phanerogamic, or, more accurately, of angiospermous plants into monocotyledons and dicotyledons. The lower class of plants producing spores or cellular embryos having no cotyledons are called acotyledonous. On germination the cotyledons either serve as foliage-leaves or remain underground as fleshy lobes.

Cotylosauria, kŏt-ĭ-lō-sâ'rĭ-ạ, the most ancient of reptiles, from which, as is claimed by the American naturalist, E. D. Cope (q.v.), and his adherents, sprang the saurian and snake-like species of later ages. Their remains are among the characteristic fossils of the Carboniferous Age.

Coucal, koo'kạl, or **Lark-heeled Cuckoo** (*Centropus*), a genus of common bush-birds in Africa, India, and through the Malayan Archipelago to Australia. The hind toe is prolonged into a very long spur. The 35 known species constitute the sub-family *Centropodinæ* of the cuckoo family (*Cuculidæ*). One species is held in religious veneration in Madagascar.

Couch. See QUILLER-COUCH, ARTHUR THOMAS.

Couch, Darius Nash, American soldier: b. South East, Putnam County, N. Y., 23 July 1822; d. Norwalk, Conn., 12 Feb. 1897. He graduated at West Point 1846, served in the Mexican and Seminole wars, and resigned from the army in 1855 to engage in business. During the Civil War he was commissioned brigadier-general 1861; commanded a division in the battles of Williamsburg, Fair Oaks, and Malvern Hill; promoted major-general July 1862, and took part in Pope's retreat and the battle of Antietam. At Fredericksburg and Chancellorsville he commanded the Second Army Corps; organized the Pennsylvania militia to resist Lee's invasion 1863, and took part in the battle of Nashville and the North Carolina operations 1864–5. In 1865 he was unsuccessful as the Democratic candidate for governor of Massachusetts; and was collector of the port of Boston 1866–7. He removed to Connecticut soon after, and was adjutant-general of that State 1833–4.

Couch-grass (a corruption of quitch-grass and quick-grass), a perennial grass (*Triticum repens*) of the same genus as wheat, and one of the most common and troublesome weeds of agriculture. When it first appears above ground its blade is readily eaten by sheep. In arable land, under any tolerable management, the seeds are never allowed to ripen, and the propagation is effected by the numerous joints of the long trailing rootstock, each joint sending forth a shoot which becomes a new plant. The proper time for extirpating it is in summer, when the land is undergoing a pure fallow, or, where fallow is not used, when the land is being prepared for a root-crop. The most effectual means are a deep ploughing, going below the roots of the plant, a diligent use of the roller, grubber, and ordinary harrows, and careful hand-picking. The rootstock may be used as food for various domestic animals, or, when prepared, as a medicine. The root is pulled up by the Germans and cut into small fragments and sold largely to venders of patent medicines. It has a large amount of gum which renders it somewhat demulcent, but its medical properties are nil,

although enormous quantities of it are used in the United States by manufacturers of quack medicines.

Coucy, koo-sē, **Raoul,** rä-ool, or **Renaud,** rė-nō, **Châtelain de,** French chevalier; hero of a tragic story often celebrated in ancient ballads and songs, sometimes in connection with other names than his. He was in love with Gabrielle de Vergy, lady of Aubert de Fayel, and dying in the Holy Land, he directed his faithful squire to enclose his heart in a casket and carry it to the Lady of Fayel. He was surprised by the lord of the castle, who found out on what mission he came. Burning with rage, and determined on revenge he ordered the heart to be served at table. The unhappy woman, having eaten, was told the nature of this horrible meal, whereupon she refused all sustenance, and died of voluntary starvation. Uhland has made this story the subject of a fine ballad.

Couder, Louis Charles Auguste, loo-ē shärl ō-güst koo-dā, French painter: b. Paris 1 April 1790; d. there 23 June 1873. He studied in Paris under David, and later in Munich. Among his works are: 'Cæsar on the Ides of March'; 'The Battle of Lawfeld'; 'The Opening of the States-General, 1789'; and 'The Siege of Yorktown'; the last three are at Versailles.

Coudersport, kow'dėrz-pōrt, Pa., a town and county-seat of Porter County in the northern part of the State, on the Allegheny River, and on the Coudersport & Pennsylvania Railroad. It has a foundry, a tannery and other manufacturing establishments. Pop. (1900) 3,217.

Coudert, koo-dĕr', **Amalia Küssner,** American artist: b. Terre Haute, Ind., 26 March 1873; married Charles Du Pont Coudert 3 July 1900. She is one of the most distinguished of living miniature painters, beginning her artistic career in New York in 1892. She went to London in 1896 and painted King Edward (then Prince of Wales), and many leading members of the nobility; in 1899 received a summons to Russia to paint portraits of the emperor and empress, and the Grand Duchesses Vladimir and Ellen; and the same year went to South Africa to paint a portrait of Cecil Rhodes.

Coudert, Frederic René, American lawyer: b. New York, 1832; d. Washington, D. C., 20 Dec. 1903. He was graduated at Columbia College in 1850, and admitted to the New York bar in 1853. In 1892 he was appointed one of the counsel on the part of the United States before the Bering Sea Tribunal of Arbitration in Paris, and was specially complimented by Baron de Courcel, president of the tribunal, for his argument on the necessity of putting a stop to pelagic sealing. On 1 Jan. 1896, President Cleveland appointed him a member of the Venezuela Boundary Commission. He had a world-wide reputation as an advocate and authority on international law, and several times declined appointment to the bench of the United States supreme court. He was the legal representative of the French government in the United States for many years.

Coues, kowz, **Elliott,** American naturalist: b. Portsmouth, N. H., 9 Sept. 1842; d. Baltimore 26 Dec. 1899. In 1861 he graduated from Columbian University, Washington, D. C., and the year following entered the United States army as a medical cadet. His thorough work as assistant surgeon in the army, 1863–81, attracted attention, and for that and other services he was brevetted captain. For some years he continued to practice surgery or teach its science; but he also continued to pursue the study of zoology, begun while in the university. In 1873 he was appointed surgeon and naturalist for the United States commission which defined the northern boundary. For three years he remained connected with this commission, and in addition gave some assistance to the Smithsonian Institution. In 1877 he was called by the Columbian University to take charge of a department of anatomy, and later was appointed by the Virginia Agricultural and Mechanical College as professor of biology. He was associate editor of 'The American Naturalist' and other periodicals; and edited, for the Century Dictionary, the departments of comparative anatomy, biology, and zoology. He was one of the founders of the American Ornithologists' Union, and an active member of many scientific societies in Europe and America. He was president of the board of control of the American branch of the Theosophical Society of India. His last years were given chiefly to the Smithsonian Institution. He has left a large number of valuable works on mammalogy and ornithology, some of which are: 'Key to North American Birds' (1872); 'Field Ornithology' (1874); 'New Key to North American Birds'; 'Birds of the Northwest' (1874); 'Fur Bearing Animals' (1877); 'Birds of the Colorado Valley' (1878); 'New England Bird Life' (1881); 'Check List of North American Birds' (1884); 'Biogen' (1884); 'The Dæmon of Darwin' (1884); 'Our Native Birds.'

Cougar, the great American cat (*Felis concolor*), which ranges from Hudson Bay to Cape Horn, a remarkable distance for any wild animal. It was formerly called panther by the settlers of the eastern States; but in the West it is usually called «mountain-lion» or «puma,» the latter name said to be of Peruvian origin. «Cougar» comes from a native Brazilian name. The cougar is from six to eight feet long from the tip of the nose to the tip of the tail. The cubs are apt to be spotted and marked; but this wears off with the advent of maturity; and, after the first year, the animal is a uniform reddish, tawny color, deepening in tone toward the spine, paler around the eyes, and whitish on the throat, legs, and under portion. The color is so much like the hide of the Virginia deer that at a distance hunters have been known to mistake a cougar for a deer. This is one of the creature's great advantages as a beast of prey. He may be mistaken by his intended victims for an animal of their own kind, and thus is enabled to get into their midst before his identity is disclosed. In South America he is sometimes called, on this account, «false deer.» The head of the cougar is rounded, and the face is extremely intelligent, but crafty in general expression. The facial muscles can be drawn into as ferocious an expression as that of any of the great jungle felines of the Old World. It is said to be more cowardly and less dangerous than the other large carnivores; and it is asserted by authorities in good standing that it generally flees from man except in defense of the young, when the female becomes desper-

ately brave. The puma will prowl about lone camps and logging-huts from curiosity or hunger, but rarely ventures on offensive warfare with humanity. This imputation of cowardice is denied by certain people, notably J. Hampden Porter, who says "there is no need to argue the question whether or not pumas will kill men; that has been affirmatively settled by facts"; and Theodore Roosevelt says, in his 'Hunting Trips of a Ranchman': "When hungry, a cougar will attack anything it can master."

Though plentiful a century ago, in the eastern United States, the cougar is met with rarely, if at all at the present time, east of the Alleghanies. It may still be found in the Appalachian ranges and in the wilder parts of the Middle West. It is so troublesome to ranchmen that, especially in southern California, western Oregon, and various other districts, a constant war, tending toward extermination, is waged upon the species by owners of cattle and sheep. In common with all cats, large and small, the cougar hunts preferably at night. Merriam says that it creeps to leeward of its intended victim; and, with noiseless tread and crouching form, passes over fallen trees and ragged ledges or through tangled thickets, until, if unobserved, within 30 or 40 feet of its quarry. Then it springs upon the back of the victim, plants its long claws in the quivering flesh, and with its sharp teeth despatches its prey. Deer, rabbits, ground-squirrels, ground-nesting birds, and even porcupines form part of its food. It will even catch and eat fish. But best of all it likes the flesh of young ponies, or even of full-grown horses,—a delicacy unknown to its bill-of-fare before the advent of the white race. When it has killed its quarry, the cougar drags it away to eat what appetite demands in the seclusion of its chosen covert; and, when its meal is finished, lies down beside the bloody remnant of its feast, and sleeps. This habit of napping when gorged has procured many a cougar its death at the hands of hunters, who track it by the blood and body of its victim.

The cry of the cougar is said to be one that will carry terror to the stoutest heart,—"a cry that can be likened only to a scream of demoniac laughter," in the male; and in the female, to "the wail of a child in agony." These cries, never heard by day or in captivity, are doubted by some as being so terrible as, heightened by the darkness and the silence of the night, they seem to the lonely hunter. In winter cougars congregate in the valleys of the western mountain regions and raid corrals for sheep and cattle, doing much damage. These depredations are so extensive and constant in Mexico as to be a serious menace to the business success of the ranchmen.

When very young the cubs are playful and kittenish, and may be readily tamed. Indeed, many experiments of this sort have been tried, and the records of such afford interesting reading. But with maturity they develop treacherous qualities which usually render them unsafe for human society. Cougars are often hunted with dogs, and any sort of dog, it is said, will do to scent them. They are not, however, creatures of the chase for sport, as are lions and tigers; but are usually hunted as vermin. When pursued by dogs they take to trees, and are kept there until the hunters come up, when they are easily shot. On the plains of South America they are frequently caught with lassoes by the mounted cattle-herders.

The cougar was held in religious veneration by the Indians of California, as was the tiger by certain sects in India; hence the redmen did not dare to kill the beast, and it multiplied accordingly. Among the Zuñis it is regarded as the chief "prey-god."

Cough, in physiology, a deep inspiration of air, followed by a sudden, violent, and sonorous expiration, in a great measure involuntary, and excited by irritation of the air-passages, due to the presence of some foreign material or irritation of the nerves distributed to the respiratory organs. The organs of respiration are so constructed that every foreign substance, except atmospheric air, offends them. The smallest drop of water entering the windpipe is sufficient to produce a violent coughing, by which the organs labor to expel the irritating substance. A similar effect is produced by inhaling smoke, dust, etc. The sudden expulsion of air from the lungs is produced by the violent contraction of the diaphragm and the muscles of the breast and ribs. The contraction of the muscles is due to impressions reaching them by their motor nerves, such impressions coming from the nerve-centre in the medulla, thrown into activity by stimuli received from the irritated sensory nerves of the air-passages. The sensation of obstruction or irritation, which gives rise to cough, though sometimes perceived in the chest, especially near the pit of the stomach, is very often confined to the trachea, or windpipe, and especially to its aperture in the throat, termed the glottis. Of the various irritations which give rise to cough, some occur within the cavity of the chest; others are external to that cavity; some exist even in the viscera of the pelvis. Of those causes of cough which take place within the chest, the disorders of the lungs themselves are the most common, especially the inflammation of the mucous membranes. Here the cough may be a dry one, that is without expectoration, and this occurs in the early stage of the affection, or a loose cough attended by expectoration, as in the later stage. In the former case it is due to the dry inflamed mucous membrane being very irritable, so that the cough is excited even by the coldness of the inspired air. In the latter case the presence of the defluxion causes the cough and thus excites its expulsion.

Pleurisy, or inflammation of the serous membrane which covers the lung and lines the interior of the chest, also gives rise to cough, this disease being almost invariably accompanied by inflammation of the outer layer of the tissue of the lung. It may be simple, but is very frequently associated with tubercular phthisis. Another common cause of cough which has its seat in the chest is inflammation of the lungs. In this disease there is inflammation of the tissue of the lungs, with exudation of fibrin, which solidifies the lung and shuts up the air-cells. Much constitutional disturbance accompanies it. In the progress of the disease the exuded material softens, and, being swept up the air-tubes, irritates the passages and brings on the cough by which it is expelled. In such a case the cough is desirable rather than the reverse, since it is nature's method of sweeping out the foreign substance from the air-cells and tubes. Another

frequent origin of cough is the rupture of some of the blood vessels of the lungs, and the consequent effusion of blood into the cells, which is expelled by the cough that its irritation excites, constituting what is technically termed, hæmoptysis, or spitting of blood. Cough is also excited by the existence of tubercles in the lungs, one of the most frequent causes of consumption; and by cancer and growths in the lungs.

Then the irritation may arise at the back part of the throat, no disorder being present in the windpipe, bronchial tubes, or lungs. Thus a long uvula, by tickling the back of the throat, may be the cause of a most persistent dry cough, coming on specially when the person lies down. Enlarged tonsils, a chronically thick condition of the mucous membrane of the back of the throat, small growths or polypi in this neighborhood or in the box of the windpipe, may maintain a most troublesome cough. Direct irritation of the nerves connected with respiration, as by the pressure of a tumor, the pressure, for example, of an aneurism in the chest on one of the nerves of the larynx, may excite spasmodic cough of a suffocative kind. Again, cough is very often excited by reflex irritation, the seat of the irritation being a long way from the air-passages. Where a cough is excited by disorders of parts external to the cavity of the chest, it is generally dry, as the irritating cause is external, and not any obstructing matter in the lungs themselves. Disorders of the viscera of the abdomen, especially of those which lie in contact with the diaphragm (the muscular curtain separating the cavities of the belly and chest), frequently induce a cough. A short, dry cough invariably attends inflammation of the liver, whether acute or chronic, and accompanies the various tubercular and other obstructions in that organ. Hence inflammation of the liver is not infrequently mistaken for inflammation of the lungs; and in some of the chronic diseases of the liver the cough is occasionally complained of as the most urgent symptom. The presence of pain in the right side, shooting up to the top of the shoulder, the dryness of the cough, and pain, enlargement, hardness, or uneasiness on pressure below the ribs of that side, will afford the best means of distinguishing whether a disease of the liver is the origin of the cough. Disorders of the stomach are also often accompanied with a cough of the same dry and teasing nature. A short cough is, therefore, a frequent symptom of indigestion. In short, there is scarcely any one of the viscera in the cavity of the abdomen the irritation of which, in a state of disease, has not excited cough. Disorders of the spleen, pancreas, and even the kidneys, have all given rise to this symptom; and external tumors attached to them have had the same effect. Any distension of the abdomen, which, by its pressure upward, impedes the descent of the diaphragm, and consequently the expansion of the lungs, occasions cough. The variety of causes from which coughs may arise must convince every reader of the absurdity of attempting to cure all kinds of cough by the same remedy. The treatment can be satisfactorily indicated only when the real cause is ascertained. When a long uvula is the cause a small piece may be snipped off; when it is a relaxed condition of throat, or a similar state of the box of the windpipe, local applications, paints directly applied by a brush, or inhalations, are the suitable remedies. One of the commonest coughs attends slight swelling and irritability about the larynx. To relieve this warm poultices should be applied to the front of the neck, or a piece of flannel sprinkled with turpentine should be placed over the larynx on the neck. In bronchitis and inflammation of the lungs the treatment of the cough resolves itself into the treatment of the special disease, and so with the cough due to diseases of distant organs. Often soothing remedies must be given to allay the excitability of the irritated nerves.

Couiy. See TREE-PORCUPINE.

Coulanges, koo-lañzh, **Numa Denis** (dŭ nē) **Fustel de,** French historical writer: b. Paris 18 March 1830; d. Passy, near Paris, 12 Sept. 1889. After filling professors' chairs successively at Amiens, Paris, and Strasburg, he was transferred in 1875 to the École Normale at Paris, and became a member of the Institute in the same year. His earlier writings, 'Memoir on the Island of Chios' (1857), and 'Polybius, or Greece Conquered by the Romans' (1858), had hardly prepared the reading public for the altogether exceptional importance of his brilliant book, 'The Ancient City' (1864; 10th ed. 1885), which threw a flood of fresh light on the social and religious institutions of antiquity. The work was crowned by the French Academy, as was also his profoundly luminous 'History of the Political Institutions of Ancient France' (1875); while 'La Gaule romaine' (1888–91) received the Reynaud prize.

Coulomb, Charles Augustin de, ò-güst-an dė koo-lôñ, French scientist and inventor: b. Angoulême, France, 14 June 1736; d. Paris 23 Aug. 1806. He is famous for his experiments on friction, and the invention of the torsion balance for measuring the force of magnetic and electrical attraction. In early life he entered the engineers' corps and served some time at Martinique. In 1777 he gained an Academy prize by a work on magnetic needles, and again two years later by his 'Theory of Simple Machines.' Coulomb was a member of the French Academy, and in 1784 was made intendant general of the waters and fountains of France.

Coulomb, the unit of quantity in measuring electric currents. It is the quantity produced by a current of one ampere in one second. See also AMPERE.

Coulter, kōl'tėr, **John Merle,** American botanist: b. Ningpo, China, 20 Nov. 1851. He graduated at Hanover College, Ind., 1870; was appointed botanist of the United States Geological Survey in the Rocky Mountains 1872–3; professor of the natural sciences, Hanover College 1874–9; and professor of biology in Wabash College 1879–91. He was president of the University of Indiana 1891–3; president of Lake Forest University 1893–6, when he was elected professor and head of the department of botany in the University of Chicago. Since 1887 he has also been special agent in botany for the United States Department of Agriculture. Among his many publications are: 'Manual of Rocky Mountain Botany' (1885); 'Botany of Western Texas; Manual of the Phanerogams and Pteridophytes' (1891–4); 'Preliminary Revision of the North American Species of Cactus, etc.' (1894); 'Preliminary Revision of the North American Species of Echino Cactus, Cereus, and

Opuntia' (1896); 'Morphology of Spermatophytes,' with Chamberlain (1901); 'Plant Relations' (1899); 'Plant Structures' (1899); 'Plant Relations' (1900), the last three being excellent introductory manuals for use in schools. He is editor of the 'Botanical Gazette.'

Coumarin, or **Cumarin,** a compound of the aromatic series, having the formula $C_9H_6O_2$, or $C_6H_4 < \begin{matrix} CH:CH \\ | \\ O-CO \end{matrix}$ and occurring in nature in the Tonka bean (the fruit of *Coumarouna odorata,* or *Dipteryx odorata*), in small white crystals, between the seed-coating and the kernel; also in woodruff (*Asperula odorata*), in the leaves and flowers of sweet-scented vernal grass (*Anthoxanthum odoratum*), and in other plants. It is obtained from the Tonka bean by extraction with strong alcohol, and it may also be prepared synthetically by heating sodium-salicyl-anhydrid with acetic anhydrid, or by heating phenol with malic and sulphuric acids. It crystallizes in colorless triclinic plates, which melt at 153° F. Coumarin is scarcely soluble in cold water, but dissolves somewhat in hot water, and freely in alcohol. It has an agreeable, aromatic odor, and a burning taste. Melted with solid caustic potash, it yields acetate and salicylate of potassium. The peculiar odor of Swiss schabzieger cheese is due to the coumarin existing in the melilot that is used in its manufacture. The «Maiwein» (or May-wine) of the Germans is prepared by steeping woodruff in white wine, and owes its pleasant aroma to the coumarin that that herb contains. Indeed, the woodruff is often dispensed with, and the Maiwein prepared by the direct addition of an alcoholic solution of pure coumarin.

Coumoundou'ros, or Kumundo'ros, Alexander, Greek statesman: b. Messenia 1814; d. Athens 27 Feb. 1883. He entered the Greek chamber of deputies in 1850, became president of that body, and was subsequently appointed a minister of State with charge of the department of finance. His first official step was to propose to the chamber a bill for the recognition of the Greek debts of 1814 and 1825 contracted in the struggle for freedom, and succeeded in securing its adoption 1879. He was frequently prime minister of Greece, and held the office longer than any contemporary Greek statesman. His popularity was very great through the country; he was called the Cavour of Greece.

Council (L. *concilium*), an assembly met for deliberation, or to give advice. The term as used in an ecclesiastical sense specially applies to certain assemblies of the Roman Catholic Church. These may be classified as ecumenical, provincial, or patriarchial councils, and synods; but the last is not usually included among councils. An ecumenical, or general council is one in which bishops and others entitled to vote are convoked from the whole world to deliberate on the state of the Church or to meet an emergency, as the rise of a new heresy. The decrees of such a council, having received papal confirmation, are binding. A council might be ecumenical in its convocation, yet if its decrees did not receive the papal confirmation they would not be binding, and the council would not be considered of ecumenical authority. Or a council might not be ecumenical in its convocation, but its decrees being accepted and receiving the papal confirmation, it is then classed as ecumenical. The First Council of Constantinople was originally a council of the East, but ultimately its decrees on faith were accepted in the West and received the confirmation of the Pope. Patriarchal councils represent a whole patriarchate; national councils, a nation; and primatial councils, provinces subject to a primate. (See PATRIARCH.) Provincial councils are of a province and are known usually by the name of the metropolitan see; as the Baltimore Council. (See METROPOLITAN.) Diocesan councils, usually termed synods, are composed of the clergy of the diocese and are presided over by the bishop or vicar-general or a representative of the bishop.

Ecumenical councils are convoked by the Pope, and are under his presidency or that of his legate. In the early ages of Christianity councils were sometimes convoked by emperors, but only by permission or by request of the Pope. The dangers and difficulties of traveling in those times made it necessary to have the protection of the civil powers, and hence the real part which the emperor took in convoking the council was to promise it immunity from those who might wish to influence or retard its deliberations. The patriarch, metropolitan, or bishop, convokes the council within his jurisdiction. The membership of councils not ecumenical consists of the local clergy, as in a diocese, or the suffragan bishops of a province or patriarchate. Certain rules regulating representation are observed. In the early ages (and even as late as 1598), laymen were sometimes invited to attend provincial councils. They were permitted to present complaints and give advice, but it is very doubtful if they ever took any part in the voting. In two instances at least women attended (see HILDA, ST., ABBESS). Ecumenical councils are composed of patriarchs, archbishops, and bishops, and such other ecclesiastics as may be invited for specified reasons, as theologians, one at least for each archbishop or bishop. (The council of Trent gave procurators — priests and deacons — of absent bishops a right to vote. The Vatican council did not even admit to the council hall such procurators.) Cardinals, even if not bishops or abbots, generals of regular orders, mitred abbots of whole orders, may be members with right to vote. The rule has always prevailed that no royal representative may be present at any council except a general one in which «faith, reformation, and peace» are in question.

The presidency of a council does not confer an *ex officio* right to vote or to take part in the deliberations, such right depending upon the hierarchical rank of the one presiding.

Usually bishops take their places according to the rank of their sees. At the Vatican council they were arranged according to their hierarchical rank,— first the Pope, then the cardinals, patriarchs, primates, archbishops, bishops, abbots, and generals of orders. The voting is generally by single vote, but at Constance the vote was by nations. At Basel the members were divided into four deputations which met separately. Decrees passed by three deputations were accepted by all. At Trent much of the matter to be debated was first considered by commissions. (See TRENT, COUNCIL OF.) The proceedings of the Vatican council, not yet

finished, were conducted in a somewhat similar manner.

Church historians usually regard the assembly of the apostles in Jerusalem described in the Acts of the Apostles as the first example of a general council of the Church; yet that assembly is not entered in the list of the 20 general councils. From the times immediately subsequent to the epoch of the apostles, the fathers always on occasion of controversy over questions of faith or of discipline appealed to the tradition of the apostolic doctrine and government as preserved in the churches founded by the several apostles or authentically derived thence, to the churches scattered over the world. Not till peace was assured to the Christian body by Constantine, was it deemed prudent to hold a general assembly of the Church's pastors, the bishops; though in various provinces of the empire — in Gaul and Spain, in Mesopotamia, in Africa, synods or councils were held even in the times of persecution. But in the year 325 there assembled at Nicæa in Bithynia, at the call of the emperor, the first or Nicene council. As this council and many which followed were in their membership predominantly eastern, so in later councils western bishops predominated; and for some time the decrees of these predominantly eastern, or predominantly western councils were not accepted by both sections; but in time many of them received a tacit acceptance as expressing the teaching of the whole Church Catholic; while the decrees of other eastern and other western churches are ignored on one side or the other.

The general or ecumenical councils of the Church, as reckoned by Roman Catholic historians, are as follows:

		A.D.
1.	Council of Nice (*Nicæa*)	325
2.	First Council of Constantinople	381
3.	Council of Ephesus	431
4.	Council of Chalcedon	451
5.	Second Council of Constantinople	553
6.	Third Council of Constantinople	680
7.	Second Council of Nice	787
8.	Fourth Council of Constantinople	869
9.	First Council of Lateran	1123
10.	Second Council of Lateran	1139
11.	Third Council of Lateran	1179
12.	Fourth Council of Lateran	1215
13.	First Council of Lyons	1245
14.	Second Council of Lyons	1274
15.	Council of Vienne	1311
16.	Council of Constance	1414–1418
17.	Council of Basel	1431–1438
	Council of Basel continued in Council of Ferrara-Florence	1438–1442
18.	Fifth Council of Lateran	1512–1517
19.	Council of Trent	1545–1563
20.	Council of the Vatican (not finished)	1869

Of these councils the Greek Church acknowledges the first seven. See separate accounts of the different ecumenical councils.

Among religious bodies of the Protestant faith the word council is applied to assemblies lacking the authoritative form of the Roman Catholic councils. In the Baptist and Congregational denominations it is customary to use the term council in relation to gatherings called on matters of local or restricted interest or in connection with ordinations or other church functions. A national council in these denominations is advisory in its nature. The Pan-Presbyterian Alliance is in the nature of a council of churches following the Presbyterian form of organization and holding the Reformed faith. The Evangelical Alliance (q.v.) is broad and inclusive in its constituent elements and in the themes considered. In the systematic nature of their organizations and the authoritative character of their decisions the councils of the Roman Catholic Church are more nearly related to the permanent governing bodies of evangelical sects charged with the regulation of faith, order, and discipline — such as the general and diocesan conventions of the Protestant Episcopal Church, the general assemblies and synods of the Presbyterian Church, the general conferences of the Methodist Church, etc.

In its use as a term relating to civil government, the word council signifies a body of men selected to advise a sovereign or other ruler. The body exercising such functions in Great Britain is known as the privy council (q.v.). In colonial times there existed in America councils modeled on the English privy council and originally intended as the executive bodies of the various provinces, in conferences with the respective governors. Such a body was called the executive council or legislative council, or simply the council, and besides its executive functions, bore much the same relation to the popular assembly that the Senate does to the House in the States. As the legislatures developed into the form in which we now know them, the upper house kept the name council till long after the Revolution; in South Carolina till 1790; in Delaware till 1792; in Georgia till 1798; and in Vermont till 1836. The Territories have retained the name, and it is used in some States for a body like that in the old provinces, the executive council of the governor.

Council of the Ancients (*conseil des anciens*), an assembly instituted by the French Directory in 1795, which shared the power with the executive directory, and composed, with the Council of Five Hundred, the legislative body. It had 250 members, either married or widowers, residents of France for at least 15 years, and a third of the number were to be renewed annually. This council held sessions in the Tuileries, in the hall of the convention, and had the power to change the residence of the legislative body. It confirmed or rejected, but could not amend, the measures proposed by the Council of Five Hundred. It was overthrown on 19 Nov. 1799 (19th Brumaire). See DIRECTORY.

Council of Blood, The, a court created in the Netherlands by the Duke of Alva, its object being to put down all agitation caused by the religious and political tyranny of Philip II. Its first session was held 20 Sept. 1567, and in less than three months it had put to death 1,800 persons, among them the counts of Egmont and of Hoorn. See ALVA.

Council Bluffs, Ia., a city and county-seat of Pottawattamie County, situated on the left bank of the Missouri, opposite Omaha, Neb., at the junction of several railroads, chief of which are the Union Pacific, Chicago & N. W.; Chicago, M. & St. P.; Chicago, B. & Q.; Chicago, R. I. & P., and the Ill. Cent. The name is said to have been derived from a council held here in 1804 between the Indians and the explorers Lewis and Clark. In April 1847 the Mormons, who had been violently expelled from this place, became the pioneers of the new Mormon settlement of Utah. Council Bluffs has manufactories of iron, paper, agricultural implements, etc. Pop. (1900) 25,802.

Council of Five Hundred (*conseil des cinqcents*) was established by the French Directory 23 Sept 1795. It was composed of 500 members, each of whom had to be a resident of France for at least 10 years previous to appointment, and not under 30 years of age. One third of the 500 had to be renewed annually. It held its sessions in the Salle du Manége, in the Rue de Rivoli. This council had power to frame laws which, after being read three times at intervals of 10 days, were proposed to the Council of the Ancients, who accepted or rejected them. On 4 Sept. 1497 (18th Fructidor, year V.) the majority of the Directory, suspecting that certain members of this council were really royalists, expelled about 50 of them and restricted their powers. When the Jacobins again secured the ascendancy the council regained its influence; but it was violently dissolved by Napoleon on 19 Nov. 1799 (19th Brumaire, year VIII.). See DIRECTORY.

Council Grove, Kan., a city and county-seat of Maris County, situated on the Neosho River, and on the Missouri, Kansas & Texas and the Missouri Pacific railroads, about 50 miles from Topeka. It is the centre of rich grazing country, and its principal business is connected with stock raising. The city owns its own water and lighting plant. Pop. (1900) 2,265.

Council of the Indies, The, a tribunal to which, in conjunction with the *Casa de Contratación,* or India House, at Seville, the administration of the Spanish colonies was assigned by King Ferdinand. It was the business of these two tribunals to further the progress of discovery, watch over the infant settlements, and adjust the disputes which grew up in them. Eventually the India House was subordinated to the council, the powers of the latter having been greatly extended in the reign of Charles V.

Council of State (*Conseil d'etat*), an advisory body which existed in France from early times, but which was developed and its duties well defined under Philip IV. and his sons. It consisted of magistrates and statesmen selected by the sovereign, to give advice on affairs of state. Its powers were often modified, especially in 1497, and again about 1630 when, under Richelieu, it occupied a most important place in the government. Napoleon reorganized the council, and extended its duties. Under him and the second empire it consisted, besides members of the imperial family, of the chief functionaries of state in the different departments of public service, war, marine, public works, etc., and was intrusted with the elaboration of projects of law to be submitted to legislative chambers, and with the defense of these projects before the chambers. This council is now composed of 90 members, part of whom are nominated by the president and part by the legislative assembly. Its duties are to advise on administrative and legislative affairs.

Council of Ten, a secret tribunal in the old republic of Venice, instituted in 1310, after the conspiracy of Tiepolo. It was first composed of 10 members who wore black costumes; later six more, who wore red, were added. This council was founded to protect the interests of the state, and it had power to punish its enemies. All its processes were secret, and through its means some of the most wicked and bloodiest crimes were committed. At first established temporarily, it was prolonged from year to year until 1335 it was declared perpetual. It went down with the republic in 1797.

Council of War, an assembly of officers of high rank called to consult with the commander-in-chief of an army or admiral of a fleet on matters of supreme importance.

Councilman, William Thomas, American physician: b. Pikesville, Md., 2 Jan. 1854. He was educated at the University of Maryland, was for some time assistant professor in Johns Hopkins University and is now (1903) Shattuck professor of pathological anatomy at Harvard University. He has given much attention to the study of smallpox and has recently announced his important discovery of the probable etiology of smallpox. He has published: 'A Contribution to the Study of Inflammation' (1879); 'Ueber fibrose Tuberkel' (1881); 'Zur Aetiologie der Eiterung' (1883); 'On the Etiology of Malaria' (1884); 'Syphilis of the Lungs' (1890); etc.

Counsel, in the United States a term applied indiscriminately to all members of the legal profession retained in a cause; as, the counsel for the defendant. In the United Kingdom the word has a limited and specific use, "lawyers," as the term is understood in America, being classified as advocates, attorneys, barristers, counselors, proctors, serjeants, solicitors, etc. The function of the counselor, or more usually, barrister, is the pleading of cases in court from the data furnished to him by the attorney or solicitor in the form termed a brief (q.v.). King's counsel (abbreviated K. C.) are barristers appointed counsel to the crown by the lord chancellor. They have the privilege of wearing silk gowns instead of the stuff gowns worn by ordinary barristers, of whom the king's counsel takes precedence, pleading cases from within the bar, while the utter or outer barristers plead beyond the bar.

Counselor, a term of loose meaning as used in the United States. Primarily it imports a person retained by a client to plead his cause in a court of judicature. It has no specific meaning, however, in general use, and in some parts of the country is used as is the word "lawyer." See COUNSEL.

Count, Countee, or **County** (Lat. *comes*) appears to have been first used, as a title of dignity, under the reign of Constantine. During the existence of the republic the inferior officers, as *tribuni, præfecti, scribæ, medici, haruspices, accensi, præcones,* who accompanied the *proconsules* and *proprætores* into their provincial governments, were known as the *comites* or *cohors* of their provincial. On the establishment of the imperial government the name was applied to the court and household of the prince; and Dio (53) mentions a council of senators selected by Augustus as his *comites.* On the first distribution of his dominions, and the foundation of the new capital by Constantine, 10 out of 35 provincial generals received the title of *comes.* After the fall of the Roman power the title was retained by the conquerors; and under Charlemagne it denoted equally a military or civil employment. About the end of the 15th century, in Germany, and under the last princes of the Merovingian race in France, the title appears to have become hereditary in families. Selden, in his 'Titles of Honor,' treats the

origin and progress of the title at much length, and with his usual learning. The institutions of the ancient German tribes may have contributed much to the establishment of this class of nobles. In early times, before the existence of the Latin *comites,* the Germans had officers chosen, at least in some tribes, by the people. These were a kind of inferior judges. After the Franks became the ruling nation they made a change in their character. The king now appointed them, and they exercised jurisdiction over certain districts in the king's name, with the title of *grafen.* These ancient officers are perhaps as fairly entitled as the *comites* to be considered the root of the subsequent counts. The German title *graf* corresponds to the title "count" in other countries of Europe. These *grafen* superintended the administration of justice, the police, and the taxes. After the time of the Carlovingian dynasty different classes of counts or *grafen* were formed; thus *pfalzgrafen,* or *comites Palatii,* the judges of the court who decided whether a case should be brought before the king; *markgrafen,* counts of the frontiers; *holzgrafen,* counts of the forests, that is, inspectors, etc. These royal officers soon usurped power which did not belong to them, and treated the people so badly that the emperors and kings were obliged to go themselves into the provinces and hold courts, or to send particular officers for this purpose, called *sendgrafen.* The sheriffs in England were originally the deputies of the English counts or earls, who correspond to the German *grafen.* Their Latin title is still *vicecomes.* Their English title, derived from "shire" and "gerefa," has the same origin with the German *graf.* (See SHERIFF.) In the 12th century the division of counties on the continent of Europe was abolished, and thus the counts lost their jurisdiction, except on their own possessions. In point of rank, the English earls are considered as corresponding to the continental counts. See COUNTY; EARL.

Count of Monte Cristo, The, a famous work by Alexandre Dumas, published 1844–5. It is the only novel of modern times which the great romancer has written; and it is so widely known that "the treasure of Monte Cristo" has passed into a proverb. The story opens in Marseilles, in the year 1815, just before the "Hundred Days." The first half of the book is a story of romantic and exciting adventure; the second is in a different key, sombre and unlovely, and not likely to convince any one that revenge is sweet. But the splendid imagination of Dumas transfigures the whole, its intensity persuades the reader that the impossible is the actual, and its rush and impetuosity sweep him breathless to the end.

Count of Presidential Votes. See ELECTORAL SYSTEM.

Count Robert of Paris, a novel by Sir Walter Scott, published in 1831. The scene is laid in Constantinople during the reign of Alexius Comnenus (1080–1118). Many historical facts are altered for artistic effect. At the time of the story Anna Comnena was only 14 instead of over 30, and was not the heiress to the throne. The most striking scene is the swearing allegiance by the Crusaders to the emperor as overlord, in which Count Robert defiantly seats himself on the throne with his dog at his feet.

Counter-irritation, the production of an artificial inflammation in order to relieve another in some other part of the body. The principal counter-irritants are dealt with in the article on blister (q.v.).

Counter Reformation, a movement that took place in the Roman Catholic Church in the 16th century, chiefly as the result of the Protestant Reformation. The movement was in one aspect a more or less definite and avowed attempt to counteract the Protestant revolt, and in another, an inevitable outcome of the very conditions that produced the great schism. Among those who shared the widespread discontent with existing abuses in the Church and who longed for a return to its apostolic purity and simplicity, there were many who remained loyal to the Roman communion and believed in the possibility of an internal reform. There were others whose piety and sincerity of motive were more questionable, but who from wise policy advocated an amendment of life and doctrine, perceiving that force alone was not sufficient to keep wavering adherents within the Church's pale nor to regain those who had broken away. The Council of Trent was one of the most prominent of the factors in the problem of checking the spread of the Reformed faith. Conciliatory measures which were originally intended were abandoned after the fifth session and attention was concentrated on the reaffirmation of doctrines questioned by the Reformers, and on regulations for the purification of the Church. Even if Macaulay's estimate of the Jesuits' share in the Counter-Reformation be exaggerated, the devotion and zeal of Loyola and his followers undoubtedly played a large part in the abatement of ecclesiastical scandals and abuses. The Jesuits perceived that in an age of intellectual ferment and inquiry the Church must control the education of the influential classes if she would retain her domination over them, and in the perfectly organized Society of Jesus they offered her an instrument fitted for the task. The repressive and punitive features of the Counter-Reformation as illustrated by the work of the inquisition (especially in Spain and in the Netherlands), and by force of arms, banishment, confiscation, and other political penalties, are familiar, being more frequently dwelt upon than the changes taking place within the Church.

Counterfeiting, the making of imitations or counterfeits of money, either paper or coin,—in an extended sense including some degrees of forgery. This is a crime heavily punishable by statute, and the United States government has legislated at considerable length for its suppression. The punishment prescribed for imitating United States paper money is a fine of not over $5,000 and imprisonment at hard labor not exceeding 15 years; for counterfeiting coin, the penalty is a fine not over $5,000 and imprisonment at hard labor not exceeding 10 years; for minor coins of five cents and less, $1,000 fine and five years' imprisonment is the maximum. For having counterfeit money or counterfeiting tools in possession, or for counterfeiting post-office locks, or for altering or reusing revenue stamps, similar penalties are prescribed by statute. The United States laws on the subject may be found in the Revised Statutes, § 5413 et seq.

COUNTERFEITING

For the suppression of counterfeiting and enforcement of the laws on the subject, the United States has been divided into 10 secret-service districts, in each of which officials are constantly working to detect passers of counterfeit money and ferret out those who are engaged in its manufacture.

The paper money of the United States has been rendered very difficult of imitation by reason of the high character of the workmanship employed. The paper used includes colored silk threads, and as the manufacture of such paper for other purposes is prohibited, the counterfeiter must either control a paper mill, involving a very heavy investment, or must steal some government paper, or imitate the colored threads with colored lines written or printed. Pen-written lines are the usual form of imitation of these, commercial paper being employed, the nearest to the government paper that the counterfeiter can buy. The engraving of the plates is of such high quality that there are usually not a dozen men in the country, outside of those engaged on the government notes, who are capable of executing good imitations, and these men are known to the secret-service, which keeps an eye on them and their associates. The printing is done in colored inks in order to prevent reproduction of the plates by photography, which would be comparatively easy if printed in black. These conditions, combined with excellent work by the secret-service, have almost stopped the counterfeiting of United States paper money, and the temptation to counterfeit is still further reduced by the government's policy of changing the designs of the notes frequently, and withdrawing the old paper from circulation, rendering it certain that a high-class counterfeit would be driven out of circulation in a short time.

The success of counterfeiters is not so much due to the cleverness of their work as it is due to the ignorance and carelessness of the general public. A man who is not familiar with the distinctive ear-marks on the genuine money of the land cannot be expected to detect the counterfeit presentment of them when they face him on spurious money; so that every man ought to make himself familiar with these distinctive ear-marks of real money — and he must do so if he would successfully protect himself against the skilful imitations and the cunning devices of the shrewd counterfeiters who infest the land and prey upon this species of popular ignorance.

Steel-engraving is a fine art about which the general public knows next to nothing; and yet the possibility of detecting counterfeit paper money unerringly is bound up in the engraved features of its make-up. Of course, it is not contended that everyone must become a master of the engraver's art before he can successfully detect counterfeit money; but it is contended that he must make himself so familiar with the distinctive features of the genuine machine-engraving on the national currency that he can distinguish it from spurious and imperfect imitations of it. Nor is it a very difficult task. It can be done by anyone who will take the trouble incident to a proper study of the subject. The work executed by the government as well as that which is executed by banknote companies, possesses great beauty in its art and exact perfection in its execution and finish. It is mathematically and geometrically exact in all its parts, while the spurious work of imitating counterfeiters is necessarily imperfect in these respects.

This is due to the fact that the former is done by machinery, while the latter is done by hand; and to the further fact that hand-engraving, even when aided by simple machinery, can never approach the beauty, exactness and general perfection of machine-engraving. And yet although these very designs have bound up in them the chief safeguards which the government has thrown around our national currency to protect it against being successfully counterfeited, not one man in any 10 met upon the streets of our cities, much less among the rustic tillers of the soil, is familiar with either the character or the object of those beautiful designs which are found upon our national currency. This fact is very aptly illustrated by the tests which are applied by different persons to determine whether a suspected note is spurious or genuine: one looks carefully for pen-holes; another scans it for signs of wear, and another scrutinizes the vignettes, while others examine the paper,— not knowing that all of these evidences may be counterfeited successfully or imitated so perfectly as to deceive almost anyone; but very few, if any, apply those real tests which involve the only truly and unmistakably distinctive features of genuine notes. Hence, the alarming success of counterfeiters in passing their spurious products is not so much due to the fact that the excellence of their imitations of these distinctive features of genuine notes is prone to deceive the intelligent observer as it is due to the fact that the general public is ignorant concerning the construction, purpose, character, and distinctive features of that difference which distinguishes the genuine from the spurious. Everything on the average national currency note, except the fine lines of engraving, may be successfully counterfeited; but these fine lines defy all impostors. All of the circles, ovals, squares, and parallels, as well as the geometrical lathe-work upon which the denominations are usually placed, are composed entirely of a perfect network of finely engraved lines which cross each other at such angles or approach each other at such distances as to produce the desired effect. These finely engraved lines constitute the chief, the distinguishing feature of the government's money-engraving, and they cannot be successfully counterfeited.

It will be noticed in all genuine work that these fine lines can be traced by use of a lens, throughout the figures,— not a line being broken, not a line losing itself in another line and not a line showing any irregularity whatever in its course, in its uniformity of curve and width, or in its degree of shading. These lines may be either white upon a background of black, green or red; or they may be black, green or red upon a background of white; but they are always exact, always even and always uniform. They are made by a geometrical lathe which was invented by one Asa Spencer and introduced to the public about 1818.

This lathe is a perfect wonder; it produces patterns of almost every conceivable variety in form and figure; but this same fine quality of the lines clings to them in whatever form they may appear. So that, when it is remembered that this uniformity and uniqueness of execution

is impossible in hand-engraving, the spurious note falls all to pieces under this test. The striking difference between the genuine and the spurious is very natural from the simple fact that the one is mathematical and exact, while the other is mechanical and necessarily varied. The lathe does not engrave directly upon the note-plate, while the counterfeit engraver does. The lathe engraves upon a piece of soft steel one eighth of an inch thick. After this piece of soft steel has been properly engraved by the lathe, the piece of engraved steel is hardened by a peculiar process; then (by means of a powerful machine called a transfer press) a cylinder of soft steel is rolled over the hardened piece of engraved steel in such a manner that the engraving is transferred to the cylinder, which is then hardened; and, from this hardened cylinder the designs are transferred to the note-plate by means of the transfer press. In this way the work is not only exact — mathematically exact and artistically perfect — but it is always uniform; for this cylinder acts as a perpetual model from which any number of plates can be transferred — each being an exact facsimile of all the others taken from that same cylinder. Hence all United States notes of any one series are exactly alike in every respect — except the numbers and the signatures. And right there is where the counterfeiter falls down before the practised eye. He must do his engraving directly upon the note-plate — which imposes many insuperable difficulties; the lines cannot be made as perfect as they are in this lathe work, and the general effect of the printing is inartistic in comparison with the impressions taken from lathe-made plates. Even to the naked eye the appearance is more or less dull and sunken, or scratchy; and the figures are sure to be lighter or darker in spots, as the lines are heavier or lighter in places. The use of the lens in such cases discloses the fact that the lines are often broken, varied or irregular, either in size or course. Besides, it being impossible for any hand-engraver to produce two dies exactly alike, it happens that the spurious dies are not only not exact reproductions of the genuine lathe-made dies, but no two of the spurious dies are exactly alike; so that comparison, under the lens, between the dies on a suspected note (if it be spurious) and a genuine note brings out this difference so clearly that very little skill is required to detect and read it.

All the government dies used in printing any given series are exactly the same — all being transferred from the same cylinder, and they must therefore be exactly the same in every respect. This impossibility of making two dies separately and independently exactly alike by the hand-engraving process not only prevents the counterfeit dies from being like the genuine, but it also prevents any two counterfeit dies from being exactly alike, since the plates must be separately and independently engraved. But besides this absence of exactness in the reproduction of the dies, there is another notable feature of difference which is conspicuous for its presence in the genuine and for its absence from the spurious note; and that is the beautiful, clear-cut, raised impressions produced by the correct and uniform lines of the lathe-work which the counterfeiter cannot reproduce to save his life.

This machine work is therefore the safest ear-mark there is for detection purposes; but it must be used intelligently. In examining this work on any suspected note, it is a pretty safe way for the examiner to begin at the centre of the curvilinear figures and then gradually follow the lines around the circles, one within another, carefully searching for any special defects and for the discovery of any irregularity not patent to the naked eye. And he should also make careful and minute comparisons between the general designs on the genuine note and those on the suspected one.

Sometimes the whole face of a note (except the vignettes and dies) are tinted a pale red or some other color; but examination under a lens discloses the fact that this tint is composed of fine crossed or looped lines running clear across the face of the note. This is another species of machine work which is but poorly imitated by the most expert counterfeit engraver who has to depend upon his hands. This work, when genuine, shows the lines to be perfect in execution and in shading, while the spurious note bears evidence of imperfection in both respects.

Parallel lines also afford a check. They are made by a parallel-ruling machine, which is governed by an index to regulate the width of the lines, and they are mathematically exact. They are always uniform, always regular, and always exactly parallel — conditions which do not obtain when the counterfeiter undertakes to reproduce them by the process of hand-engraving. These parallel lines are used in shading the letters and figures on the genuine notes into a perfectly even pale gray. They are also used to represent a clear sky or water; but crossed lines are used to represent cloudy or heavy skies. In genuine work these lines can always be counted, while such is not always the case with counterfeit notes, as the lines on them are often broken, blurred, and irregular.

Some people rely on the vignettes as reliable ear-marks for detection purposes; but they make a mistake in doing so. The vignettes are the most artistic part of the whole note, and they are mostly hand-engraved, even on the genuine notes; so they may be almost perfectly imitated or reproduced — but that is not often the case. The vignettes on the national currency are made by the very finest artists in the country, and they are beyond the successful imitation or reproduction of any one but an artist of the first water; and, since the salaries which such artists can command at legitimate work are too satisfactory for them to resort to the rather risky business of counterfeiting themselves or lending their talents to others engaged in that hazardous outlawry, these would-be imitations are made by rather inferior artists and are necessarily imperfect in many respects. Real vignettes have this advantage over spurious ones: They are never made but once, and are therefore uniform and always exactly the same. They are transferred to the cylinder, just as the lathe-work is, and then transferred (by use of the transfer press) from the cylinder to the note-plate, thus using one model all the time; but such is not possible with the spurious vignettes. They must be reproduced, and exact reproduction is very difficult, if not impossible. But, it being noticed that counterfeiters get along better in reproducing outdoor scenes than

they do in reproducing portraits, the government has very wisely mingled its vignette work — making them consist of outdoor scenes, historical pictures, portraits, and allegorical figures, which it not only becomes difficult for counterfeiters to imitate, but which furnishes a somewhat graduated scale of difficulties for them to surmount.

The engraving test is the best possible earmark in the detection of counterfeits, for two very good and sufficient reasons: In the first place, the above-noted differences will always appear as long as counterfeiters have to rely upon hand-engraving while the government uses machine engraving; and, in the second place these counterfeiters will always have to rely upon hand-engraving, because machines for the purpose are too bulky and too expensive for them to handle,— considerations which will always place machine-engraving beyond their reach. If a man has $75,000 to $150,000 capital (the cost of a proper outfit of machinery for this work), he would hardly risk its investment in an illegitimate enterprise which might be swooped down upon at any moment by government officers and utterly destroyed, with the legacy of a long sentence in the penitentiary added. Hence, it may be pretty safely assumed that all the engraving done upon spurious note-plates will always be done by hand, and that this test can always be applied.

Coin is more easily counterfeited. The government mints it by subjecting blanks of metal to heavy pressure between dies. The cheap imitator casts them under slight pressure in a base metal. The maker of a better grade of counterfeit coin cuts out or casts a blank or disk of the required size, and compresses it between dies in an ordinary stamping-press. To make a really good imitation of gold coin requires a very wide knowledge of alloys, possessed by very few men, and principally for this reason counterfeit gold coins are scarce. The imitation of silver is much easier, as there are in the market numerous metals, used in the manufacture of tableware, etc., that closely simulate silver. Their principal basis is lead, and it is by the softness of the mixture and its increased weight that counterfeit silver is most easily detected. It does not require an expert to distinguish the average counterfeit silver coin from the genuine, as a simple balancing on a scales with a good coin shows the difference in weight, a shave with a penknife exhibits the softness of the metal, and ringing the coin produces a dull sound as compared with the ring of silver.

Counterfeits made in real silver have been circulated since the value of the metal deteriorated, and these, if well made, are very difficult of detection. The government's principal safeguard against them is obtained by watching all purchasers of silver, and following up those who do not seem to have good reason for requiring it. The imitations of five-cent pieces in the real metal are not difficult for a skilled mechanic, and the statement has been widely circulated that they were once actually manufactured by convicts while serving sentence in a prison of one of the larger States, where nickel-plating was carried on in the workshop. The more common imitation of the five-cent piece, however, is simple lead, cast in a mold, and, while easy of detection, it secures circulation because the passers handle it without examination. This is the most usual form of counterfeiting carried on to-day, and a flood of bad nickels is liable to break out anywhere as the result of some misguided man's efforts. As soon as they attract attention in a locality the secret-service men concentrate their action, and usually find the base of supplies within a few months, unless the counterfeiters take the alarm and fly, destroying their apparatus.

The most elusive counterfeiter the United States secret-service men were ever called on to unearth was a New Jersey mechanic skilled in photography and the use of the pen and brush. For many years he patiently imitated twenty-dollar greenbacks by hand, making about one a week, and then going to some New York saloon to change it. His work was very artistic, and he could surely have made more money by legitimately employing his talent in the trades. He was finally caught passing a note, and sentenced, the almost invariable fate of every persistent counterfeiter.

Countermark, in numismatics, the name given to those stamps or impressions which are found on ancient coins or medals, and have been given since their first impress. These countermarks or stamps are often executed without any care, and frequently obliterate the most interesting portion of the original inscription. There have been various opinions respecting the cause of these countermarks; some antiquaries thinking that they were to indicate an augmentation of the value of the money upon which they were stamped; others, that they were vouchers for workmen; and, again, that they were only struck upon money taken or received from foreign enemies. During the long war with revolutionary France Britain stamped millions of Spanish dollars with small, oval countermarks of the head of George III. upon the neck of the Spanish monarch. Many of them were completely restamped or countermarked in the mint, but the new impression sometimes failed to entirely obliterate the old.

Counterpoint, in music. This word is used in two different significations by musical authorities; by some it is employed simply as an equivalent of harmony, by others it is used to denote the art of composition generally. In former times musical sounds were represented by dots or points placed on the lines, and the added part or parts were written by placing the proper points under or against each other (*punctum contra punctum*). It is preferable to apply this term now to that branch of the art which, a musical thought being given, teaches the development of it, according to the laws of the art, by extension or embellishment, by transposition, repetition, or imitation throughout the different parts. It thus stands related to harmony as literary composition stands to grammar. Simple counterpoint is the art of adding a part or parts to a given melody in notes all of equal time value, as in plain-song or ecclesiastical style. Florid counterpoint is when the notes of the added parts are of less time value (say two crochets or four quavers against a minim) than those in the melody or subject, as it is called. In double counterpoint, the subject may start in the bass and be repeated in the upper part, or *vice versa*. It becomes triple or quadruple when two or three parts are added

with the harmony inverted. Further, counterpoint is divided into the free and strict styles, the former, which is of the florid order, allowing many licenses as to discords, etc., not permitted in the dignified slow movement of the strict style. It has been said that the art was known as far back as the 4th or 5th century; others again ascribe its invention to Guido d'Arezzo in the 11th century, or Adam de la Hale two centuries later. It was not until the 17th or 18th century that the art attained its maturity under the fostering care of J. Sebastian and Emmanuel Bach, Handel, Haydn, Mozart, and Beethoven. The best authorities on this subject are the treatises of Albrechtsberger, Cherubini, and Fétis.

Coun'tersign, in military affairs, a watchword used to prevent unauthorized persons passing a line of sentries, whose orders are to stop any one unable to give it. It is fixed each day by the commanding officer, but may be changed at any moment if necessary, and is communicated only to those entitled to know it.

Counting-out Games. See GAMES.

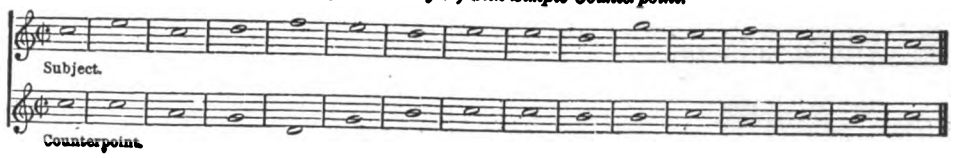
Country- or **Contra-dance,** a dance in which as many couples can take part as there is space to accommodate them; the gentlemen being ranged at the commencement on one side, and the ladies on the other. The dancers are constantly changing places, leading one another back and forward, up and down, parting and uniting again. 'Sir Roger de Coverley' is the best-known example.

County, in the United States, an administrative subdivision of each State, intermediate between the body as a whole and the town, parish, or municipality. In the North (except the wild northern parts of Maine and New Hampshire), and the thickly settled States of the central West, it is an aggregation of actual towns, there being no county land which is not a part of some town. In the South and the more sparsely settled Western States, the town is a piece cut from the county, the greater part of which may be entirely unorganized, except as divided by the State into artificial sections for administrative convenience or the saving of future boundary disputes; townships (as also in Aroostook County, Me.), military districts as in Georgia, «wards» as in Louisiana, «beats» as in Mississippi, etc. The relations of the county to the political and social life of the community also vary widely in different sections, owing to historic development. In New England it is of less consequence than anywhere else in the United States: a mere artificial group of towns, which might be regrouped at any time with little disturbance. Here it has three commissioners, who act as its attorneys and representatives, as well as executive officers, apportion the taxes among the towns, care for highways, etc. The old militia regiment, of which the town train-bands were companies, has disappeared; the county court has been replaced by sessions of the State superior court on circuit; there are, as of old, a sheriff, court-house, and jail, a probate court, registry of deeds, etc. The representative system here is not based in the least on the counties, but on the towns in general, singly for the lower house in the State, and grouped into «senatorial districts for the upper. Hence there is but languid interest in county matters, and no feeling of county unity. But in the Middle and Southern States the county is a much more integral part of daily life; it is the basis of representation, and often the real unit of growth and settlement. In the Middle States the towns were the original centres of settlement, as in New England, but they have not reduced the counties to insignificance; on the contrary, the county-seat is usually the chief centre of business and political interest, and the coveted spot at which to edit a newspaper sure of the largest circulation — in New England the county-seat has no advantages as such to make it a newspaper focus, and frequently is an insignificant place where none is published — and the county meetings of the town boards of supervisors determine the important actions of the county population. In the South, generally, the county was originally not only the most important, but almost the one subordinate unit of settlement, owing to the paucity of towns due to the plantation system. The county regiment, instead of being made up of town companies, was divided into district bands for convenience of drill and assemblage; the local management was mainly by county instead of town officers; the magistracies were mostly self-perpetuating, in the hands of a few leading families, instead of being elective or even appointive. The very settlements intended for towns often did not grow into such, but spread into disconnected plantations, and became counties; as James City County and Charles City County, Va. In South Carolina there were two systems — the county in the low country, the district in the Piedmont region; after the war the district system was extended over the whole State; in 1868 it was abolished and the whole State divided into counties. But these are purely artificial creations, and not even created with good judgment; they are of immense size, nearly double those in Massachusetts or Connecticut, and treble those in Virginia or Kentucky; Charleston County is larger than Rhode Island. They have no courts, being grouped into judicial circuits. The real subdivision seems likely to take place within them. In Louisiana the corresponding divisions are called parishes instead of counties. The institution was brought from England by the first settlers: the county there was an old tribal settlement, sometimes a whole kingdom as in Kent, the counties or shires being gradually fused into the kingdom. The shires are therefore not divisions made in the kingdom, but small governments whose coalescence made the state. The name «county» was given them after the Norman Conquest, from their likeness to the counts' governments on the continent. At first here the English organization was copied: there were courts called quarter-sessions, justices of the peace with extensive powers, lieutenants, coroners or «crowners,» etc. Virginia had the county in 1634, Maryland in 1638, Massachusetts in 1643. Consult: Fiske, 'Civil Government in the United States' (1890).

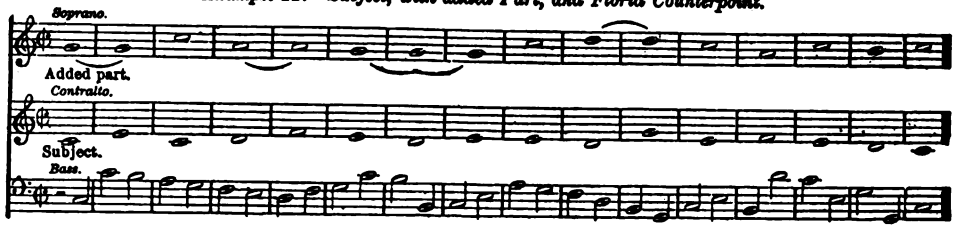
Coup, koo (Fr. «a stroke») a word used in certain phrases which have become almost universally current. *Coup d'état* (stroke of state) means an arbitrary encroachment suddenly effected by the governing authorities upon the constitution of a state, altering or setting aside the prerogatives of other parts of the body politic. The term is applied particularly to the

COUNTERPOINT.

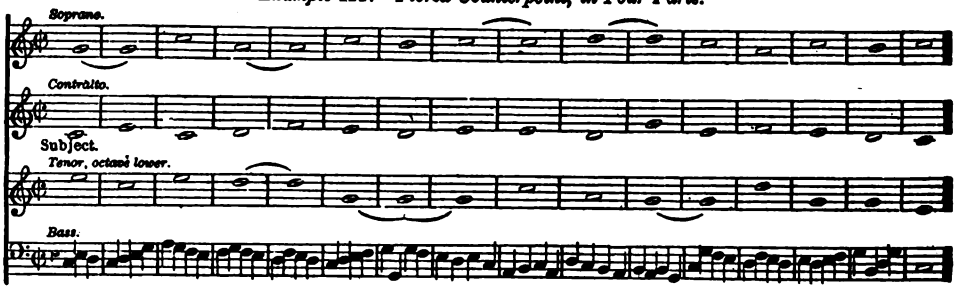
Example I.—Subject, with Simple Counterpoint.



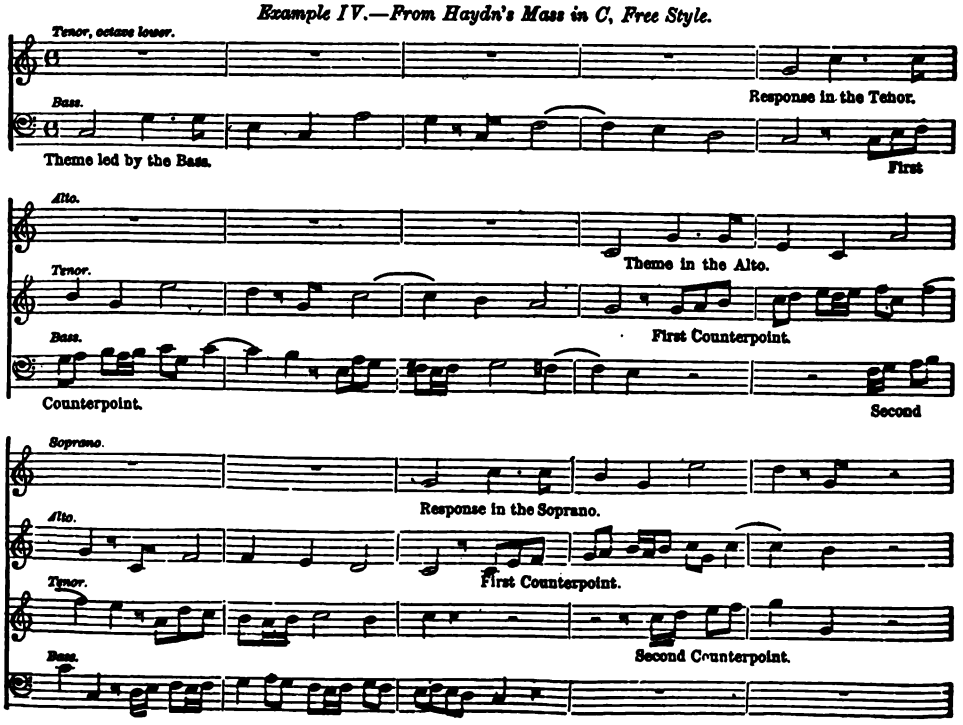
Example II.—Subject, with added Part, and Florid Counterpoint.



Example III.—Florid Counterpoint, in Four Parts.



Example IV.—From Haydn's Mass in C, Free Style.



procedure whereby Louis Napoleon placed himself as virtual dictator at the head of government in France, 2 Dec. 1851. *Coup de main* (a stroke of the hand) means a sudden and successful attack; *coup d'œil* (a stroke of the eye), a quick comprehensive view of a complicated matter; *coup de theâtre,* a trick of the stage, or any striking dramatic effect; and *coup de grâce,* the merciful blow that puts a victim out of pain; hence a decisive or finishing stroke.

Coupé, koo-pā', a four-wheeled carriage carrying two persons inside, with a seat for the driver outside.

Coupland, William Chatterton, English philosophical writer: b. London 2 Dec. 1838. He was educated at Manchester New College, and the University of Berlin, and held Unitarian pastorates at Bridgewater 1864–8; and at Kensington 1870–2. He was professor of mental and moral science at Bedford College for Women, London, 1881–6; first secretary of the English Goethe Society 1886–90; and has since lectured on philosophical themes. He has published 'Incentives to the Higher Life' (1866); translation of Hartmann's 'Philosophy of the Unconscious' (1884); 'The Spirit of Goethe's Faust' (1885); 'Elements of Moral Science Applied to Teaching' (1889); 'Gain of Life and Other Essays' (1890); 'Thoughts and Aspirations of the Ages' (edited) (1895).

Coupon, koo'pŏn (from Fr. *couper,* to cut), a warrant or certificate for the periodical payment of interest on bonds issued for any term of years. The interest being payable in different cases quarterly, half-yearly, or yearly, as many coupons are attached to each bond as represent the total number of such payments as are to be made, with the date of payment printed on each. When a payment of interest becomes due at any particular date the holder of the bond detaches the corresponding coupon and presents it for payment at the specified banking house or office. The term is also applied to one of a series of tickets which bind the issuer to make certain payments, perform some service, or give value for certain amounts at different periods, in consideration of money received.

Courbet, Gustave, güs-tāv koor-bā, French painter: b. Ornans, Franche-Comté, 10 June 1819; d. Vevay, Switzerland, 31 Dec. 1877. In 1839 he was sent to study law in Paris, but all the bent of his nature was turned toward art. He made himself acquainted with the Flemish, Florentine, and Venetian schools; but amid all he was careful to preserve — as he phrases it — his "own intelligent and independent individuality." In 1841 he took to landscape work, painting in the forest of Fontainebleau. In 1844 he began to exhibit at the Salon; and his works created a great sensation when shown in the Salon of 1850. His hunting scenes and animal subjects are especially vigorous and spirited. Several of his pictures are owned in the United States, four of them being contained in the Boston Art Museum. After the revolution of 1870 he was appointed director of the fine arts. In the following year he joined the Commune, and was responsible for the destruction of the Vendôme Column (16 May). For this act, in the following September, he was sentenced to six months' imprisonment, and to be fined for its restoration, his pictures being sold in 1877 toward that purpose. On his release he retired to Vevey.

Courbevoie, koor-bē-vwä, France, a town in the department of the Seine, on the left bank of the Seine, in the northwest suburbs of Paris. It contains numerous handsome villas; extensive barracks built by Louis XV. for the Swiss regiment, and manufactures of white-lead, carriages, etc. Pop. (1901) about 25,000.

Courcelle, koor-sĕl, **Daniel de Rémy,** rā-mī, governor of Canada 1665–72. The Mohawk Indians annoyed the colony by constant attacks, for which the governor sought to punish them by leading an expedition against their encampments. In the winter of 1666 he marched with 300 or 400 men from Quebec to the Mohawk valley by way of lakes Champlain and George, but gained nothing, as the extreme severity of the season decimated his force. The next year, with a much larger force, and under more favorable conditions, he had greater success, and succeeded in destroying several strongholds of the Indians. This invasion of English territory caused much alarm in the New York colony, and Gov. Nicolls protested vehemently. Courcelle was succeeded by Frontenac. Consult: Parkman, 'Old Régime in Canada,' p. 186 et seq.

Courier, koo'rĭ-ėr, a bearer of special despatches, whether public or private. The employment of couriers is of great antiquity. There was a very complete organization of them in the ancient empire of Persia. They were also used by the Greeks and Romans. Couriers who act as guides to and attendants on travelers are common on the continent of Europe, and are useful to those having much baggage or unacquainted with the foreign languages and moneys. Their special duty is to make all arrangements for journeys, and to relieve their employers as far as possible of anxiety about passports, exchange of money, hotel negotiations, and the like. The speaking of several languages is therefore one of the many important qualifications of a good courier.

Courier de Méré, Paul Louis, pōl loo-ē koo-rē-ā dė mā-rā, French Hellenist: b. Paris 4 Jan. 1772; d. near Veretz, Touraine, 18 Aug. 1825. He was a pupil in the artillery School at Châlons and served in the army 1792–1809. In 1813 he made an elegant translation of 'Daphnis and Chloe,' an ancient romance by Longos, discovered by him at Florence; he also translated 'The Luciad, or the Ass of Lucius of Patras,' published with the Greek text (1818). His numerous pamphlets, especially his 'Pamphlet of Pamphlets' (1824), are masterpieces of style, of marvelous conciseness, and noteworthy documents for the history of the ancient political and ecclesiastical contentions.

Courland, koor'länd, **Duke of.** See BIREN, ERNEST JOHN.

Courland, koor'land, or **Kurland,** Russia, a province on the Baltic, bounded north by Livonia and the Gulf of Riga, west by the Baltic, south by Kovno, and east by Vitebsk; area, 10,535 square miles. In the neighborhood of Mitau, the capital, the surface is diversified by hills of very moderate height; but elsewhere, and particularly toward the coast, it is flat, and contains extensive sandy tracts. About two fifths of the whole province is occupied by

forests; and there are many small lakes. The principal rivers are the Aa and the Windau; the latter is connected with the Niemen by a canal. Agriculture forms the chief occupation of the inhabitants, but many are engaged in fishing. The industrial establishments include distilleries, breweries, and factories for tobacco, metals, wool, and leather. A large number of the inhabitants are Letts, there being some Germans, Jews, Russians, and Poles. The prevailing religion is Lutheran. Courland was anciently a part of Livonia, and, like the latter, was conquered in the 13th century by the knights of the Teutonic order. It was subsequently united with Semgall, and, under the name of the Duchy of Courland, the two provinces became a fief of Poland. The duchy, however, was governed by its hereditary dukes till 1737. The sixth duke, Frederick William, espoused in 1710 Anna Ivanowna, princess of Russia, who, after his death, maintained possession of the duchy; but the government of it was intrusted to Prince Ferdinand, brother of the deceased duke. On the death of Ferdinand in 1737 the estates, in consequence of the influence of the empress of Russia, elected to succeed him her favorite and grand chamberlain, Ernest John Biren, who was exiled to Siberia in 1740. In 1762 the Emperor Peter of Russia recalled Biren, who after some contention with Prince Charles, son of the king of Poland, who had been placed over the duchy in his absence, was declared by the estates the only legitimate duke. In 1769 he transferred the duchy to his son, at whose death the estates of Courland solicited a union with the Russian empire. Catharine consented, and, by an edict of April 1795, secured to the inhabitants all the privileges which they had enjoyed under their princes, and all the rights of her other subjects. In 1818 the Emperor Alexander confirmed the charter of the nobility of Courland, which declared the peasants free, and regulated their relations to their former lords. Libau is the chief commercial city. Pop. 680,500.

Courser, kōr'sėr, a bird of the genus *Cursorius,* belonging to the family *Cursoriidæ* of the order *Grallatores* (waders), closely allied to the plovers, characterized by a bill as long as the head, arched mandibles compressed toward the extremities, basal oval nostrils with an oblong lateral opening, and long legs with three separated front toes, the middle one longest and armed with a serrated claw. They are found chiefly in Africa and Asia, on arid inland tracts, along which they run with great swiftness. One of the species, called the black-bellied courier (*C. temminckii*), is eight inches long, and generally of a cream-colored brown, varied by a ferruginous head and breast, and black on the quills and middle of the body. One of the best-known species is the cream-colored courser, or swift-foot (*C. gallicus*), found almost exclusively in the East, although it has been seen as an occasional visitor in western Europe.

Coursing, a kind of sport in which hares are hunted by greyhounds, which follow the game by sight instead of by scent. Coursing is a very old sport, but in modern times it has been considerably modified in various ways, mainly through the influence of the English coursing clubs, which began to be formed in the latter half of the 18th century, one prominent club, the Swaffham, being founded in 1776. These clubs in 1858 formed a central body called the National Coursing Club, which now controls the whole sport. In 1882 the 'Greyhound Stud Book,' a genealogical record, was started, and dogs without pedigrees, or not entered in that book, are not now allowed to compete. Meetings are held in various localities, at which dogs are entered for a variety of stakes, as horses are at a race-meeting. The "blue ribbon" of the coursing year in England is the Waterloo Cup, run in the Altcar meadows, near Liverpool, for which 64 dogs compete.

This pastime has become immensely popular in the western United States, and under the supervision and control of the American Coursing Board, large meets annually take place in the open country of the two Dakotas, Kansas, Nebraska, Iowa, and Minnesota, where hares are plentiful. The contests take place in practically the same way as in England and under similar rules. The greyhounds are sent out, two in each leash, in the care of a "slipper," who lets the dogs slip upon orders from the judge, when a hare has been sighted. The judge follows the dogs, and gives "points" to each according to the cleverness of its individual work. It may so happen that the dog which actually kills the hare may not be adjudged victor, because the other dog may have made the most points during the course. The following is the scale of marks: (1) For speed, according to the degree of superiority shown, one, two, or three points. (2) For the "go by" (the starting of a greyhound a clear length behind its opponent, passing him in a straightaway run, and obtaining a clear length's lead) two or three points. (3) The "turn" (a sharp turn of not less than a right angle in the hare's course when pressed by a dog), one point. (4) "The wrench," a change of less than a right angle in a hare's course when pressed, half a point. (5) "The kill," two points or less. (6) "The trip," an unsuccessful effort which throws the hare off its legs; or the getting so close to the hare as to snatch the hare and lose hold, one point, more or less, in the judge's discretion. One course will often traverse three miles before a kill is made. The cavalcade of sightseers is kept in a line behind the coursing hare and hounds, by the steward. Consult: 'Coursing the Hare,' H. A. Macpherson ('Fur and Feather Series').

Court, Antoine, äṅ-twäṅ koor, French Protestant clergyman: b. Villeneuve-de-Berg, Ardiche, France, 17 May 1696; d. Lausanne, Switzerland, 15 June 1760. He was one of the most prominent Protestant leaders of his time and is commonly regarded as the restorer of the Reformed Church in France. Consult Hugues, 'Antoine Court' (1872); Baird, 'The Huguenots and the Revocation of the Edict of Nantes' (1895).

Court. Although the word "court" is still used as a descriptive of the household of a reigning monarch and in connection with the official functions of royalty, it is now almost exclusively used in the United States and European countries in connection with judicial tribunals. The objects and powers of the institutions called courts in English-speaking countries and probably in all lands where such institutions are free and independent of the executive,

are: (1) The preservation of personal liberty, the enforcement of the criminal laws, and the punishment of all infractions of the penal code, the trial of persons arrested for violation of criminal laws, and the conservation of the public peace, order, and safety; (2) the preservation of property rights, the adjudication of disputes and controversies between individuals, corporations, and States, and the determination of all kinds of legal actions commonly known as civil suits.

The establishment of law courts, the growth and gradual increase of their jurisdiction and power, has marked, step by step, the advance of civilization, the increase of personal liberty, the rights of individuals to enjoy and to hold property, and to maintain suits for the preservation and enforcement of their civil liberties and the free and unrestrained enjoyment of their personal and real property. Almost every gain in these directions made by the courts of Great Britain in the increase of their authority and jurisdiction represented the acquirement by individuals of increased liberty and the enjoyment of their property rights, coupled with the curtailing of the prerogatives of the king, springing from the acquisition by the people of some great charter enlarging their liberties.

English Courts.— In very early days in England and in many of the European countries all of the power and jurisdiction now held by the law courts was vested in and exercised by the king or the executive ruler, commonly described as the throne. This was also true in the primitive administration of law among the ancients. Such judicial powers were exercised by the executive in early Rome and were delegated to many of the subordinate officers. In the States of Greece the king or chief magistrate was not alone a military leader, but was also the chief judicial officer, as is the case now in Oriental autocracies where the sovereign appoints deputies to act as judges subject to his right of review on appeal. This is the system in vogue at the present time in Persia and Turkey, where the deputies of the shah and the sultan respectively govern the various states and administer the laws. The early English kings held almost absolute judicial power; they were to all intents and purposes courts of law. The sole executive and judicial authority over whatever law there was, free from the will of the king, vested in his person and was exercised by him to such an extent that individual ownership and personal liberties were subordinated to his absolute whim and caprice. As a legal fiction the king was considered, even after the courts had assumed a large measure of independence, the head of the court, and in such sense the king is so treated purely as a matter of fiction at the present time in England, for in that country and throughout Great Britain all writs run in the name of the king. That the administration of justice was one of the prerogatives of the English king in early times is clearly shown by the fact that the king himself sat on circuit even as late as the rule of Edward IV. Regular courts had then been established but authority was still vested in the king to participate personally in the business of the courts. King James I. exercised what has been frequently termed the last judicial act of an English monarch when he settled the controversies between the courts of law and the court of chancery.

The first step toward the separation of the executive and judicial powers as jointly vested in the king came when King John was compelled to sign the Magna Charta, or Great Charter, in 1215. By the Great Charter the inconvenience caused by the court following the king's person was remedied, as far as private litigation was concerned, by the provision that *communia placita* — common pleas — should be held at some fixed place, and it was in this way that the court of common pleas was established in England and that the independence of the courts became a vested right of the people.

John Richard Green, in his 'History of the English People,' after commenting on the vagueness of some of the provisions of the Great Charter says:

> But all vagueness ceases when the Charter passes on to deal with the rights of Englishmen at large, their right to justice, to security of person and property, and to good government.

He also writes:

> A memorable article that lies at the base of our whole judicial system ran, "No freeman shall be seized, or imprisoned or dispossessed, or outlawed, or in any way brought to ruin; we will not go against any man or send against him, save by legal judgment of his peers, or by the law of the land."

Another section of the Great Charter reads as follows:

> To no man will we sell or deny, or delay, right or justice.

In summing up the beneficial effects of the Great Charter Mr. Green writes:

> The great reforms of the past are now formally recognized; judges of assize were to hold their circuits four times in the year, and the king's court was no longer to follow the king on his wanderings over the realm, but to sit in a fixed place.

During the reign of Edward I. judicial reforms of great importance were brought about. The king's court was divided into three distinct tribunals: 1. The court of exchequer, which took cognizance of all cases in which the royal revenues were concerned. 2. The court of common pleas, for the trial of suits between private persons. 3. The court of king's bench, which had jurisdiction in all matters that affected the sovereign as well as in pleas to the crown, or criminal cases that were expressly reserved for his decision. Each of these courts is provided with a distinct staff of judges.

Another judicial reform of even greater importance, was the establishment in the reign of Edward I., of an equitable jurisdiction, side by side, with that of the common law. By this measure was brought into existence the equity side of the court, and by it the law officers of the crown for the first time reserved to it, in its judicial capacity, the correction of all breaches of the law which the law courts had failed to express; equity jurisdiction assuming to correct that wherein the law was deficient by reason of its fixed rules and ancient precedents. This equitable jurisdiction, it will be seen, sprang from the defective nature and the technical and unbending rule of the common law, and was a great gain in the administration of justice. After the establishment of parliamentary government the courts took their law from the legislative enactment, and their jurisdiction was constantly widened and increased by the many legislative acts that were adopted from time to time.

The Court of King's Bench continued, however, to be migratory for some years, but

finally became fixed, like the other law courts, at Westminster. The judges of all the courts were appointed by the king, and could be removed by him at will, until during the reign of William III. (1701) it was enacted that the commissions of the judges should be *quamdiu se bene gesserint* instead of *durante bene placito*, as formerly, and they could be removed only upon an address to both Houses of Parliament. The chancellor, who presides over the equity jurisdiction, became subject to removal by the king at pleasure, his office being by political tenure.

It will accordingly be seen that it was not until the tenure of judicial office was made independent of the king, and the separation of the judiciary from the executive was made effectual, that the independence and power of the courts of law and equity were firmly established; and it was not until these reforms were brought about that the courts were organized and firmly established under the system which prevailed for two centuries prior thereto and so continued until modified by the Judicature Act of 1875, when the several superior courts of England, including the courts of chancery, admiralty, probate, divorce, and the London court of bankruptcy were consolidated into one supreme court consisting of two parts or divisions called respectively the high court of justice and the court of appeals.

The High Court of Justice has original jurisdiction in all causes of action, with appeal to jurisdiction in certain cases from inferior courts. It is a superior court of record, and in it is vested the jurisdiction previously exercised in common-law and equity cases, by the Court of Chancery, and the jurisdiction formerly exercised by the courts of Queen's Bench, and of Common Pleas at Westminster, the Court of Exchequer in revenue and common-law cases; the courts of admiralty and of probate, divorce and matrimonial causes, of common pleas, at Lancaster and at Durham and the other courts created by the commissions of assize, of oyer and terminer, and of jail-delivery. The ordinary judges of the High Court of Justice have equal power, authority, and jurisdiction, but they sit in three divisions: the chancery division, consisting of 5 justices with the lord chancellor as president; the king's bench division, consisting of 14 justices and the lord chief justice as president; and the probate, divorce, and admiralty division, consisting of 2 judges. The criminal jurisdiction of the court is exercised entirely by the king's bench division. The lord chancellor is not to be deemed a permanent judge of the court.

The Court of Appeals has appellate jurisdiction with such original jurisdiction as may be deemed necessary to dispose of cases on appeal. It consists of four *ex-officio* judges and five ordinary judges, appointed by letters patent. The ordinary members of the court are called lords justices of appeal. The four *ex-officio* judges are the lord chancellor, who is the president, the lord chief justice of England, the master of the rolls, the president of the probate division, and the presidents of the other divisions. The Court of Appeals is the superior court of record and the highest court of appeal except the House of Lords. In hearing ecclesiastical appeals the court is composed of judges and assessors, the latter being archbishops or bishops of the Church of England. The Supreme Court and any of the judges can sit at any time or place. By the Act, commissioners of assize on circuit are continued. Matters not deemed proper to be heard by a single judge are to be heard by divisional courts of the high court, consisting of three or not less than two judges. It is provided that the determination of these divisional courts is to be final unless the court gives special leave to either party to appeal. No appeal is to lie from any judgment of the High Court of Justice in criminal matters except for error of law, apparent on the record passed, regarding which no question has been reserved. In the Court of Appeals every appeal must be heard and the decision made by divisions of the court. Under this Judicature Act the High Court of Justice is divided into sections named after the old courts. These courts are so created as to administer justice under simpler forms without distinguishing between law and equity, giving, however, precedence to equitable principles. The lord chancellor, the two chief justices, the chief baron, and the master of the rolls, under this consolidation act, continued to be appointed with the same titles and ranks as before. The judges continued to go on circuit as under the old system. By the Judicature Act the House of Lords is enabled to sit for the hearing of appeals from the English court of appeals and the Scotch and Irish courts.

The Court of Marshalsea of the Household of the King of England, the Court of Our Lady the Queen, the Court of the Palace of the Queen at Westminster, and Her Majesty's Court of Review for the house of Peveril, and certain other minor courts of like import, were abolished by Act of 12 and 13 Victoria.

In addition to these high courts of England there are many inferior courts of criminal and civil jurisdiction. The lowest of criminal courts is that of a justice of the peace, sitting singly; sometimes the justices of the peace, two or more sitting at the same time, constitute a Court of Petty Sessions, and may dispose, in a summary way, of minor specific offenses. Besides inflicting punishment, the justice of the peace, or the Court of Petty Sessions, may commit persons for trial at the assizes. Justices at the Court of Quarter Sessions are commissioned to determine felonies and other offenses not including treason, murder, forgery, and bigamy. These, and other more serious offenses, are reserved for the superior courts, sitting under commission, or oyer and terminer, or of jail delivery in each county. The Assize Courts, so called, sit in general in each county twice a year. Sometimes several counties are united together for the assize court. In London there is a high criminal court known as the Central Criminal Court, and there are many inferior criminal courts known as police courts. The Court of King's Bench has the general supervision over all courts of criminal jurisdiction, and criminal cases may be moved into the King's Bench by writ of *certiorari*. There are a number of civil courts of inferior jurisdiction in which small claims may be litigated before justices or stipendiaries. In each county there are county courts and high courts of justice, for the determination of important civil actions.

The English courts are guided by precedents and by the former rules of the common law. When no former decision can be found, the

judges are guided by analogy to what has been held before on general principles of common law, and sometimes their decisions are based on fundamental principles of the Roman law. Crimes are defined by law, either statutory or by prescription. The English criminal courts have no power to create new crimes, nor can the courts impose any other penalty than those fixed by law.

United States Courts.— The judicial system of the United States, like the government, is of two kinds. It consists of the Federal courts, provided for by the Federal Constitution, and created and deriving their powers from Congress, and of the courts of the several States, created by the States, and provided with law by the legislatures of the several States. All of these courts follow the common law except where it has been repealed or statutory law provided in place of the common law. The judges of the Federal courts, including those of the Supreme Court of the United States, are appointed by the President with the consent of the Senate. The judges of the Federal courts hold office during good behavior, their appointment being for life. The Supreme Court of the United States has original jurisdiction in certain specified cases (see the section of this article on the United States Supreme Court below) and hears such appeals from the inferior courts as are especially provided for, and which will be referred to later.

The inferior Federal courts are the Circuit and the District courts. There are nine circuits in the United States, in each of which is a circuit judge. A justice of the Supreme Court occasionally sits with the Circuit Court judge. A district court judge may also sit on circuit. Sometimes the three sit together, but usually the Circuit Court judge sits alone. These Federal circuit courts exercise jurisdiction, concurrently with the State courts, where the subject-matter of the litigation exceeds $500 in value, and the United States is the plaintiff or is a party to the litigation, or where the suit is between citizens of different States. The Circuit Courts also have exclusive jurisdiction in cases of crime against the Federal government, except where otherwise provided. They have jurisdiction of cases for infringement of patents and copyright, and appeals lie to the Circuit Courts from the District Courts, where the amount involved in the litigation exceeds $50. The United States District Courts — every State is a district and has at least one District Court, some having two or more — are the bankruptcy and admiralty courts of the Federal government. They have jurisdiction in cases where an alien sues, and where the United States or an officer thereof or a foreign consul is a party. The District Courts also have jurisdiction of such crimes as are not capital as the United States takes cognizance of. The United States district court judge presides over a District Court.

The other Federal courts are the Court of Claims, the courts of the District of Columbia, and the Territorial courts.

The Supreme Court of the District of Columbia has jurisdiction corresponding to that of the State courts and similar to that of the Federal District Court. It consists of a chief justice and five associate justices. The District of Columbia has a Court of Appeals consisting of a chief justice and two associate justices.

The Court of Claims consists of five judges, and has authority to hear and determine all claims against the United States, founded upon any law of Congress or regulation of the executive department, or upon any contract, express or implied, entered into with or by the government. It can also be called upon to determine claims which may be referred to it by Congress, also all set-offs, counterclaims, claims of damage or other demand whatsoever on the part of the government against any persons making claims against the government in that court.

A Court of Private Land Claims was established by an Act of Congress of 3 March 1891 for the purpose of determining land claims under the laws of the United States, and land grants. It was provided that this court was to cease to exist 30 June 1903.

According to an Act passed 3 March 1891 the chief justice and associate justices of the Supreme Court were each assigned to a circuit; a Supreme Court justice, with the Circuit Court and District Court Judges to constitute, in each circuit, a Circuit Court of Appeals.

The courts of the Territories of the United States, the judges of which are named by the President and confirmed by the Senate, possess the powers especially conferred upon them by the act providing for their creation. These judges hold office subject to the will of the President. Such Territorial courts have beeen created for Porto Rico and all Territories acquired by the United States as the result of the Spanish-American war.

As the Federal as well as the State courts are the outgrowth of the English system of judicial tribunals, drawing their precedents from the common law, and being in a measure, so far as practice and precedents are concerned, a continuation of the English colonial courts, prior to the Revolutionary War, they have an equity and common-law side.

The several States of the Union have a system of courts similar in many respects to the Federal courts and those of England. Each State has a court of last resort, which hears and determines all questions of law and equity on appeal from the trial court. The highest court in most of the States is named the Supreme Court, although in many of the States, like New York, for instance, the court of last resort is the Court of Appeals, the Supreme Courts in the State of New York being trial courts, similar in jurisdiction to the Superior or Circuit Courts in many of the States. The judges of these State courts are elected for a term of years by popular vote, like other officers. The State courts have a separate criminal and civil jurisdiction, and the court of final appeal in each State settles all questions on appeal except where a violation of the Constitution of the United States is set up.

Each county in the separate States has its probate and other minor courts, and disposes of crimes and civil actions committed within the county. The counties and the towns in each county have justices of the peace and minor courts of limited jurisdiction, like those of the English system, which dispose of minor offenses and determine civil actions. The justices of the peace are usually committing magistrates, who

issue warrants of arrest, hold preliminary hearings, and commit offenders to await the action of the grand jury or the disposition of their cases by courts higher in criminal jurisdiction.

In the large cites and towns there are many police magistrates and justices of the peace to perform the same duties. In some towns and cities the magistrates and police justices are elected, and in others they are appointed by the mayor, as is the case in New York. There are also in each city minor courts which hear and determine civil actions.

Where a prisoner is held by a magistrate for trial, and is subsequently indicted, he or she is placed on trial on the indictment found, in a court of record of criminal jurisdiction, and, upon conviction, appeals in capital cases directly to the court of last resort. The decision of the court of last resort is final unless an infraction of the Constitution of the United States is alleged, and the case is then taken to the Supreme Court of the United States. In case the Supreme Court of the United States finds that a constitutional right has been violated, it orders a new trial of the prisoner. In the event of a decision adverse to the prisoner, the sentence imposed by the trial court is carried out.

A similar rule follows in cases of civil suit where the final appeal is taken to the Supreme Court of the United States. Such appeals from the State courts to the Supreme Court of the United States usually go up on a writ of error. There are, however, in many of the State courts, intermediary courts of appeal, as, for instance, in the State of New York there is the Appellate Division, which disposes of many appeals, and from which an appeal cannot be taken unless a constitutional right has been violated, except upon the consent of the court. In the State of New York the trial courts in civil actions, exclusive of such minor legal business as is disposed of by the Magistrates' and Municipal courts, are the Supreme court and the Surrogates' courts.

The Courts of Special Sessions determine cases of misdemeanor, and capital cases and other felonies are tried in the Courts of General Sessions. The first step in the criminal prosecution after the arrest of the prisoner is the arraignment before the magistrate or the justice of the peace, as the case may be. The prisoner is then either discharged or held, subject to the action of the grand jury, and his trial and various appeals follow as heretofore described.

As New York, second to London, is probably the home of more courts than any other place in the world, a brief *résumé* of the courts of that city may not be out of place here. The borough of Manhattan contains one of the largest judicial systems of the metropolis, and its system is carried out in the other boroughs of the city of New York.

Housed within the County Court-house are the 13 Trial Terms and the 7 Special Terms of the Supreme Court of the county of New York, and the two branches of the Surrogates' Court.

There are similar Supreme Courts throughout the other boroughs and the counties of the State of New York. The jurisdiction of the Supreme Court of the State of New York includes all the jurisdiction which belonged to the Supreme Court of the colony of New York and the Court of Chancery in England, on 4 July 1776, with the exceptions, limitations, and additions created by the constitution and laws of the State. In 1896 the Court of Common Pleas, the Superior Court, and the criminal court of oyer and terminer were merged into it. Sessions are held for the hearing of motions and *ex parte* business in the County Court-house in the borough of Manhattan, New York, beginning on the first Monday of each month. Special terms for equity cases and enumerated business are held in the court-house on the first Monday of each month excepting July, August, and September. Trial terms are held at the court-house — except Part I., Criminal Term, which is held at the criminal courts building, beginning on the first Monday of each month, excepting July, August, and September, and on the third Monday of September. The Appellate Division meets on the fourth Monday of each month except August.

The Surrogates' Court consists of a trial and special term. This court has power to take proof of wills, to grant letters of administration, to direct and control estates and the settlement of accounts of executors and administrators, and to perform many other acts relating to probate business.

The criminal courts in the borough of Manhattan, New York, are Part I., Trial Term of the Supreme Court, and the courts of general sessions of the peace. The first-named court has jurisdiction to hear and determine all crimes and misdemeanors triable within the county, and to deliver the jails of the county, according to law, of all prisoners therein. It has power to try all indictments sent to it from the recorder's sessions, or which may be removed into it from that court, which in the opinion of the justice may be proper to be determined therein. It is held in the Criminal Courts building on the first Monday of January, February, March, April, May, June, October, November, and December.

Three branches of the Courts of General Sessions of the Peace are held every month except July and August, when usually only one part is in session. These courts have a recorder, and also three judges known as judges of the Court of General Sessions. The latter are vested with the same power as a recorder, and, like him, are elected for 14 years at salaries of $12,000 a year each. This court has power to hear and determine, and punish according to law, all crimes and misdemeanors whatsoever, including crimes punishable by death and imprisonment for life, which are triable in the county of New York. Every conviction for a capital offense had in this court is reviewable as a matter of right upon a writ of error to the Supreme Court and the court of appeals, which courts may direct that a new trial be had.

The Court of Special Sessions for the Peace, as reorganized in the spring of 1895, occupies a position between the police and municipal courts and the Courts of General Sessions. Its jurisdiction extends to all misdemeanors. It is held by five justices appointed by the mayor, at salaries of $8,000 a year each, and the cases tried by it are sent to it by the various police courts. The accused, when brought before the police justice, may enter into a recognizance to appear for trial at special sessions. There is no jury trial in this court, and the accused, from the time of his appearance before the com-

mitting magistrate, has his election of trial here or in the Court of General Sessions. His election must be expressed in writing, and jury trial must be expressly waived if he elects to be tried by the court of special sessions. There are two divisions of the city for this court; the first comprises the boroughs of Manhattan and the Bronx, and the second the other three boroughs.

City Magistrate's Courts.— There are in New York 24 justices, called city magistrates, 12 for each of the two divisions of the city. They are appointed by the mayor at salaries of $6,000 a year each, except those of the boroughs of Queens and Richmond, who receive $5,000 a year. They hold the police courts of the city.

Appellate Division of the Supreme Court.— This court was established in 1896. Its jurisdiction covers appeals from the Supreme Court of the county of New York, and is final in all cases except those in which it certifies that questions are involved which should be passed on by the court of appeals. A subsidiary appellate court, known as the Appellate Term of the Supreme Court, sits to hear appeals from the city and district courts.

City Courts.— The City Court was formerly known as the Marine Court. It has no jurisdiction in equity. Its jurisdiction embraces the following cases: An action for the recovery of a sum of money, only where judgment can be rendered for not more than $2,000, or for the recovery of a chattel not worth more than $2,000. The city court has also jurisdiction to enforce a mechanic's lien and to foreclose a chattel mortgage not exceeding $2,000 in value.

The United States Circuit Court, the United States District Court, and the United States circuit court of appeals sit in New York.

Supreme Court of the United States.— The Supreme Court of the United States, created in 1789 after much discussion and consideration and after many attacks had been made upon its proposed jurisdiction, now consists of nine justices, including the chief justice. The chief justice and the associate justices are appointed by the President with the concurrence of the Senate. The justices are appointed for life, and receive a salary of $10,000 a year, with the exception of the chief justice, who is paid $10,500 a year. The justices have a retiring pension of the same amount upon reaching the age of 70 years. The court has original jurisdiction in all cases affecting ambassadors, other public ministers, and consuls, and those actions in which a State is a party. It has final jurisdiction in admiralty, patent, copyright, and revenue cases, and has power to declare void acts of Congress or of the United States which it finds in conflict with the Federal constitution. This great court has always upheld the national character of the Federal government, and has, while indicating the national policy, carefully guarded the reserved rights of the several States. Its decisions have not been confined to narrow questions of commercial law, but have interpreted the Constitution and established the welfare of the nation. Within the great powers exercised by it, it restricts congressional acts to constitutional limits. Its jurisdiction extends over sovereign States as well as over the humblest of its citizens. It has power to annul the statutes of any States in the Union whenever any such statute violates the Constitution and are in violence to civil right, the contracts, the currency, or the intercourse of the people.

Hampton L. Carson, in his 'History of the United States Supreme Court,' says:

> The establishment of the supreme court of the United States was the crowning marvel of the wonders wrought by the statesmanship of America. In truth the creation of the supreme court with its appellate powers was the greatest conception of the Constitution. It embodied the loftiest ideas of moral and legal power, and although its prototype existed in the superior courts of the various States, yet the majestic proportions to which the structure was carried became sublime. No product of government, either here, or elsewhere, has ever approached it in grandeur. Within its appropriate sphere it is absolute in authority. From its mandates there is no appeal. Its decree is law. In dignity and moral influence it outranks all other judicial tribunals of the world. No court of either ancient or modern time was ever invested with such high prerogatives.

The third article of the Federal Constitution provides for the establishment of the Federal courts. It embodies in three sections the system from which has been developed the greatest and wisest judicial system the world has ever known.

Section 1 vests the judicial power of the United States in one Supreme Court, and in such inferior courts as Congress may from time to time ordain and establish, and regulates the tenor of office of all Federal judges, prescribing their good behavior and guaranteeing their compensation against diminution.

Section 2 provides that the judicial power shall extend to all cases in law and equity arising under the Constitution, the laws of the United States, and treaties made, or which shall be made under their authority, to all cases affecting ambassadors, other public ministers and consuls, to all cases of admiralty and maritime jurisdiction; to controversies to which the United States shall be a party; to controversies between two or more States, between a State and citizens of another State, between citizens of different States, between citizens of the same State claiming lands under grants of different States, and between a State, or the citizens thereof, and foreign States, citizens or subjects. It also provides that all cases affecting ambassadors, other public ministers and consuls, and those in which a State shall be a party, the Supreme Court shall have original jurisdiction. In all the other cases before mentioned the Supreme Court shall have appellate jurisdiction both as to law and fact, with such exceptions and under such regulations as the Congress shall make. Section 2 also provides that the trial of all crimes, except in cases of impeachment, shall be by jury, and that such trials shall be held in the State where the said crime shall have been committed; but when not committed within any State, the trial shall be at such place or places as the Congress may, as by law, direct.

Section 3 provides: 1. Treason against the United States shall consist only in levying war against them, or in adhering to their enemies, giving them aid and comfort. No person shall be convicted of treason unless on the testimony of two witnesses to the same overt act or on confession in open court. 2. The Congress shall have power to declare the punishment of treason, but no attainder of treason shall work corruption of blood or forfeiture except during the life of the person attainted.

Before the adoption of the Constitution the great importance of such a court as the Supreme

Court of the United States was discussed. As early as May 1783 Alexander Hamilton called attention to the grievous defect in the Articles of Confederation in failing to provide a Federal court and a court of last resort, especially for the settlement of matters involving foreign nations. In the 'Federalist' he wrote:

> Laws are a dead letter without courts which found and define their true meaning and operation. The treaties of the United States, to have any force at all, must be considered as part of the law of the land. Their true import, as far as respects individuals, must like all other laws, be ascertained by judicial determination. To produce uniformity in these determinations they ought to be submitted as a last resort to one supreme tribunal, and this tribunal ought to be instituted under the same authorities which form the treaties themselves.

James Madison and other statesmen of that day held practically the same view. It was from such ideas as these expressed by Mr. Hamilton and concurred in by his contemporaries that the Supreme Court of the United States took its rise, and when the main business of the Constitutional Convention was begun 28 May 1787 a provision for the creation of a national judiciary was suggested, among a series of 15 resolutions relating to the adoption of the Constitution, commonly known as the Virginia plan. The clause relating to the judiciary provided as follows:

> That a national judiciary be established, to consist of one or more supreme tribunals, and of inferior tribunals to be chosen by the national legislature. The judges to hold their office during good behavior, and to receive punctually, at stated times, fixed compensation for their services, in which no increase or diminution shall be made so as to affect persons actually in office at the time of such increase or diminution; that the jurisdiction of the inferior tribunals shall be to hear and determine, in the first instance, and the supreme tribunal in the *dernier ressort*, all piracies and felonies on the high seas, captures from an enemy, cases in which foreigners or citizens of other States applying to such jurisdiction may be interested, or which respect the collection of the national revenues, the impeachment of any national officers, and questions which may involve the national peace or honor.

A resolution that a national judiciary be established was unanimously passed by the convention, which was made up chiefly of lawyers and four judges. Then followed a vigorous and protracted discussion as to the formation and the method of selecting the various judges. John Rutledge was against establishing any national tribunal except a single supreme one, and he contended that the State tribunals might and ought to be left in all cases to decide in the first instance as to the right of appeal to the supreme national tribunal. He contended that to do otherwise was making an unnecessary encroachment on the jurisdiction of the States. He was supported in these contentions by Roger Sherman. After the various plans and suggestions had been fully discussed, the convention committed to the people of the United States, on 17 Sept. 1787, the Constitution, containing the Article (3) relative to the formation of the Federal judiciary.

The first Congress to meet after the ratification of the Constitution, which was summoned to meet in New York, as the seat of government, on 4 March 1789, did not convene until the beginning of April, and after the counting of votes it declared Washington President-elect. His inauguration followed on 30 April, but there was no Federal judge to administer the oath required by the Constitution, and this service was performed by Robert R. Livingston, the first chancellor of the State of New York under the constitution of that State of 1777. Having had its attention called in this striking manner to the fact that the new Federal government was without a single judge, Congress, the day after its organization, began the preliminary work for the establishment of a judiciary by appointing a committee, of which Oliver Ellsworth, one of the framers of the Constitution, and afterward chief justice of the Supreme Court, was chairman. The judicial Act which set in operation the Supreme Court of the United States, and the circuit and district courts of the United States substantially as it exists to-day, was the work of Ellsworth. It was approved by Washington 24 Sept. 1789.

The first section of this Act provides that the Supreme Court of the United States shall consist of a chief justice and five associate justices (now increased to eight) any four of whom shall constitute a quorum, and shall hold annually, at the seat of government, two sessions, the one commencing the first Monday of February, and the other the first Monday of August. The Senate promptly confirmed Washington's appointment of John Jay of New York to be the chief justice of the supreme court. Washington appointed and the Senate confirmed as associate justices: John Rutledge, of South Carolina; William Cushing, of Massachusetts; Robert H. Harrison, of Maryland; James Wilson, of Pennsylvania; and John Blair, of Virginia. Of these, Jay, Cushing, and Harrison had served as chief justices in their own States; Rutledge, Wilson, and Blair as the members of the convention that framed the Constitution. Harrison declined to serve, and his place was afterward filled by the appointment of James Iredell, of North Carolina.

The first Monday of February,—it was the first day of the month,—1790, being the day fixed for the opening session of the Supreme Court of the United States, in the city of New York, which was then the capital of the Federal government, Chief Justice Jay and Justices Cushing and Wilson appeared in the court room, which had been provided at the Exchange, Federal Hall being occupied by Congress. A quorum was not present and the court was adjourned to the following day, when, Justice Blair having arrived with Edmund Randolph, the first attorney-general, the Supreme Court of the United States was open for its first session. Chief Justice Jay wore on that occasion a robe of black silk with salmon-colored facings on the front and sleeves. This robe was, according to family tradition, the academic gown of a Doctor of Laws of the University of Dublin, which had recently conferred this decree upon the new chief justice. The associate justices wore the ordinary black robes which have since been used by all the members of the court. Richard Wenman was appointed "crier," and made proclamation that the Supreme Court was open. John Tucker, of Massachusetts, was appointed first clerk of the court. After a seal had been adopted the roll of attorneys and counselors was opened. The first name on the roll of counselors was that of Elias Boudinot, of New Jersey, a Revolutionary patriot, who was conspicuous in the Continental Congress and later in the first Congress of the United States. He was also first president of the American Bible Society.

The old distinction between attorneys and counselors was preserved for a time, but was afterward abolished. After holding a few formal sessions the court adjourned, for lack of business, 10 February. In 1791 the Supreme Court was removed to Philadelphia, the then seat of the Federal government, where it continued to sit during term time for 10 years, the court room being on the second floor of the city hall, at the corner of Fifth and Chestnut streets. In 1801 the court was removed to Washington, where it has remained ever since. On the day of the first meeting of the supreme court of the United States in the city of Washington, 4 Feb. 1801, John Marshall sat as chief justice for the first time. The supreme court at present consists of Chief Justice Melville W. Fuller, of Illinois, and Associate Justices John M. Harlan, of Kentucky; David J. Brewer, of Kansas; Henry V. Brown, of Michigan; Edward D. White, of Louisiana; Rufus W. Peckham, of New York; Oliver W. Holmes, of Massachusetts; Joseph McKenna, of California; and William R. Day, of Ohio.

LEWIS P. CLOVER.

Court of Appeals. See COURT.

Court of Appeals in Cases of Capture (1780–87), the chief federal court prior to the establishment of the supreme court, which in a sense grew out of it. From the nature of the revolt against Great Britain, the colonies were very loath to erect any new plenary power to decide their mutual disputes, which would also create new disputes between it and themselves. The first clash of jurisdictions came on the question of naval prizes. As early as the autumn of 1775 cruisers were capturing British vessels off the eastern coast, part under commission from Massachusetts, part from the Continental Congress (see CONTINENTAL NAVY); and Washington, conducting the siege of Boston, was appealed to for determination of conflicting claims, there being neither provincial nor Federal courts for trial and condemnation of captures. On 11 November he suggested to Congress to establish such a court; on the 25th it recommended to the colonies to erect them, reserving an appeal to itself or such persons as it appointed. The act, however, provided neither court, procedure, nor method of enforcement, did not define the source or limits of its jurisdiction, and had the same defects as the entire Confederation proceedings (see CONFEDERATION, ARTICLES OF). Washington criticised it on the first ground. Nor would Congress take original jurisdiction, but only appellate. Several appeals were referred to special committees; then, on 30 Jan. 1777, a special committee on revision of prize methods reported in favor of the creation of a standing committee of five to hear all such appeals. This was appointed, and the following March three more were added, but it was too large, and was shortly reduced to five again, with three as a competent quorum. But Washington's suggestion was evidently the right one, and on 5 Aug. 1777 it was moved to consider the establishment of a permanent court. This was discussed for over two years, and not finally acted on till 15 Jan. 1780. Meantime a case had come up which forced some new method on them. Four Connecticut men in the fall of 1778 had been captured by the British and compelled to help navigate the sloop Active toward New York; then in British hands; they recaptured it from the British crew, and were steering it for a patriot port when a Pennsylvania privateer captured them, and claimed the sloop as prize. A Pennsylvania jury gave the Connecticut men one fourth of the prize, and divided the rest between the privateers and the State of Pennsylvania. The Connecticut men appealed to Congress, which reversed the decision; the Pennsylvania judge refused to admit its authority, and ordered the sloop and cargo sold and the proceeds divided. (It should be said that the State admiralty act prohibited appeal or rehearings.) The committee thereupon refused to hear any more cases till its jurisdiction was settled. Congress resolved that such cases could not be left to self-interested State decision, but that it would not prejudice the Union by resort to force; and the Connecticut men only obtained their rights many years later through the supreme court. After futile conferences with State legislative committees, an act was passed establishing a Federal "Court of Appeals in Cases of Capture," to hold sessions first in Philadelphia, and then anywhere they pleased between Hartford, Conn., and Williamsburg, Va. But like all other enactments of the time, it was shorn of its needful powers: it could not fine or imprison for disobedience, the State courts were not to execute its decrees, and no marshal was appointed. No tenure, either of definite time or good behavior, was assigned to the judges. Three of these were appointed, but one of them died soon after, and the other two performed the duties for two years, when another resigned, and two others were chosen. But the cases were gradually decided after the war, and on 23 Dec. 1784 the docket was reported empty. The judges were still retained, but their salaries were abolished, except for a *per diem* allowance when in actual service. About this time the States began to constitute courts of appeal to take matters out of the hands of the Federal court. The defeated parties, however, insisted on appeals to the latter, and on 27 June 1786 Congress resolved that these should be heard. The last session of the court was on 16 May 1787 at Philadelphia, while the Convention of 1787 (see CONSTITUTION, FRAMING OF) was framing the supreme court. Consult: Carson, 'The Supreme Court of the United States: Its History' (1892).

Court-baron, in England, a court composed of the freeholders of a manor, presided over by the lord of the manor or his steward. These courts have long fallen into disuse.

Court of Chancery. See COURT.

Court of Claims. See COURT.

Court de Gébelin, Antoine, äṅ twăn koor dė zhā-bė-lăṅ, French writer: b. Nimes 1725; d. Paris 10 May 1784. He was a son of Antoine Court (q.v.), and settled in Paris in 1763, after the death of his father. After 10 years he published from 1773 to 1784, 'Le Monde Primitif Analysé et Comparé avec le Monde Moderne,' which, after nine volumes had appeared, remained unfinished. It is a work of disproportioned erudition, on a plan too vast for the labors of a single individual. The other works by which his name is known are 'Lettres Historiques et Apologétiques en Faveur de la Religion Réformée' (1760), a work completed by him on materials left by his father; 'Histoire

Naturelle de la Parole,' extracted from his 'Monde Primitif' (Paris 1776). Toward the end of his life he became a believer in animal magnetism, which was at that time much in vogue. He defended Mesmer, the author of the theory, in his 'Lettre sur le Magnetisme Animal' (1784).

Court of High Commission, a court which was established in Queen Elizabeth's reign, and exercised powers like those which during the reign of Henry VIII. had been entrusted to Lord Cromwell. The judges had the power of arresting suspected persons, imprisoning, torturing them, and causing them to accuse their confederates or their friends. They could impose new articles of faith, and impose them on recalcitrant consciences by compulsion of the severest and most odious kind.

Court of Honor, a court of chivalry, of which the lord high constable was judge. It was a continuation of what in the time of Henry IV. was called *curia militaris,* military court.

Court of Lions. See ALHAMBRA.

Court of Love (Fr. *cour d'amour*), in mediæval France and Germany, a tribunal composed of ladies illustrious for their birth and talent, whose jurisdiction, recognized only by courtesy and opinion, extended over all questions of gallantry. Such courts existed from the 12th to the 14th century, while the romantic notions of love which characterized the ages of chivalry were predominant. The decisions were made according to a code of 31 articles, which have been preserved in a MS. entitled 'De Arte Amatoria et Reprobatione Amoris,' written by André, royal chaplain of France, about 1170. Some of the troubadours were often present to celebrate the proceedings in verse, and the songs of these minstrels were not unfrequently reviewed and judged by the tribunals. Among the ladies who presided were the Countess De Die, called the Sappho of the Middle Ages, and Laura de Sade, celebrated by Petrarch. There was such a court in Provence in the palmy days of the Troubadours. The following case was submitted to their judgment: A lady listened to one admirer, squeezed the hand of a second, and touched with her toe the foot of a third. With which of these three was she in love? King René of Anjou attempted in vain to revive the courts of love, and the last imitation of them was held at Rueil at the instance of Cardinal Richelieu, to judge a question of gallantry, which had been raised in the Hôtel de Rambouillet.

Court-Martial. See LAW, MILITARY.

Court-plaster, so called because originally applied by ladies of the court as patches on the face; black, flesh-colored, or transparent silk varnished over with a solution of isinglass, which is often perfumed with benzoin. It is used for covering slight wounds.

Court, Presentation at, a formal presentation to the sovereign of Great Britain of persons whose status entitles them to that honor. It takes place either at St. James' Palace, at a levee, intended for gentlemen only, or at Buckingham Palace, a drawing-room, where both ladies and gentlemen appear. The days when levees and drawing-rooms are to be held are always announced some time beforehand. It is difficult in the present day to define exactly who may and who may not be entitled to be presented. Members of families of the nobility and landed gentry, diplomats, members of the House of Commons, persons holding high offices under the crown, judges, magistrates, Church dignitaries, officers in the army and navy, persons who have attained distinction by eminence of any kind, and the wives and daughters of the same classes, form the larger number of those presented at levees and drawing-rooms. Persons are often presented on entering on some office or attaining some dignity. Any one who has been once presented is entitled to appear at any future levee or drawing-room without a new presentation. The whole arrangements connected with presentations are under the supervision of the lord chamberlain, in whose office in St. James' Palace information is given to all persons wishing to be presented. The names of ladies and gentlemen desiring presentation, and of the ladies, noblemen, and gentlemen who are to present them, have to be submitted to the sovereign for approval, and there is a strict exclusion of persons of damaged reputation, whatever their rank. Court dress or official uniform must be worn. A British subject who has been presented at St. James' may on any after occasion claim to be presented by the British minister at any foreign court.

Court of Private Land Claims. See COURT.

Court of Special Sessions. See COURT.

Courtat, Louis, loo-ē koor-tä, French painter: b. Paris 1847. He was a pupil of Cabanel; has exhibited in the Salon, and one year won a first class medal. His best-known work is 'Leda,' owned by the French government.

Courtenay, koort'nā or kėrt'nā, **Edward Henry,** American mathematician: b. Maryland 1803; d. Charlottesville, Va., 21 Dec. 1853. He was graduated at West Point in 1821, and was professor of philosophy there 1821–34, and professor of mathematics at the University of Pennsylvania 1834–6. After several years devoted to civil engineering he was professor of mathematics in the University of Virginia 1843–53. He published: 'Treatise on Differential and Integral Calculus'; and 'Calculus of Variations.'

Courtesy, or **Curtesy,** kėr'tē-sĭ, a form of tenure by which a man who has married a woman seized of an estate of inheritance, and has by her issue capable of inheriting her estate, on the death of his wife holds the lands for his life.

Courtesy Title, a title assumed by or given to any person by common consent, as an act of courtesy or respect, not of absolute right. Thus in England, the eldest son of a duke is allowed the courtesy title of marquis; the eldest son of a marquis that of earl; the eldest son of an earl that of viscount, etc. The younger sons of peers above the rank of viscount are allowed the courtesy title of lord; the daughters that of lady.

Courthope, kōrt'hōp, **William John,** English scholar: b. 17 July 1842. He was educated at Harrow and Oxford, was first civil service commissioner in 1892, and professor of poetry at Oxford 1895–1901. He has edited an edition of Pope, and is author of 'Ludibria Lunæ' (1869); 'Paradise of Birds' (1870); 'Life of

Addison' (1882); 'History of English Poetry' in progress Vol. I (1895), Vol. II (1897); 'Life in Poetry'; 'Law in Taste' (1901); 'The Longest Reign.'

Courtmans, koor-măn, **Joanna Desideria Berchmans,** Flemish poet and novelist: b. Oudegem, East Flanders, 6 Sept. 1811; d. Maldegem, 6 Sept. 1890. She was married in 1836. Besides dramas and poems, she wrote 22 volumes of stories. She excelled particularly in her descriptions of the life of the common people. The most notable of her tales are: 'The Hunter's Gift'; 'Dame Daneel'; 'The Cowherd'; 'Aunt Clara's Bonnet.'

Courtney, koort'nā or kĕrt-nā, **Frederick,** Canadian prelate: b. Plymouth, Eng., 5 Jan. 1837. He was graduated at King's College, London, in 1863, entering the Anglican priesthood in 1865. From 1876 to 1880 he was stationed in New York; was rector of St. James' Church, Chicago, 1880–2; and rector of St. Paul's, Boston, 1882–8. In 1888 he was consecrated bishop of Nova Scotia.

Courtney, koort'nĭ, **William Leonard,** English author: b. Poona, India, 5 Jan. 1850. He was educated at Oxford, became editor of the 'Fortnightly Review' in 1894 and has served on the editorial staff of the *Daily Telegraph.* He has published: 'The Metaphysics of John Stuart Mill' (1879); 'Studies on Philosophy' (1882); 'Constructive Ethics' (1886); 'Studies New and Old' (1888); 'Life of John Stuart Mill' (1889); 'Studies at Leisure' (1892); 'Kit Marlowe,' a play ((1893); 'The Idea of Tragedy' (1900); 'Undine' (1902).

Courtois, Bernard, bār-nār koor-twä, French chemist: b. Dijon 1777; d. Paris 27 Sept. 1838. He was trained in pharmacy, and entered Fourcroy's laboratory in the École Polytechnique. He had to join the army in 1799, but after his discharge resumed his chemical work with Thénard and Séguin. In conjunction with the latter he discovered morphine in opium, but nothing was published on the subject till Séguin's paper long after, and Courtois' share has consequently been overlooked. In 1804 he began work on nitrate of sodium, the process consisting in decomposing nitrate of calcium by the carbonate of sodium obtained from kelp. In the course of his operations he observed that the iron vessels were corroded if the liquors from which the sodium salts had been crystallized were kept in them for a time. Investigating the cause of this, he found that on distilling the liquors with sulphuric acid a body with a splendid purple vapor was liberated. He examined it and ascertained some of its properties; for instance, its formation of a detonating compound with ammonia, and then gave a specimen of it to Clément, who read a paper on it, and ultimately resigned the investigation to Gay Lussac. This was the first discovery of iodine. In 1815 his nitre manufacture was ruined, and thereafter he had a precarious livelihood by making various chemical products.

Courtois, Gustave Claude Étienne, güs-tāv klōd ā-tē-ĕn koor-twä, French painter: b. Pusey 18 March 1852. He studied at Paris as a pupil of Gérôme, first exhibited in the Salon in 1876; won the first-class medal at the Paris Exposition of 1889. His works include: 'The Death of Archimedes'; 'Narcissus' (in the Luxembourg); 'Dante and Virgil in Hell'; 'Bayadere'; 'The Burial of Atala'; and a number of portraits.

Courtois, Jacques, zhäk (It. Jacopo Cortese), surnamed le Bourguignon (It. Il. Borgonone). French painter: b. St. Hippolyte, Doubs, 1621; d. Rome 14 Nov. 1676. He was especially eminent in battle-pieces. His wife dying of poison, which he was suspected of having administered, he took the habit of a lay brother of the Jesuits, with whom, though he still practised his art, he remained till his death. His brother William (d. 1679) was also an eminent painter who excelled in historical pieces, and assisted Jacques in some of his works.

Courtrai, koor-trā, Belgium, a fortified town in the province of West Flanders, on the Lys River, 26 miles south of Bruges. It is well built, having handsome and spacious streets, and a fine Grande Place, with several other squares. Its manufactures are table linens, lace, which is celebrated for its beauty of design and exquisite workmanship, cambrics, cotton goods, etc., and it has extensive bleaching and dyeing works. Here, in 1302, took place the "battle of spurs" between the French and Flemings. Pop. (1900) 34,000.

Courtship of Miles Standish, The, the title of a poem by Longfellow. It is in hexameter measure and was published in 1858.

Couscous, koos'koos. See Cuscus.

Cousin, Jean, zhŏn koo-zăn, French artist: b. Soucy, near Sens, France, 1501; d. Sens about 1590. He is generally regarded as the earliest French historical painter. He chiefly painted on glass, but his 'Last Judgment,' painted on canvas for the convent of the Minims at Vincennes, is esteemed an excellent work. He was the author of 'Livre de Perspective' (1560); and 'Livre de Portraiture' (1571). See Firmin-Didot, 'Etude Sur Jean Cousin' (1872).

Cousin Michel, mē'hĕl, a nickname sometimes applied to a German, as John Bull is to an Englishman, or Brother Jonathan to an American.

Cousin, Victor, vēk-tor, French philosopher: b. Paris 28 Nov. 1792; d. Cannes 2 Jan. 1867. He founded a school of eclectic philosophy; combining the doctrines of the Scotch school of Reid and Stewart, based on sensation, with those of Schelling and Hegel, which rest on the opposite principle of idealism or intuition. He was not an original thinker in philosophy, but possessed in a high degree the faculty of clear exposition and for that reason his lectures and his writings enjoyed a great popularity. He rendered a memorable service both to philosophy and literature by his translation of 'Plato' (1840). Besides his 'Fragments philosophiques' (1826) and other works on that theme, he is author of a few biographical sketches, mostly of characters related to the spiritual and intellectual movements of the 17th century: as 'Jacqueline Pascal'; 'Mme. de Longueville'; 'Mme. de Hautefort'; 'French Society in the 17th Century.' As a lecturer and philosophical writer Cousin was distinguished by a rare combination of eloquence, enthusiasm, and clearness of exposition. He possessed a beauty of style such as no modern or ancient

philosopher excepting Plato has equaled. He rendered a very valuable service to his native land in the part he took in the organization of primary instruction. In 1831, under a commission from the French government, he visited Germany to study educational methods there, and the 'Rapport sur l'Etat de l'Instruction Publique' published on his return had powerful influence on subsequent legislation. See Janet, 'Victor Cousin et son Œuvre' (1885); Jules Simon, 'Victor Cousin' (1887); Taine, 'Les Philosophes Classiques du XIXe Siècle' (1888); B. Saint-Hilaire, 'Victor Cousin, sa vie, sa Correspondance' (1895).

Cousins, kŭz'ĕnz, **Samuel,** English engraver: b. Exeter 9 May 1801; d. 7 May 1887. He first brought himself into notice by his engraving of Lawrence's 'Lady Acland and her Children,' in 1826. In 1835 he was elected A.R.A., and in 1855 became the first Royal Academician engraver. Of his numerous works the following may be mentioned: 'Pope Pius VII.' (1827), after Lawrence; 'Bolton Abbey in the Olden Time' (1837), after Landseer; 'Queen Victoria' (1838), after Chalon; 'The Maid and the Magpie' (1862), after Landseer; 'Yes or No' (1873), after Millais; 'Simplicity' (1874), after Reynolds; 'Cherry Ripe' (1881), and 'Pomona' (1882), after Millais.

Coustou, Guillaume, gē-yōm koo-stoo, French sculptor: b. Lyons 25 April 1678; d. Paris 20 Feb. 1746. He was a brother of Nicolas Coustou (q.v.) whom he succeeded as director of the Academy of Fine Arts. Among his works the monument of the Cardinal Dubois, in the Church of St. Roch, is much esteemed.

Coustou, Guillaume, French sculptor: b. Paris 1716; d. there 1777. He was eldest son of the preceding, and on him Joseph II., during his stay in Paris, conferred with his own hands the order of St. Michael. The statues of Venus and Mars, larger than life, which he made in 1769 for the king of Prussia, gained universal admiration. His monument of the dauphin and dauphiness, parents of Louis XVI., in the cathedral of Sens, bears the character of majestic simplicity.

Coustou, Nicolas, nĭk-ō-lä, French sculptor: b. Lyons 9 Jan. 1658; d. Paris 1 May 1733. He is admired for his ability in grouping and delicacy in design, although a tendency to an affected refinement, then becoming common, is observable in his works. His 'Descent from the Cross,' in the Cathedral in Paris, is particularly valued. The younger brother was a worthy disciple of the elder.

Couthon, Georges, zhŏrzh koo-tôṅ, French revolutionist: b. Orcet 1756; d. Paris 28 July 1794. Immediately previous to the Revolution he had made himself conspicuous as a liberal in the provincial assembly of Auvergne, and had gained considerable popularity by the gratuitous assistance he afforded the poor. Some time after the Revolution he was chosen a member of the national assembly, where he soon forfeited his character for mildness and amiability, and allying himself with Robespierre, aided and abetted the latter in all his atrocities. On the downfall of Robespierre's party Couthon shared, along with him and St. Just, in the decree of arrest pronounced by the Convention on 9th Thermidor. The same day he and his compeers were seized in the Hôtel de Ville, where, in the scuffle that ensued, Couthon was nearly trampled to death, but survived sufficiently to be guillotined next day.

Coutts, koots. See BURDETTE-COUTTS.

Coutts, Thomas, Scottish banker: b. Edinburgh, 7 Sept. 1753; d. London 24 Feb. 1822. With his brother James he founded the banking house of Coutts & Company in London, and on the latter's death in 1778 became sole manager. Keen and exact in matters of business, although charitable and hospitable in private, he left a fortune of some $4,500,000. By his first wife he had three daughters, who married respectively the Earl of Guilford, the Marquis of Bute, and Sir Francis Burdett. His second wife subsequently married the Duke of St. Albans, and at her death left the bulk of her property to Miss (now Baroness) Burdett-Coutts, daughter of Sir Francis Burdett.

Couture, Thomas, to-mä koo-tür, French historical and genre painter: b. Senlis, 21 Dec. 1815; d. Villiers-le-Bel, near Paris, 30 March 1879. His best picture is 'Les Romains de la Decadence' (1847), now in the Louvre. Among other works are 'Une Veuve'; 'Le trouvère' (1844); 'Joconde' (1847); and 'The Volunteers of 1793,' now in the Boston Museum of Fine Arts.

Couvade, koo-väd', a curious custom prevalent in ancient as well as modern times among primitive races in all parts of the world. After the birth of a child the father takes to bed, and receives all the delicate food and careful nursing which, among civilized peoples, is given to the mother. This custom was observed, according to Diodorus, among the Corsicans; and Strabo states that it existed among the Iberians. Many travelers from Marco Polo downward have met with a somewhat similar custom among the Chinese, the Dyaks of Borneo, the negroes, the aboriginal tribes of North and South America, etc. No satisfactory reason for this singular practice has yet been suggested. The Indians themselves explain it by saying that descent is directly from the father, while anthropologists suggest that it is a ceremony by which the father proclaims his relation to the new-born child.

Covenant, the first bond or oath drawn up by the Scottish reformers, and called by them a Covenant, was signed in the winter of 1557, on the second coming of Knox to Scotland; another signed by King James, and called the King's Covenant, was signed in 1580. These documents, which it is difficult to characterize by an abstract, are given at length in Burton's 'History of Scotland.' After the union of the crowns of Scotland and England (1603), as the Stuarts favored the Episcopal churches, whose hierarchical form seemed fitted to promote their despotic views, the dangers which threatened Presbyterianism brought its followers in Scotland to a closer union; and when, in 1637, the new liturgy, modeled after the English, was ordered to be introduced into their churches, disturbances arose, which ended in the forming of a new Covenant the following year. This was called the National Covenant. The subscription of it began in the Grayfriars' Church, Edinburgh, 28 Feb. 1638. Copies were circulated throughout the country for general signature, many of which are still extant. The Covenant, with the confession of faith which it embodied, was ratified by the General Assembly at Glasgow, 21

Nov. 1638, and by the Scottish parliament in 1640. It was signed, along with the Solemn League and Covenant, by Charles II. on his landing in Scotland in 1650, and again at his coronation at Scone, 1 Jan. 1651. The Solemn League and Covenant was an agreement entered into by the English Parliament with the Scottish nation during the civil war in the reign of Charles I. In 1642 the Parliament had applied to the Scots for aid, and the application was pressed more earnestly in the following year. The Covenanters, who were then masters of Scotland, demanded that the English Parliament should take the Covenant, and assimilate the doctrine and discipline of the churches of the two nations. In consequence of this stipulation, Sept. 25, 1643, both Houses of Parliament met at Saint Margaret's Church, Westminster, along with the Assembly of Divines and the Scottish commissioners, to take the Covenant, which had been modified by the Assembly. After prayers and sermons, all present held up their hands in testimony of assent to it; and afterward, in their several Houses, subscribed it on a Parliament roll. The House of Commons ordered it to be taken by all persons in their respective parishes next Lord's Day. Though it was subscribed by Charles II. when he could not well help himself, he had little love for it; and in 1661 it was burned by the hangman, and in 1662 abjured by act of Parliament, in both England and Scotland. See COVENANTERS.

Covenant, an agreement between two or more persons, entered into by deed, whereby one of the parties promises the performance or non-performance of certain acts, or that a given state of things does or shall, or does not or shall not exist. It differs from an express assumpsit in that it must be by deed. Affirmative covenants are those in which the covenanter declares that something has already been done, or shall be done in the future. Such covenants do not operate to deprive covenantees of rights enjoyed independently of the covenants. Auxiliary covenants are those which do not relate directly to the principal matter of contract between the parties, but to something connected with it. Collateral covenants are those which are entered into in connection with the grant of something, but which do not relate immediately to the thing granted. Concurrent covenants are those which are to be performed simultaneously. Declaratory covenants are those which serve to limit or direct uses. Dependent covenants are those in which the obligation to perform by one is made to depend upon the performance by the other. Covenants for title are those covenants in a deed conveying land which are inserted for the purpose of securing to the grantee and covenantee the benefit of the title which the grantor and covenanter professes to convey. Those in common use are five in number in England,—of seisin, of rights to convey, for quiet enjoyment, against encumbrances, and for further assurance, —and are held to run with the land. There is beside, in the United States, a covenant of warranty which is more commonly used than any of the others. The covenants of seisin, against incumbrances, and right to convey, are generally held to be *in præsenti* and not assignable.

Covenanters, in Scottish history, the name given to the party which struggled for religious liberty from 1637 on to the Revolution; but more especially applied to the insurgents who, after the passing of the act of 1662 denouncing the Solemn League and Covenant as a seditious oath (see above article), took up arms in defense of the Presbyterian form of Church government. The Presbyterian ministers who refused to acknowledge the bishops were ejected from their parishes and drew around them crowds of their people on the hillsides, or any lonely spot, to attend their ministrations. These meetings, called "conventicles," were denounced as seditious, and to frequent them, or to hold communication with those frequenting them, was forbidden on pain of death. The unwarrantable severity with which the recusants were treated provoked them to take up arms in defense of their opinions. The first outbreaks took place in the hill country on the borders of Ayr and Lanark shires. Here at Drumclog, a farm near Loudon Hill, a conventicle was attacked by a body of dragoons under Graham of Claverhouse, but were successful in defeating their assailants (1679). The murder of Archbishop Sharp on Magus Moor, and this defeat, alarmed the government, who sent a large body of troops to put down the insurgents, who had increased in number rapidly. The two armies met at Bothwell Bridge, where the Covenanters were totally defeated (22 June 1679).

In consequence of the rebellious protests called the Sanquhar Declaration, put forth in 1680 by Cameron, Cargill, and others, as representing the more irreconcilable of the Covenanters (known as Cameronians), and a subsequent proclamation in 1684, the government proceeded to more severe measures. An oath was now required of all who would free themselves of suspicion of complicity with the Covenanters; and the dragoons who were sent out to hunt down the rebels were empowered to kill anyone who refused to take the oath. During this "killing-time," as it was called, the sufferings of the Covenanters were extreme; but, notwithstanding the great numbers who were put to death, their fanatic spirit seemed only to grow stronger. Even after the accession of William some of the extreme Covenanters refused to acknowledge him owing to his acceptance of episcopacy in England, and these formed the earliest dissenting sect in Scotland.

Covent (kŭv ĕnt) **Garden** (corrupted from Convent Garden, originally the garden of the Abbot of Westminster), is a spacious square in London, celebrated for a great market of fruit, vegetables, and flowers. The square was formed about 1631 from the designs of Inigo Jones, and has the arcade or piazza on the north and north-east side, Tavistock Row on the south, and the Church of Saint Paul's on the west. In the 17th century Covent Garden was a very fashionable quarter of the town. The scene of one of Dryden's plays is laid here, and frequent allusions are made to the place in plays of Charles II.'s time. The market, now so famous, appears to have originated about 1656 in a few wooden sheds and stalls. The first theatre erected here was built in 1733. It was burned in 1808, rebuilt from a design by Smirke, burned in 1856, and since wholly rebuilt. Covent Garden is for a stranger one of the sights of London, and is seen to greatest advantage about 3 o'clock on a summer morning; Tuesday, Thursday, and Saturday being the principal market days.

Coventry, kŭv'ĕn-trĭ, England, city in the county of Warwick, 85 miles northwest of London. It is one of the oldest cities in England, formerly a walled town. A Benedictine monastery was founded here in 1044 by Earl Leofric and Lady Godiva (q.v.), his wife. Many of the buildings, the cathedral among them, were destroyed by Henry VIII. Parliaments were convened here by the earlier monarchs of England, several of whom occasionally resided in the city. Pageants and processions were popular in the old days, and they still have many admirers. Some of the houses and a few of the narrow and irregular streets of the 15th and 16th centuries are in existence. Coventry has now several fine churches. Its boundaries have been extended because of the expansion of its industries. Its chief manufactures are bicycles, tricycles, ribbons, and fringes. The city owns its own gas, electrical, and water plants; it has public baths, an excellent system of sewerage, libraries, a technical school, and other public institutions.

Coventry, R. I., a town in Kent County, situated on the Pawtucket River, and the New York, New Haven & Hartford Railroad. The chief industries are the manufacture of cotton and wool. There is also some agricultural interest. The town is noted as the home of Gen. Nathanael Greene (q.v.). Pop. (1900) 5,279.

Coventry Plays, The, a series of 42 old plays exhibiting the characteristics of both the old English Morality and Mystery plays. Three complete sets of such dramas have descended to modern times: the 'Chester,' the 'Towneley,' and the 'Coventry' mysteries; and from these we derive nearly all our knowledge of the early English drama. Coventry was formerly famous for the performance of its Corpus Christi plays by the Gray Friars. These plays contained the story of the New Testament, composed in Old English rhythm. The earliest record of their performance is in 1392, the latest in 1589. The Coventry plays were published in a volume by the Shakespeare Society in 1841, under such titles as 'The Creation,' 'The Fall of Man,' 'Noah's Flood,' 'The Birth of Christ,' 'Adoration of the Magi,' 'Last Supper,' 'The Pilgrim of Emmaüs,' 'The Resurrection,' 'The Ascension,' 'Doomsday.'

Cov'erdale, Miles, English bishop and reformer: b. probably at Coverdale, Yorkshire, 1488; d. February 1568. He was educated at Cambridge, entered the convent of the Augustine friars, and was ordained a priest at Norwich in 1514. He was led some years afterward to embrace the reformed doctrines, and, having gone abroad, is said to have assisted Tyndale in translating the Pentateuch. In 1535 his own translation of the Scriptures appeared, with a dedication to Henry VIII., being the first printed version of the entire Bible. (See BIBLE.) In 1538 he was engaged in superintending at Paris the printing of a revised English version, the greater part of the impression of which was seized and destroyed by the ecclesiastical authorities. The printing presses and types, however, escaped the inquisitors, and being brought over to England, enabled Cranmer's, or the Great Bible, to be printed. The Prayer-book version of the Psalms is from the Great Bible. After the execution of his patron, Cromwell (1540), Coverdale went abroad. Having returned in 1548 he was made almoner to Queen Catharine Parr. In 1551, during the reign of Edward VI., he was appointed bishop of Exeter, but was ejected on the accession of Mary, and thrown into prison. After two years' confinement he was liberated, and proceeded first to Denmark, and subsequently to Geneva, where he assisted in preparing the Geneva Bible (1560), the favorite Bible of the Puritans. On the accession of Elizabeth he returned to England, but his recently acquired views on ecclesiastical ceremonies prevented his being restored to his see of Exeter. He was, however, made rector of St. Magnus, London Bridge. The third centenary of the publication of his Bible was celebrated by the clergy throughout the churches of England 4 Oct. 1835. His writings are numerous. Consult 'Memorials of Miles Coverdale' (1838), which contains a bibliography; Fry, 'The Bible by Coverdale' (1867).

Covered Way, in fortification, a space of ground 30 feet broad, on the outer edge of the ditch, above the counterscarp and next the glacis, ranging round the works of a fortification. It affords a safe communication round all the works, facilitates sallies and retreats and the reception of reinforcements, and its parapet protects the fortifications in its rear.

Coverley, SIR **Roger de.** (1) The name given by Addison to a fictitious character whose adventures were related in the 'Spectator'; (2) a Scotch air and dance, known to the Americans as 'The Virginia Reel.'

Coverly, kŭv'ĕr-lĭ, **Robert,** American composer: b. Oporto, Portugal, 6 Sept. 1863. He has written numerous successful topical songs and piano pieces, including the march, 'The Passing Regiment,' and a 'Spanish Gypsy Dance.'

Coverture, kŭv'ĕr-tŭr, a legal term applied to the position of a woman during marriage, because she is under the cover or protection of her husband. See LAW OF HUSBAND AND WIFE.

Covilhao, kō-vēl-yäñ, Portugal, a town in the province of Beira, on the southeast slope of the Serra da Estrella, some 25 miles southwest of Guarda. In the neighborhood there are noted sulphurous baths. The town contains dyeworks, and important cloth factories. Pop. (1900) 15,527.

Co'ville, Frederick Vernon, American botanist: b. Preston, N. Y., 23 March 1867. He was educated at Cornell University and was instructor in botany there 1887–8, and assistant botanist in the United States Department of Agriculture 1888–93. Since the last named year he has been chief botanist of that department, as well as curator of the United States National Herbarium. He has published: 'Botany of the Death Valley Expedition.'

Covington, kŭv'ĭng-tŏn, Ga., a town and the county-seat of Newton County, 40 miles east of Atlanta, on the Georgia R.R. It has a good local trade, being the commercial centre of a large cotton-growing and dairying region. Pop. (1900) 2,062.

Covington, Ind., the county-seat of Fountain County, situated in the northwestern part of the State, on the Wabash River, the Wabash and Erie Canal, and the Cleveland, Cincinnati, Chicago & St. Louis and the Wabash railroads. It exports live stock and agricultural produce, and has several iron foundries. Pop. (1900) 2,213.

Covington, Ky., city and county-seat of Kenton County, on the Ohio River opposite Cincinnati, with which it is connected by a handsome suspension bridge, 2,250 feet long, and costing $2,000,000. It is the northern terminus of the Kentucky Central Railroad, and is also on the Louisville, Cincinnati & Lexington Railroad. It is a residence town for Cincinnati business men and is the see of a Roman Catholic bishop.

Business Interests.— Covington is the farming, live stock, and whiskey-producing trade centre of central Kentucky, and has steamer connections with all ports on the Ohio. According to the Federal census of 1900 there were 403 manufacturing establishments, with $4,729,786 capital and 3,898 hands, and having annual products valued at $6,610,082. The principal manufactories are distilleries, cotton and woolen-mills, rolling-mills, and tobacco factories. In 1899 there were four national banks, with $1,150,000 capital, and several daily and weekly newspapers.

Public Interests.— Covington is built on a beautiful plain, and has an area of over 1,350 acres. The most notable buildings are the combined city hall and court-house; the United States government building, including the post-office and Federal court rooms; the public library, and the Hospital of St. Elizabeth. At the end of the school year 1897–8 there were 12 public schools, with 4,334 pupils and 120 teachers, a public high school for white children and the William Grant High School for colored, the Academy of Notre Dame, and the Rugby School.

History.— Covington was settled in 1812; laid out in 1815, and incorporated as a city in 1834. Pop. 42,938.

Covington, Tenn., county-seat of Tipton County, on the Illinois Central Railroad. It has an export trade in the agricultural products of the surrounding region, and has cotton-mills, a cotton compress, and saw-mills. Pop. (1900) 2,787.

Covode, John, American congressman: b. Westmoreland County, Pa., 17 March 1808; d. 11 Jan. 1871. He was a farmer's lad of Dutch blood, and became a coal dealer, a woolen manufacturer, and a railroad owner. He entered public life as a Whig, served two terms in the legislature, was sent to Congress in 1854 by the Anti-Masons (see ANTI-MASONRY), and re-elected 1856 as a Republican, serving by regular re-elections till 1863. In 1859 he was appointed chairman of the special committee to investigate President Buchanan's conduct in forcing through the Lecompton Bill (see title below, and LECOMPTON CONSTITUTION), and his report was valuable ammunition for the Republican party. He was a member of the committee on the conduct of the war. After Johnson's accession he was sent South to aid in that President's reconstruction policy, but was recalled for lack of sympathy with it. In 1868 he was again elected to Congress, and was a strong opponent of Johnson. In 1869 he was chairman of the Republican State Committee of Pennsylvania. He was an eager, impulsive man, with the friendships and the enmities natural to such a temperament, but respected for his entire honesty.

Covode Investigation, 1860. President Buchanan, in the struggle to have Congress validate the Lecompton Constitution (q.v.), was urged by the party organs to save the unity of the Democratic party, which was menaced with irremediable division, by using the patronage at his disposal to bring the hesitating members into the ranks. In the debates at the opening of the 36th Congress 1859–60, two anti-Lecompton Democrats alleged that he had attempted to use corrupt influence with them. On 5 March 1860 John Covode (above) moved the appointment of a committee to inquire whether the President or any other official had attempted, by money, patronage, or other improper means, to influence legislation or the execution of the laws, etc. In spite of Democratic objection that only insinuations and no specific charges were made, the rules were suspended by 117 to 45, and the resolution adopted; an investigating committee of five was appointed, with Covode at the head. Buchanan sent in a message of protest 28 March, objecting on the ground that the President could only be indicted by impeachment, and that this was an indictment; and that such a method was inconsistent with the dignity of the office. The protest was declared unfounded by 88 to 40. On 16 June the committee reported, the Republican members declaring that the mass of evidence collected was proof of corrupt use of patronage, and Covode later alleged that they found also direct bribery, as evidenced by bank books. The Democratic members declared the allegations unsupported. No action was recommended to the House by the majority report, and none was taken. On 22 June Buchanan sent a second message protesting against the rejection of his first, and saying that on such views no man of honor and principle could accept the presidency. The House appointed another committee to report on this at the next session. Consult: Report of the Committee, Washington, 1860; Buchanan's 'Autobiography,' with his defense; Curtis, 'Life of Buchanan' (1883), for another defense.

Cow, the female of bovine animals, of which the male is called an ox (q.v.) or a bull. By a familiar process of extension the term has been applied to various other large herbivorous animals, such as the elephant, and even to female seals and whales.

Cowage. See COWITCH.

Cow'an, Frank, American lawyer and writer: b. Greensburg, Pa., 11 Dec. 1844. Making the tour of the world in 1880–1 and 1884–5, he entered Korea before that country had made treaties with other nations. He has written: 'Zomara, a Romance of Spain' (1873); 'The City of the Royal Palm and Other Poems' (1884); 'Fact and Fancy in New Zealand' (1885); 'Dictionary of Proverbial Phrases Relating to the Sea'; 'Australianisms.'

Cow'ard, William, English physician: d. about 1722. He was the author of 'Thoughts on the Human Soul; Demonstrating the Notion of the Human Soul United to the Human Body to be an Invention of the Heathens, and Not Consonant to the Principles of Philosophy or Reason.' This work excited considerable indignation among the more zealous divines, who procured an order to have it burned by the common hangman.

Cowbane, or **Water-hemlock** (*Cicutavirosa*), a perennial, umbelliferous, aquatic plant, producing an erect, hollow, much-branched, striated stem three or four feet high, furnished with

dissected leaves. It is highly poisonous. *C. maculata* is the spotted cowbane of the United States.

Cowberry, a common name for the single species (*C. palustre*) of the genus *Comarum,* of the rose family (*Rosaceæ*). It is known also as March cinquefoil and purple marshlocks. It is a stout green herb with very large and showy purple flowers. It grows in swamps and peat-bogs from Labrador to New Jersey, Iowa, British Columbia; also in Alaska and California. It is indigenous in Europe and Asia. It received the name of cowberry because it was thought, when rubbed on the milk-pan, to thicken the milk. The name is also applied to the cranberry (q.v.).

Cowbird, a bird (*Molothrus ater*) of the family *Icteridæ* (q.v.), abundant throughout North America except in the far north, and notorious because of its habit of escaping the drudgery of domestic cares after the fashion of the European cuckoo. Closely related to the bobolink or reed-bird (q.v.), the cowbird lacks the acute tail feathers and rich spring plumage of that species, while its general build and particularly its stout beak, are even more finch-like. The male is from seven and a half to eight inches long, and iridescent black with a brown head, and the female slightly smaller and nearly uniform dull brown. The cowbird takes its name from the habit of associating in flocks with cattle in the fields, apparently for the purpose of securing the flies which frequent the cattle, or the other insects which are disturbed by their movements. They are migratory and gregarious, never separating in pairs, but apparently quite promiscuous in their sexual relations. Nests are never built, but, like the European cuckoo, the eggs are stealthily introduced into the nests of other birds, preferably those of smaller size, such as warblers, finches, and vireos, of which a great many species are victimized. Apparently the cowbird exercises little choice, but drops its egg into any suitable nest that happens to be convenient; and, owing to its abundance, an astonishingly large number of nests are thus invaded. Some of the smaller warblers, notably the yellow warbler (*Dendroica æstiva*) and the redstart (*Setophaga ruticilla*), endeavor to circumvent the intruder by building a second story to the nest, enclosing between the two floors the egg of the cowbird, and even sacrificing one or more of their own. Nests with three cowbird's eggs thus enclosed in as many compartments have been found. Although but a single egg is deposited at a time, as many as three or four will sometimes be found in a single nest, in which cases they have probably been dropped by different females. The alien eggs hatch before those rightfully belonging to the nest, and, once the young cowbird has hatched, its demands for food so claim the attention of its foster-parents that the latter's own eggs or young are neglected and usually perish. Although chiefly insectivorous, berries and seeds are sometimes eaten by the cowbird.

In the warm parts of America a number of related species occur, which, having similar habits, are also known as cowbirds. A most remarkable relation exists between two South American species.

Molothrus badius, one of those in question, has the unusual habit of seizing and utilizing for the purpose of incubating its own eggs, the nests of weaker birds, whose eggs are destroyed. The second species (*M. rufoaxillaris*) is regularly and perhaps exclusively parasitic on the former.

Cowboys, in the American Revolution, a band of American Tories who infested the neutral ground of Westchester County, N. Y., robbed the Whigs and Loyalists, and made a specialty of stealing cattle. A similar band of marauders on the British side received the name of "Skinners." The word cowboys is now used to designate the men who have charge of the cattle on the vast ranges in the west and southwest of the United States. They are well mounted, and usually wear a fanciful costume. They are bold and adventurous, and necessarily have to encounter many dangers. A number of them were enlisted in two regiments of cavalry for the war with Spain, and, under the popular name of "Rough Riders," greatly distinguished themselves in the early part of the campaign against Santiago, in Cuba.

Cow-parsnip, or **Giant Parsley,** popular names for several species of the genus *Heracleum* of the natural order *Umbelliferæ.* They are coarse perennial herbs three to six feet tall, with large attractive leaves, for which the plants are valued in ornamental gardening, especially close to water and in wet soil. They should not be allowed to produce seed, because they are likely to become troublesome as weeds. Several of the species, of which there are about 60 widely distributed in temperate climates, are used as stock-feed, particularly in Europe, and have been suggested as desirable to plant for this purpose, because they produce an abundance of leaves very early in the spring. *H. panaces* is usually so recommended. It often attains heights exceeding eight feet and bears numerous leaves two or more feet long. Several species are natives of the United States and Canada, and one, *H. lanatum,* furnishes edible stems which in Alaska are called wild celery.

Cow-plant, a perennial genus of the natural order *Asclepiadaceæ,* milkweed family, which has acquired a celebrity from the repeated statement that its juice is used as milk, and that its leaves are boiled to supply the want of cream. This arises from the appearance of the juice, which is white and viscid, and contains the poisonous principles characteristic of the milkweed family. In parts of the United States cow-plant is a common name for the *Rhododendron maximum.*

Cow-pox. See VACCINIA.

Cow'-tree, a name given to a number of trees of different natural orders, the milky juice of which is used as a substitute for milk. A large tree (*Brosimum galactodendron*) belonging to the order *Artocarpeæ,* emits, when pierced, a highly nutritious milky juice with an agreeable creamy odor and taste recalling that of cow's milk, but which is slightly viscid, and soon becomes yellow, gradually thickening into a somewhat cheesy consistency. It grows on the Cordilleras of the coast of Caracas, where it is called *palo de vaca,* or *arbol de lêche.* The negroes and other lean natives of the region fatten on its milk. The cow-tree or hya-hya of Demerara is *Tabernæmontana utilis,* a tree belonging to the *Asclepiadaceæ.* In this order the

milky juice is usually acrid and poisonous, and even that of the other species of the same genus is of a sharp and burning taste. In this case, however, the juice is agreeable and wholesome, although somewhat sticky, owing to the large proportion of caoutchouc.

Cow'-wheat, the common name for the personated genus *Melampyrum,* of which there are several species, the most abundant being the common yellow cow-wheat, *M. pratense.*

Cow'ell, Edward Byles, English Sanskrit scholar: b. Ipswich, Suffolk, 23 Jan. 1826; d. Cambridge 9 Feb. 1903. He was educated at Oxford and was for some years principal of the Sanskrit College, Calcutta, but since 1867 had been professor of Sanskrit in Cambridge University, and was ranked as the foremost English Orientalist of his day. He published: 'The Prakrit Grammar of Varaaruci in Sanskrit and English' (1854); 'The Black Yajur Veda,' books 1–2 (with Roer) (1856–64); 'The Kaushitaki Upanishad, in Sanskrit and English' (1861); 'The Maitri Upanishad, in Sanskrit and English' (1863); 'The Kusumánjula, or Hindu Proof of the Existence of a Supreme Being, in Sanskrit and English' (1864); 'The Aphorisms of Sándilya,' translated from the Sanskrit (1878); 'The Sarva-darsána-samgrahá,' translated from the Sanskrit (with Gough) (1882); 'The Divyávandána' (with Neil) (1886); 'The Buddha-cáritá,' by Asvagosha, in Sanskrit and English (1892).

Cow'ell, John, English jurist: b. Ernsborough, Devonshire, 1554; d. Cambridge, England, 11 Oct. 1611. Educated at Eton and King's College, Cambridge, he soon distinguished himself in law, and in 1594 became regius professor of civil law in his university. In 1607 he offended the House of Commons by certain articles in his law dictionary, 'The Interpreter,' which asserted the absoluteness of the English monarchy, and James summoned him before his council. Ultimately his book was burned by the common hangman in 1610. Besides his dictionary he wrote 'Institutiones Juris Anglicani ad Methodum Institutionum Justiniani compositæ et digestæ' (1605).

Cow'en, Frederick Hymen, English musical composer and conductor: b. Kingston, Jamaica, 29 Jan. 1852. He was brought to England when very young, and studied music under Sir Julius Benedict and Sir John Goss. His cantata, 'The Rose Maiden,' produced in 1870, was followed in 1876 by another, 'The Corsair.' 'Pauline' (1876) is an opera, and 'The Deluge,' an oratorio. His other works include: 'Saint Ursula' (1881), a cantata; 'The Sleeping Beauty' (1885), also a cantata; 'Ruth' (1887), an oratorio; 'Song of Thanksgiving' (1888); 'St. John's Eve' (1889), a cantata; 'Thorgrim' (1890), an opera; 'The Water Lily' (1893), a cantata; 'Signa' (1893), an opera; 'Harold' (1895), an opera; 'The Transfiguration' (1895), a cantata; 'The Dream of Endymion' (1897); 'Ode to the Passions' (1898); 'Coronation Ode' (1902). He has also composed six symphonies, the chief being No. 3 (the Scandinavian), No. 4 (the Welsh), and No. 6 (the Idyllic.) Overtures, dances, suites, songs, and duets, pianoforte pieces, etc., make up the rest of his musical productions. In 1888 he conducted the concerts at the Melbourne Centennial Exhibition, and from 1888 till 1892 was conductor of the Philharmonic Society, and was re-elected in 1900. In 1896 he succeeded Sir Charles Hallé as conductor of the Manchester concerts, Liverpool Philharmonic Society, Bradford Festival Choral Society, etc.

Cowes, kowz, **West,** England, a seaport in Hampshire, on the north coast of the Isle of Wight, at the mouth of the river Medina. The public buildings include the castle, an old block fort of the time of Henry VIII., now used by the Royal Yacht Squadron as their club-house, the Royal London Yacht branch club-house, small town hall, several churches, good hotels, etc. Cowes is now principally known as a yachting port, and is considered the best place for building, fitting out, and laying up that class of vessels. Besides the building and repairing of yachts and other vessels, the industries include sail and rope making, etc. Cowes is the customs port for the Isle of Wight. The harbor, though small, is well sheltered and perfectly safe. The town is connected by railway with the principal places on the island, and there is good steamer service to Portsmouth and Southampton. The yachting season commences about the middle of May and extends to the beginning of November. Regattas are held annually. Cowes is much resorted to as a bathing-place. Pop. (1901) 8,654.

EAST COWES, on the opposite side of the river, is connected with West Cowes by a steam ferry and floating bridge. This place is also given to yachting and all trades connected therewith. Osborne House (q.v.) is in the vicinity. Pop. 2,880.

Cowhage. See COWITCH.

Cowie, George, American naval officer: b. Scotland 1846; d. Rahway, N. J., 23 May 1902. He entered the navy as assistant engineer in 1864, took part in both attacks on Fort Fisher, and was honorably discharged with the thanks of the navy department 19 Dec. 1867. He subsequently served on the Mayflower and other vessels, and for his services in the destruction of Cervera's fleet during the Spanish-American war the President advanced him three numbers. He became a lieutenant-commander in March 1899, served in the Philippines for a short time, and was retired with the rank of captain 18 Aug. 1900.

Cowitch, Cowage, or **Cowhage,** a plant (*Mucuna pruriens*) belonging to the pea family (*Papilionaceæ*). It is a twining annual with large racemes of dark-colored flowers, which in India appear in the rainy season. The food, shaped like the letter S, is covered with delicate bristle-like spines, which are easily detached and, sticking in the skin, produce an intolerable itching. In India these spines are mixed with syrup and used as a vermifuge, the spines acting mechanically. When young the pods are cooked and eaten like string-beans. A plant of the same genus, growing in the West Indies, has the same characteristics. The negroes of the Southern States apply the name cowitch to the poison ivy (*Rhus toxicodendron*).

Cowl (Sax. *cugle;* Lat. *cucullus*), a sort of hood, originally worn by all classes, and still retained by certain orders of monks. It consists of a conical covering for the head, attached to the robe or cloak, and sometimes made to draw over the shoulders also. According to Mabillon,

it was at first the same as the scapular. The Benedictines and Bernardines have two sorts,—one black for ordinary occasions, and another white and very large for days of ceremony. The proper shape of the cowl has been the subject of long and bitter dissensions in the Franciscan order, which four popes exhausted every means to heal, and which were remedied only by time.

Cowles, William Lyman, American educator: b. Belchertown, Mass., 1856. He was educated at Amherst College, where he was instructor in Latin, 1880–3. Since 1894 he has been full professor of Latin there. He has published an annotated edition of 'Terence' (1896) and 'Selections from Catullus' (1900).

Cowley, kow'lĭ, **Abraham,** English poet: b. London 1618; d. Chertsey, Surrey, 28 July 1667. He so early imbibed a taste for poetry that in 1633, while yet at school, he published a collection of verses, entitled 'Poetical Blossoms.' In 1637 he was elected a scholar of Trinity College, Cambridge, where he soon obtained great literary distinction, and published in 1638 a pastoral comedy, entitled 'Love's Riddle,' and another in Latin, called 'Naufragium Joculare,' acted before the university by the members of Trinity College. He was ejected from Cambridge as a royalist and removed to St. John's College, Oxford, where he published a satirical poem entitled the 'Puritan and the Papist.' He engaged actively in the royal cause, and when the queen was obliged to quit England Cowley accompanied her. In 1656 he returned to England, where he now published an edition of his poems, containing 'Miscellanies,' 'The Mistress,' 'Pindarique Odes,' and the never-finished epic, 'Davideis' (on the history of King David). He again visited France, and resumed his functions of agent in the royal cause on the death of Cromwell. On the Restoration he returned with the other royalists. By the interest of the Duke of Buckingham and the Earl of St. Albans he obtained the lease of a farm at Chertsey. In 1660 Cowley took part in founding the Royal Society; in 1661 he published a 'Proposition for the Advancement of Experimental Philosophy'; and a 'Discourse by Way of Vision Concerning the Government of Oliver Cromwell,' which is pronounced by Bishop Hurd one of the best of the author's prose works. He published two books of a Latin poem on plants in 1662; he afterward added four more books, and the whole, together with other pieces, was published in 1678 under the title of 'Poemata Latina.' A poem on the 'Civil War' appeared in 1679; his 'Select Works,' with preface and notes by Bishop Hurd, were published in 1772–7.

Cowley was extremely popular in his day, and his style, both in prose and verse, has been highly commended by critics; but his poems have failed to maintain their ancient popularity. The wit for which they were once celebrated has become obsolete, and he is now little read; but Charles Lamb speaks highly of him as a poet, and Hazlitt as a prose writer.

Cowpea (*Vigna cat-jang*). It belongs to the natural order *Leguminoseæ*, and is native of southeastern Asia, the Malay Archipelago, and central Africa. It was introduced into the United States in the 18th century, and is most largely grown in the southern States, where it is known as the cornfield or black-eye pea. Its habits of growth vary from a bush type in the northern States to a vine where it has a longer period of growth. Numerous varieties are on the market. Whippoorwill, Black, Clay, and Unknown are favorites. They are often grown on poor soils, but such should be enriched either with barnyard manure or phosphatic fertilizers. The seed is sown broadcast or drilled, at the rate of from one half to one and a half bushels per acre.

Uses and Feeding Value.— It is growth for food, hay, silage, soiling, grazing, and soil renovation; having marked powers of enriching the soil in nitrogen like clover (q.v.). Its average percentage composition is:

	Protein	Nitrogen-free Extract	Ether Extract	Crude Fibre	Ash	Water
Cowpea green.....	2.4	7.1	0.4	4.8	1.7	83.6
Cowpea vine silage	2.7	7.6	1.5	6.0	2.9	79.3
Cowpea hay.....	16.6	42.2	2.2	20.1	7.5	10.7
Cowpea seed.....	20.8	55.7	1.4	4.1	3.2	14.8

The average digestibility per cent is:

	Protein	Nitrogen-free Extract	Ether Extract	Crude Fibre	Dry Matter
Cowpea green.....	74	84	59	57	76
Cowpea vine silage.....	57	72	63	52	60
Cowpea hay.....	65	71	50	43	59

Cowpea seeds are eaten by man, either green, shelled, and cooked like garden peas or shell-beans, or dried for winter use. They are occasionally fed to stock. Some find difficulty in curing cowpea hay satisfactorily, but this is overcome with experience. The silage is somewhat similar to the green crop in composition. When used for soiling the amount consumed and time of feeding can be regulated, thus avoiding bloating, which is liable to occur when pasturing. Sheep are usually turned on the pasture before the plants are in bloom, cattle about the time the plants come into bloom; while for swine the peas are allowed to reach full size. The plants are sometimes cut down by the cowpea wilt. The September brood of the boll-worm and the weevil (*Bruchis chinensis*) also give trouble to the plants. Consult: Smith, 'Cowpeas'; Farmers' Bulletin No. 89, United States Department of Agriculture.

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Cow'pens, S. C., a post village in Spartanburg district, near the border of North Carolina, near which a signal victory was gained by the American forces, commanded by Gen. Daniel Morgan, over a British division under Col. Tarleton, 17 Jan. 1781.

Cowpens, Battle of, in the American Revolution, 17 Jan. 1781. At the end of 1780 Cornwallis held South Carolina with a little over 3,000 men, having lost 1,100 with Ferguson two months before, at King's Mountain. Waiting for reinforcements, he lay at Winnsborough, north of the centre, within supporting distance of Fort Motte and Orangeburg in the centre, Charleston and Georgetown on the coast, and Augusta and Ninety-Six in the west. In December Greene came down with only 2,000 men, but with a wonderful group of subordinate leaders fit for separate commands. With 1,100 men he

occupied Cheraw Hill in the northeast, and kept Cornwallis in alarm for his communications with the coast; 900 under Daniel Morgan, part militia, part regulars, he sent west to join hands with the victors of King's Mountain if possible, and alarm Cornwallis for the western posts. Cornwallis moved north into North Carolina to force a like movement on Greene, and sent Tarleton after Morgan. The latter took post in a pasture ground called the Cowpens, near the northern boundary, a few miles southwest of King's Mountain, and just west of Broad River. A long slope led up to a low rise; then came a depression, succeeded 150 yards farther on by another rise; and in rear of this was the river, cutting off retreat. This move of Morgan's was in violation of all military rules, but he was a man of genius and used to militia; he said that he could ask but one thing better, and that was to have them entirely surrounded by the enemy, so they could not run — the river was cheaper than regulars to shoot them down. Tarleton came in sight on the morning of 17 Jan. 1781, and Morgan placed his militia 150 yards in front of the first hill, with injunctions to fire at least two volleys at close range before breaking; on the hill, the famous First Maryland regulars, with some fine Virginians; on the second hill, his cavalry under Col. William Washington, a second cousin of George. As the British closed, the militia did not break; they were under Col. Andrew Pickens, and fired many more than the two volleys, with destructive effect. Finally forced back, they retired to the left around the hills to the river bank, in rear of the cavalry, to re-form. The British left stretched around to flank the right of the American regulars, who drew back to face them; the British thought them retreating, and hurried forward in some disorder. Just then Col. Washington's cavalry charged around the two hills to the left, coming up to the militia's old position and taking the British in rear, with the river on their flank; the militia rushed around the hills to the right, taking them in flank on the left; and the Continental regulars, only 30 yards off, poured in a withering fire and charged bayonet. Hannibal himself never wrought out a finer piece of tactics, or caught an enemy in a deadlier trap. Most of the British troops threw down their arms; the remnant fled with Tarleton, who barely escaped being cut down by Col. Washington's sabre. Of the 1,100, 270 were killed and wounded, and 600 taken prisoners, with two field-pieces and 1,000 small arms. The Americans lost 12 killed and 62 wounded. Nearly a third of Cornwallis' army, including all his light troops, were annihilated at a blow.

Cowper, kow'pėr or koo'pėr, **Edward,** English inventor and improver of machinery: b. 1790; d. London 17 Oct. 1852. During the greater part of his life he was a printer, and some of the most important improvements in machine printing are due to him. Among others may be mentioned the giving a diagonal action to the rollers on the self-acting inking tables. During the latter part of his life he was professor of mechanics and manufacturing arts at King's College. He wrote an elaborate article on a 'Button,' and delivered lectures on the London crystal palace in 1851.

Cowper, William, English poet: b. Great Berkhampstead, Hertfordshire, 15 Nov. 1731; d. East Dereham, Norfolk, 25 April 1800. He lost his mother at the age of 6, and at 10 was sent to Westminster School, which he left at 18 with a fair reputation for classical learning, and a horror of its discipline, which he afterward expressed in his 'Tirocinium.' He was then articled for three years to a solicitor. At the expiration of his apprenticeship he took chambers in the Middle Temple, and in 1754 was called to the bar. It was at the close of his residence in the Temple, in 1763, that the first crisis of his malady occurred. Cowper's family was possessed of considerable influence, and it had been the intention of his family in bringing him up to the law to secure him an appointment in the House of Lords. In this year several clerkships fell vacant, which were supposed to be at the disposal of his cousin. Two of them were conferred on him, the duties of which required him to appear before the house. These his nervousness induced him to relinquish, and accept that of clerk of the journals, which did not entail any public duty. Unfortunately his cousin's right to make this presentation was questioned, and it became necessary that he should submit to an examination at the bar of the house. He was now in a mortal dilemma. Many motives, among which the chief was the honor of his friend, made him feel it an imperative duty to answer the citation; but the more inevitable the necessity of his public appearance seemed, the higher rose his horror of undertaking it. He even looked forward as a relief to the approach of insanity, and finding it too slow he attempted suicide; but this too failed, and on the very day appointed for the examination he resigned the office, and soon after became insane. From December 1763 to June 1765 he remained under the care of a physician. The form assumed by his malady was that of religious doubt and despondency. The Calvinistic views he had adopted in regard to election, and his own powerful and susceptible imagination, made these doubts assume the most dreadful form. He was continually haunted with the belief that he had sinned beyond forgiveness, and that eternal misery of the most aggravated kind was ready to overtake him. On his recovery he settled at Huntingdon, and made the acquaintance of the Rev. Mr. and Mrs. Unwin, with whom he became a boarder, and whose kindness had the most soothing and beneficial influence on him. On the death of Mr. Unwin in 1767 he removed with Mrs. Unwin to Olney, the residence of the Rev. John Newton, who also became an intimate friend and exercised a powerful influence over his mind and conduct. A constant devotion to religious duties was the characteristic of the evangelical school to which Mr. Newton belonged, and to which Cowper endeavored to conform. Newton had resolved on publishing a volume of hymns, and secured the co-operation of Cowper in composing them, but before their publication in 1776 he had been again attacked by his constitutional malady, by which for 10 years from 1773 his mind, with occasional intervals of recovery, was continually clouded. In 1776 he commenced a poem on the 'Progress of Error,' followed by three other poems, 'Truth,' 'Table-talk,' and 'Expostulation'; these with some others were published in a volume in 1782. Lady Austen then suggested the 'Task,' which, together with 'Tirocinium,' formed a second volume in 1785. The 'History

of John Gilpin' is also due to the suggestion of Lady Austen. The translation of Homer, begun in 1784, occupied him for the next six years, and was published in 1791. He removed during its progress, in 1786, from Olney to Weston. In the beginning of 1794 he was again attacked with madness, which was aggravated by the death of Mrs. Unwin in 1796. During intervals of relief he revised his Homer, and composed some short pieces. The 'Task' unites minute accuracy with great elegance and picturesque beauty; and after Thomson, Cowper is probably the poet who has added most to the stock of natural imagery. The moral reflections in this poem are also exceedingly impressive, and its delineation of character abounds in genuine nature. His religious system, too, although discoverable, is more cheerfully exhibited in this than in his other productions. His version of Homer possesses much exactness as to sense, and is certainly a more accurate representation of Homer than the version of Pope; but English blank-verse cannot sufficiently sustain the less poetical parts of Homer, and the general effect is bald and prosaic. As a letter-writer Cowper is unsurpassed for ease, gaiety, and naturalness. An excellent edition of his works, with memoir, is that of Southey; the Aldine and Globe editions are also to be commended. Consult 'Lives' by Smith (1880); Wright (1892).

Cowper's Glands, two glands discovered by an English anatomist, William Cowper, situated in male mammals behind the anterior portion of the membrane of the urethra. They secrete mucus and are active in the generative function, corresponding to Bartholini's glands (q.v.) in the female.

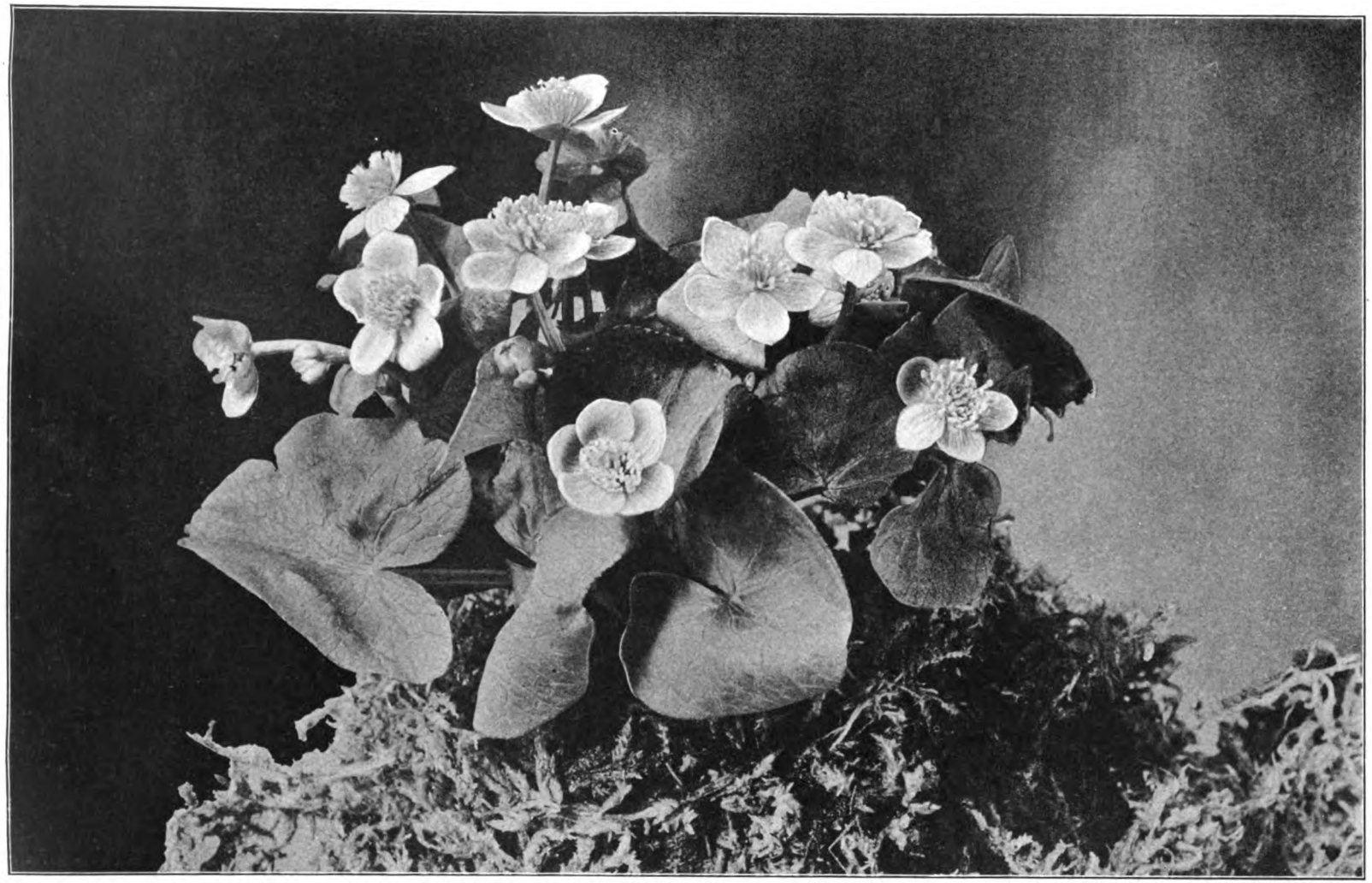
Cow'rie, resins from New Zealand, derived from *Dammara australis,* and in New Caledonia commonly from the *D. ovata.* Most of the resin is found embedded in the earth in cowrie fields, located in the northern islands.

Cowry, a mollusk, shells of the genus *Cypræa,* a gastropod, comprising nearly 200 species with beautifully colored shells. The cowries are mostly confined to the tropics, especially of the Old World, none occurring on the coast of South America. They live in reefs and under rocks at low water and feed on various polyps. The money cowry is *Cypræa moneta.* See SHELL-MONEY.

Cow'slip, a popular name for several distinct species of plants, both American and European. The English cowslip is *Primula officinalis,* of the natural order *Primulaceæ.* It is a stemless perennial herb with a rosette of oval or oblong soft leaves, from among which arise numerous scapes 6 to 10 inches tall and bearing 6 or 8 bright yellow fragrant flowers in a close umbel which leans to one side. The plant has long been a general favorite in gardens where it usually receives little attention beyond an occasional stirring of the soil to remove weeds and the application of the usual winter mulch of stable manure. Several improved varieties have been produced in divers colors. The plant most widely known in America as cowslip is *Caltha palustris,* the marsh marigold, a member of the natural order *Ranunculaceæ.* This is a succulent perennial herb common in wet ground from the Carolinas to the Arctic regions. It has strong fibrous roots, hollow branching stems one to two feet tall, heart-shaped or kidney-shaped leaves, and brilliant yellow flowers resembling buttercup, by which name the plant is sometimes called. It is often cultivated for ornament in marshy ground and has developed some improved double-flowered varieties. Its leaves and young stems are often used as a pot-herb in early spring. The American cowslip or shooting-star is *Dodecatheon Meadia* of the natural order *Primulaceæ.* It is a stemless perennial with fibrous roots, spatulate-oblong leaves in a dense rosette from which the scape rises to a height of 9 to 18 inches or more bearing at its summit several or many pendant pink, white, or lilac flowers with reflexed petals and prominent anthers and pistils. Each flower of the cluster resembles the solitary flowers of cyclamen. Other species of the same genus are also known by the name, and like it are planted in hardy flower borders like the English cowslip. The Virginia cowslip is *Mertensia virginica* (or *M. pulmonarioides*), which belongs to the natural order *Boraginaceæ.* It is also known as blue bell and Virginia lungwort, and is a perennial herb one to two feet tall, and bears pendulous clusters of blue bell-shaped flowers. The plant does best in a sunny situation sheltered from the wind, and a rich loamy soil. In such surroundings it will continue floriferous for years, hence is an admirable plant for rockeries. Propagation is effected by means of seeds and sometimes by division of the plants.

Cox, David, English landscape painter: b. Birmingham 29 April 1783; d. Harborne, near Birmingham, 7 June 1859. He was for several years engaged as scene-painter for various provincial and London theatres, and during a considerable portion of his early life he had to teach his art for a subsistence. After residing in London, Hereford, and elsewhere, he went to Birmingham in 1841. His works are chiefly of English landscape, and in water colors, in which he especially excelled, being ranked by some critics as the first of English water colorists. In later life he painted a good deal in oil. Well-known pictures by him are 'Washing Day' (1843); 'The Vale of Clwyd' (1846); 'Peace and War' (1846); 'The Summit of the Mountain' (1853). He published a work on 'Landscape-painting and Effect in Water-colors' (1814). His son, David Cox (1809–85) ,was likewise a water-colorist of some distinction.

Cox, Sir George William, English clergyman and historical writer: b. Benares, Hindustan, 10 Jan. 1827; d. Walmer, England, 9 Feb. 1902. He was educated at Rugby and Trinity College, Oxford, and took orders in 1850. From 1850 till 1851 he was curate of Salcombe Regis, Devon; from 1854 till 1857, of St. Paul's, Exeter, and in 1881 became vicar of Bekesborne, Kent. From 1881 till 1897 he was rector of Scrayingham, Yorkshire. He succeeded his uncle in the baronetcy in 1877. He published 'Poems Legendary and Historical' (with the historian Freeman, 1850); 'Life of St. Boniface' (1853); 'Tales from Greek Mythology' (1861); 'The Tale of the Great Persian War, from Herodotus' (1861); 'Tales of the Gods and Heroes' (1862); 'Tales of Thebes and Argos' (1864); 'A Manual of Mythology' (1867); 'Tales of Ancient Greece' (1868); 'The Mythology of the



Photograph by J. Horace McFarland Co.

COWSLIP

Aryan Nations' (1870); 'Latin and Teutonic Christendom' (1870); 'History of Greece' (1874); 'The Crusades' (1874); 'The Greeks and Persians' (1876); 'The Athenian Empire' (1876); 'A General History of Greece' (1876); 'History of the Establishment of British Rule in India' (1881); 'Introduction to Science of Comparative Mythology and Folk Lore' (1881); 'Short Historical Anecdotes' (1882); 'Lives of Greek Statesmen' (1885–6); 'Concise History of England and the English People' (1886); 'Life of John William Colenso, Bishop of Natal,' perhaps his most important work (1888); 'The Church of England and the Teaching of Bishop Colenso' (1888).

Cox, Jacob Dobson, American soldier: b. Montreal 27 Oct. 1828; d. Magnolia, Mass, 4 Aug. 1900. He was graduated at Cambridge in 1844, becoming a lawyer; but upon the outbreak of the Civil War was made brigadier-general of Ohio Volunteers. In 1862 he became Major-General of the United States Volunteers, and in 1864 commanded a division at Nashville. He was elected governor of Ohio in 1865, and in 1869 became Secretary of the Interior in President Grant's cabinet.

Cox, John, Canadian educator: b. London, England, 1851. He was graduated at Cambridge in 1874, becoming a Fellow of Trinity, and in 1887 Warden of Cavendish College, Cambridge. He entered the University Extension movement, and in 1889 went to Canada, becoming professor of physics in McGill University, a post he has since retained.

Cox, Kenyon, American painter: b. Warren, Ohio, 27 Oct. 1856. He is a son of J. D. Cox (q.v.). After studying in Paris under Duran and Gerome, he settled in New York in 1883 as a portrait and figure artist. Among important pictures by him are 'Jacob Wrestling with the Angel'; 'Vision of Moonrise'; 'Painting and Poetry'; 'Flying Shadows.' As an illustrator also he takes high rank, his designs for Rosetti's 'Blessed Damozel' being well known, and he has written many able art criticisms and reviews. He is a member of the Society of American Artists, and of the Architectural League, New York.

Cox, Louise Howland King, American artist: b. San Francisco, Cal., 1865. She is a pupil of the National Academy of Design, and of Kenyon Cox (q.v.), whom she married 30 June 1892. In 1896 she won the 3rd Hallgarten prize of the National Academy of Design, and in 1900 was awarded a bronze medal at the Paris Exposition.

Cox, Millard F., "Henry Scott Clark," American lawyer and writer: b. Noblesville, Ind., 25 Feb. 1856. He was admitted to the bar in 1880; was assistant reporter of the Indiana Supreme Court 1885–9, and judge of the Indianapolis criminal court 1890–4. In 1899 he published, under the pen name of "Henry Scott Clark," 'The Legionaries; a Story of the Great Raid.'

Cox, Palmer, American artist and writer for young people: b. Granby, Quebec, 28 April 1840. Since 1875 his home has been in New York. His works are both written and illustrated by himself. He is best known by his 'Brownie Books,' a very popular series containing humorous pictures and verse for children. Other productions are: 'Hans Von Petter's Trip to Gotham' (1878); 'How Columbus Found America' (1878); 'Queer People' (1888); etc.

Cox, Samuel Hanson, American Presbyterian clergyman: b. Rahway, N. J., 25 Aug. 1793; d. Bronxville, Westchester County, N. Y., 2 Oct. 1881. He began the study of law, but abandoned it for theology, was ordained by the New Jersey presbytery 1 July 1817, and became pastor of the Spring Street Presbyterian Church in New York in 1820. He took a prominent part in the anti-slavery agitation; was pastor of the First Presbyterian Church, Brooklyn, N. Y., 1837–54, and during a considerable part of the time was also professor of ecclesiastical history in Union Theological Seminary. He was a prominent member of the New School branch of Presbyterianism, and several times represented it at European gatherings. The last 20 years of his life were spent chiefly in retirement. He published 'Quakerism not Christianity' (1833); 'Interviews, Memorable and Useful, from Diary and Memory Reproduced' (1853); and edited Bower's 'History of the Popes' (1847).

Cox, Samuel Sullivan, American statesman and author: b. Zanesville, Ohio, 30 Sept. 1824; d. New York 10 Sept 1889. He was a Democratic member of Congress from Ohio 1857–65; and from New York 1869–85, and 1886–9. He was also for a short time minister to Turkey. He was a popular lecturer and published 'Eight Years in Congress' (1865); 'Why We Laugh' (1876); 'Diversions of a Diplomat in Turkey' (1887); 'A Buckeye Abroad'; 'Arctic Sunbeams'; 'Orient Sunbeams'; 'Search for Winter Sunbeams'; 'Free Land and Free Trade'; etc.

Coxal'gia, or **Coxitis.** See Coccygodynia.

Coxcie, kŏk'sē, or **Cocxie, Michael,** Flemish painter and engraver: b. Mechlin 1497; d. there 10 March 1592. He was a pupil of Bernard van Orley, and traveled to Rome, where he remained several years, attracted by the works of Raphael, with whom he was probably personally acquainted. Here he executed several paintings in fresco, and many other pieces. He also painted the 'History of Cupid and Psyche,' in the style of Raphael, which was engraved on 32 copper-plates. In the Imperial Gallery of Vienna we find a Madonna with the Infant Jesus by him. His works are rare, even in the Netherlands.

Coxe, Arthur Cleveland, American Protestant Episcopal prelate, and author: b. Mendham, N. J., 10 May 1818; d. Clifton Springs, N. Y., 20 July 1896. He was a son of S. H. Cox (q.v.), but adopted an older spelling of his surname. He took orders in the Episcopal Church in 1841; and after holding rectorships at Hartford, Conn., Baltimore, Md., and New York was consecrated Bishop of Western New York in 1865. He was a vigorous, powerful prose writer, and his 'Christian Ballads' (1840) was long popular. His other works include 'Athanasion and Other Poems' (1842); 'Saul, a Mystery, and Other Poems' (1845); 'Thoughts on the Services'; 'Impressions of England' (1865); 'The Criterion' (1866);

'Apolos, or the Way of God' (1873); 'Institutes of Christian History' (1887); 'The Pascal,' a collection of Eastern poems (1889); etc.

Coxe, kŏks, **Reginald Cleveland,** American marine artist: b. Baltimore, Md., 21 July 1855. He is the son of A. C. Coxe (q.v.). He studied under Bonnat in Paris, has been a member of the Society of American Artists from 1888, and is also a member of the Architectural League, New York. His sea pictures have been much admired, and he is also an etcher of note.

Coxe, Tench, American economist: b. Philadelphia, Pa., 22 May 1755; d. there 17 July 1824. At first a Royalist he became a Whig, was a member of the Annapolis Convention 1786; the Continental Congress 1788; assistant secretary of the treasury 1790; commissioner of the revenue 1792–7; and purveyor of public supplies 1803–12. He early devoted much attention to political economy, and his writings and ideas on this subject constitute his chief claim to remembrance. He favored the prohibition of the coasting trade to foreign shipping; the importation of foreign goods only in ships of the country producing them; the special encouragement of manufactures; and the exemption of raw materials from tariff duties. He urged the South to take up cotton-raising, is sometimes called the father of the American cotton industry, and is said to have been the first to attempt to bring an Arkwright machine to the United States. His publications are: 'Inquiry into the Principles on Which a Commercial System for the United States Should be Founded' (1787); 'Examination of Lord Sheffield's Observations on the Commerce of the American States' (1792); 'View of the United States of America' (1794); 'Thoughts on Naval Power and the Encouragement of Commerce' (1806); 'Memoir on Cultivation, Trade, and Manufacture of Cotton' (1809); 'Statement of the Arts and Manufactures of the United States for the Year 1810' (1814), the first extended attempt to make an industrial census of the country.

Coxe, William, English historian and traveler: b. London 7 March 1747; d. Bemerton, Wiltshire, 16 June 1828. He published an account of his travels through Switzerland (1779), and through Poland, Russia, Sweden, and Denmark (1784–92), which have been translated into almost all the languages of Europe. As historian he brought himself into notice by his 'Memoirs of Sir Robert Walpole' (1798), followed by those of Horatio, Lord Walpole (1802). He then published his 'History of the House of Austria' (1807); afterward 'Memoirs of the Kings of Spain of the House of Bourbon, from 1700 to 1788' (1813).

Coxeyites, the followers of Jacob S. Coxey of Massillon, Ohio, who, during the financial depression existing in the United States in November 1893 announced that he intended to lead an army of 100,000 of unemployed people to Washington, to petition Congress for the issuance of $500,000,000 in non-interest bearing bonds, to be used for the improvement of roads. Coxey left Massillon on 25 March 1894, at the head of 122 people, and reached Washington 1 May. In the attempt to make a speech from the capitol steps, he was accused of stepping on the grass, and with one Carl Browne, was imprisoned for 20 days. The starting of several "commonweal" companies, or Coxey contingents, denominated "armies," for Washington in the early part of 1894, demonstrated how widespread was the condition of idleness.

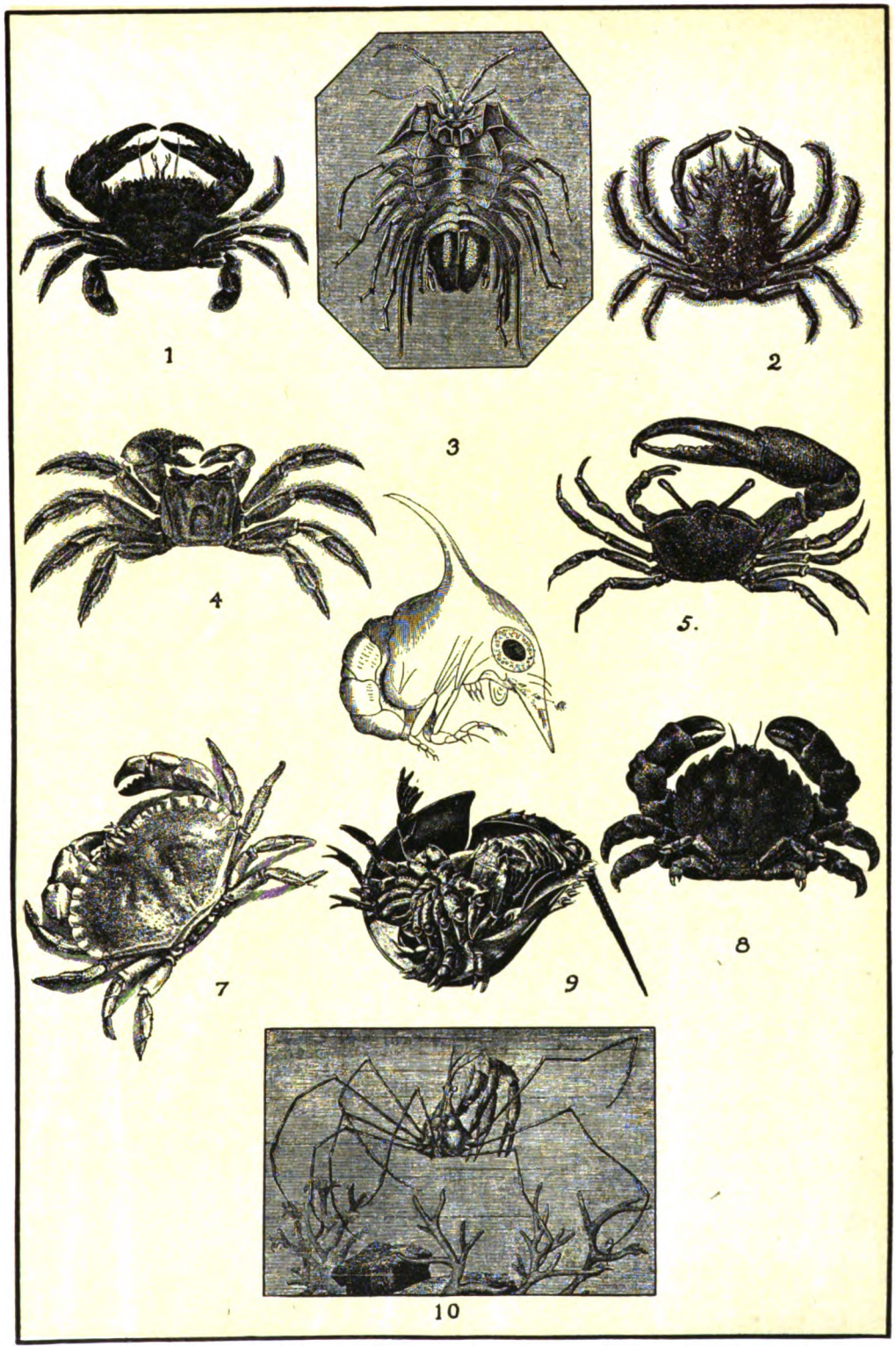
Coxwell, Henry Tracey, English aëronaut: b. Wouldham, near Rochester, 2 March 1819. From boyhood he took a keen interest in ballooning; in 1844 became a professional aëronaut, and in 1845 established the "Aërostatic Magazine." After that he made some 700 ascents, the most remarkable being that of 1862, when he reached a height of seven miles. He published 'My Life and Ballooning Adventures' (1887–8).

Coyle, John Patterson, American Congregational clergyman: b. East Waterford, Pa., 3 May 1852; d. Denver, Colo., 21 Feb. 1895. He was graduated from Princeton College in 1875 and was instructor in Latin there 1877–9. He subsequently entered the ministry and from 1882 to 1895 was pastor of Congregational churches in Ludlow, Mass., New York, North Adams, Mass., and Denver. He was the author of: 'The Spirit in Literature and Life' (1895); 'The Imperial Christ' (1896).

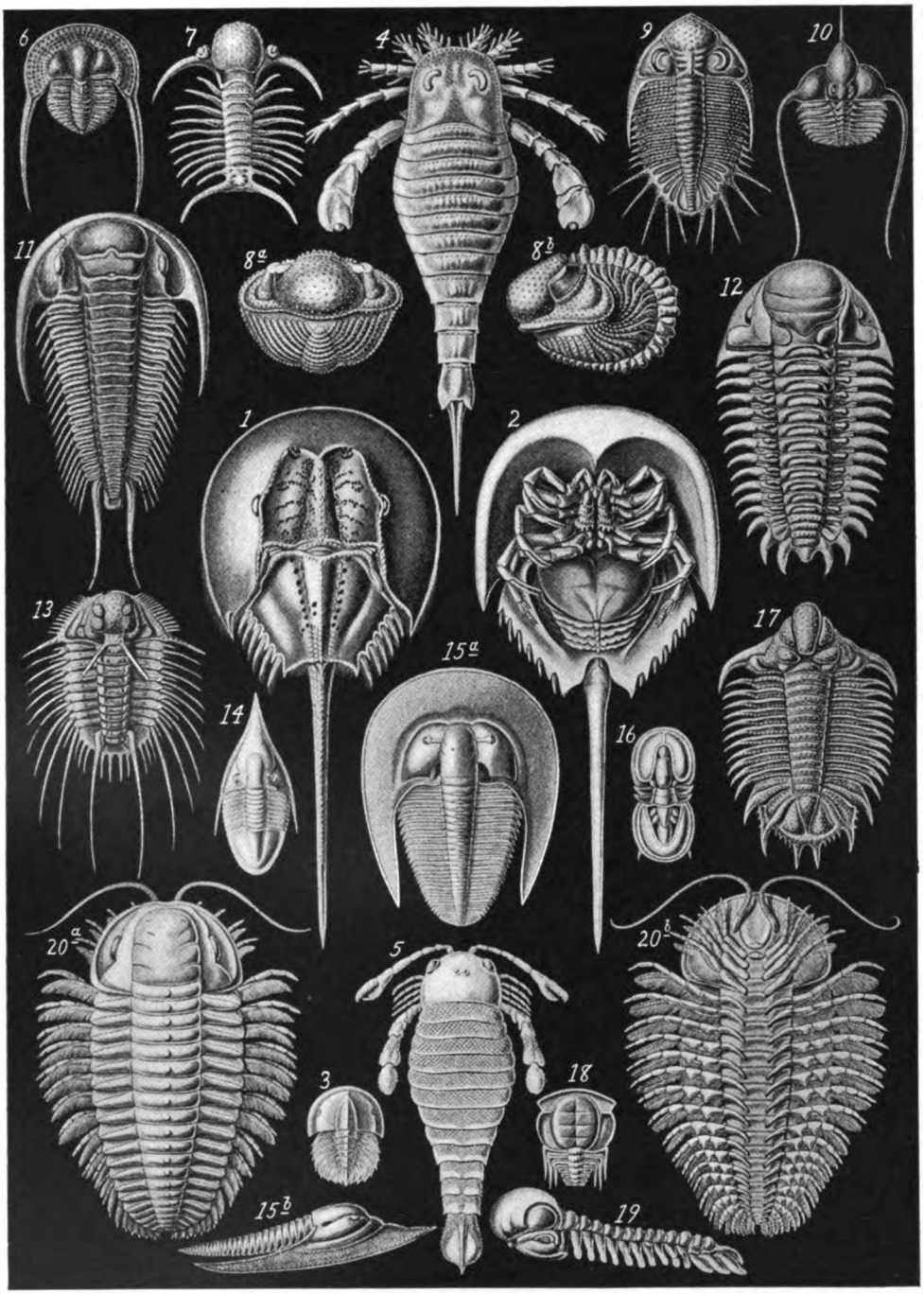
Coyote, kī'ō-tē, the prairie wolf (*Canis latrans*), native to the western United States, and before the advent of civilization numerous as far east as the extent of the prairies of the Mississippi valley, where it was called the red wolf in distinction from the large gray or timber wolf (q.v.). At present it is abundant from the dry plains of Texas, Nebraska, and Manitoba, westward to the Pacific coast, south of central British Columbia, and also in Mexico. Throughout this wide range it supports itself easily in spite of civilization, and at night its long-drawn cry, more like a bark than a howl, may be heard for long distances; and, owing to its predatory habits, this wailing call inspires terror in its possible victims and rouses the anger of the western ranchman whose flocks and herds are apt to suffer from the inroads of the barking wolf, as the coyote is sometimes called.

Coyotes are smaller than other wolves, being about the size of setter dogs, and, although they often travel in packs, as do other wolves, they are cowardly where man is concerned, and confine their raids to the brute creation. Their fur is soft, reddish or tawny-grey in color, sometimes slightly tipped with black. The tail is bushy, the ears upright, and the slender muzzle very pointed. The coyotes live in hollows among rocks, or in deserted burrows, whence they usually issue at dusk, to hunt. Their food is chiefly gophers, mice, ground-nesting birds, prairie-dogs, and other small animals, their depredations on sheep-folds and cattle-ranches being mainly reserved for winter. In former days they were persistent enemies of the pronghorns. They are fleet footed, cunning in avoiding snares, and adapt themselves readily to varying conditions,—hence they increase rather than diminish in the more isolated regions where they are found. They were well known to the western Indians and formed the basis of some breeds of their dogs. Many tales of American Indian folk-lore in these tribes are concerned with them. Consult Wolf; and consult: Elliot, 'Synopsis of Mammals' (1901); Ingersoll, 'Wild Neighbors' (1897).

CRABS.



1. The Bow Crab (Thalamita natator).
2. The Thornback Crab.
3. Serolis Bromleyana.
4. The Sand or Horseman Crab (Ocypoda).
5. The Fiddler Crab (Gelasimus pugilator).
6. A Crab at an early (zoea) stage of growth.
7. European Edible Crab.
8. The Sponge Crab (Dromia vulgaris).
9. The Horseshoe Crab (Xiphosurus).
10. The Spider Crab (Stenorhynchus longirostris).



TRILOBITES AND KING CRABS.

1–3 Limulus moluccanus. King Crab–upper–lower views are larva. 4 Eurypterus Fischeri. 5 Pterygotus Anglicus. 6–21 Trilobites of various forms.

Coypel, kwä-pĕl, **Noël,** French painter: b. 25 Dec. 1628; d. Paris 24 Dec. 1707. After he had embellished, by the royal command, the old Louvre with his paintings (from the cartoons of Lebrun), and had in like manner adorned the Tuileries, he was appointed a director of the French Academy in Rome. His four pictures for the Council Hall at Versailles — Solon, Trajan, Severus, and Ptolemy Philadelphus — excited the admiration of connoisseurs. His chief works are the 'Martyrdom of St. James' (in the church of Notre Dame), 'Cain Murdering His Brother' (in the Academy), the 'Trinity and the Conception of the Holy Virgin' (in the Hotel des Invalides). Coypel had a rich imagination, drew correctly, understood expression, and was an agreeable colorist.

Coypu, koi-poo′, or **Nutria,** an aquatic rodent (*Myopotamus coypu*), native to South America. It is known colloquially as the nutria, or otter, in the countries where it is found, and its pelt furnishes the fur known commercially as "otter." It is not an otter, but is related to the beaver. It is dull brown, has a gray muzzle, and red incisors. Its nostrils are so set that it can breathe when all immersed except the tip of its nose. It is somewhat smaller than the beaver, and has a slender, rat-like tail. It is distinctly aquatic, dwelling in ponds, and burrowing into the banks, or building platform-nests among the reeds on the shore. Owing to the threatened extermination of the coypu local laws have been enacted for its protection as a valuable fur-bearing animal, and it has been saved by these and by a smaller demand for its pelt. Its call is like the moan of a human creature in pain; and when a female and her family of eight or nine take to the water they become very noisy, as well as playful. Consult: Hudson, 'The Naturalist on the La Plata' (1892). See BEAVER.

Coysevox, Antoine, äṅ twäṅ kwäs-vŏks, French sculptor: b. Lyons 29 Sept. 1640; d. Paris 10 Oct. 1720. Among his best works are an equestrian statue of Louis XIV.; the statue of Cardinal Mazarin; the tomb of Colbert; the group of 'Castor and Pollux'; the 'Sitting Venus'; the 'Nymph of the Shell'; the 'Hamadryad'; the 'Faun with the Flute'; 'Pegasus and Mercury.'

Coyuvos, kō-yoo′vōz, natives of the Cuyos islands, Philippines. They are of Tagbanua stock and speak the Tagbanua language. They are Christians.

Cozens, John Robert, English water-color painter: b. 1752; d. 1799. He was instructed by his father, Alexander Cozens. In 1776 he visited Switzerland, with Payne Knight, and in 1783 returned from an extended tour in Italy with William Beckford, who commissioned many of the washed drawings which he then executed. Among his English subjects are some fine studies of trees made in Windsor Forest. The date of his death has been usually stated as 1799, but there is reason to believe that he was alive after 1801.

Cozumel, kō-soo-māl′, an island in the Caribbean Sea, off the coast of Yucatan in lat. 20° 34′ N.; lon. 86° 44′ W. It is 30 miles long, by about 8 miles broad, and is low and covered with trees. It is fertile, and abounds in fruit and cattle. Numerous interesting remains of ancient buildings have been discovered on it. When visited in 1518 by Juan de Grijalva it contained a numerous population, and was much resorted to as a place of peculiar sanctity by the Indians of the neighboring continent.

Cozzens, kŭz′ĕnz, **Frederick Swartwout,** American humorist: b. New York 5 March 1818; d. Brooklyn, N. Y., 23 Dec. 1869. He was a wine merchant, to whom literature was a recreation. In 'Yankee Doodle' (1847) were published his earliest humorous poems and sketches. In 1853 a volume entitled 'Prismatics' was published under the pen-name of "Richard Haywarde"; and in 1856 the 'Sparrow-grass Papers,' which attained great popularity.

Crab, the name applied to any of the brachyurous or short-tailed decapod crustacea, comprising numerous forms, which, with the exception of a very few fresh-water species, are inhabitants of the ocean. In the crabs the abdomen is folded under the chest (cephalothorax), while the antennæ are short and small. The group includes among others the spider-crabs (*Hyas, Libinia,* etc.), which have a somewhat spherical body with long sprawling legs. The shore-crabs are represented by the species *Cancer,* which are among the largest of the order. They have a broad shell or carapace, without a prominent beak, or rostrum. There are nine gills on each side. Of the two species on the New England and Canadian coast, *C. irroratus* is the more common, and often used for food, and *C. borealis* is less abundant. A fossil species (*C. proavitus*) has been detected by Packard in a collection from the Miocene Tertiary green-sand beds of Gay Head, Martha's Vineyard. It appears to have been the source from which the two existing species arose by divergent evolution. Allied to Cancer is the mud-crab (*Panopæus*).

The soft-shelled crab of the markets is *Neptunus hastatus;* it is so-called from being captured soon after molting, when its shell is still soft. The fiddler-crabs (*Gelasimus*) so abundant on our shores, dig holes near high-tide mark, closing the entrance with their larger claw. The oyster-crab is soft-shelled from living within the shell of bivalves (see COMMENSALISM). The land-crabs of the tropics live away from the sea, only going to it to lay their eggs in the water during the spawning season. See also CRUSTACEA; HERMIT-CRAB; PALM OR ROBBER-CRAB; and the various groups and species above mentioned.

Crab, in ship-building, a wooden pillar, with its lower end let down through a ship's decks, resting upon a socket like the capstan. It is employed to wind in the cable or to raise any weighty matter. It differs from the capstan by having no drum-head, and by having the bars going entirely through it. The same name is given to a portable wooden or cast-iron machine fitted with wheels and pinions similar to those of a winch, of use in loading and discharging timber vessels, etc.

Crab-apple, a plant of the genus *Pyrus-malus,* belonging to the apple family (*Pomaceæ*). The genus comprises about 15 species, natives of the temperate zone of the northern hemisphere. The term crab-apple is applied rather vaguely to any sour or uncultivated species of the apple family, but strictly it belongs

to the wild-growing varieties of the true apple, which is produced from the crab-apple by cultivation. The species best known in America is the narrow-leaved crab-apple, which is a small tree, reaching 20 feet in height, with a diameter of 10 inches. It grows in thickets from New Jersey to Illinois and Kansas, and south to Florida and Louisiana. The American crab-apple grows to the height of 25 feet, and has a diameter of 12 inches. The wood is soft, and of a reddish-brown color. In both trees the wood weighs about 44 pounds to the cubic foot. The American crab-apple grows from Ontario west to Michigan, and as far south as South Carolina. Its fruit is about one and a quarter inches in diameter, greenish-yellow, very fragrant, and externally acid. This tree is known also as the sweet-scented crab-apple. Other species grow farther south and west, one species, known as the western crab-apple, resembling the American crab-apple, is found from Minnesota eastward through Wisconsin and Illinois, and extends south and west through Kentucky to Louisiana and Indian Territory. The cultivated crab-apple requires about the same treatment as the true apple. See APPLE.

Crab-eating Dog, a fox-dog (*Canis cancrivorus*), native to eastern South America from Guiana to northern Argentina, but said to be quite unknown on the pampas. It is somewhat smaller than the colpeo (q.v.) of the extreme south, and less handsome in color. In this respect it is subject to great variation, ranging from black, with bright red on the legs, to dull gray with very little black on the back, but the tip of the tail is always black. It is a forest- or jungle-dwelling animal, feeding upon rodents and birds and upon crustaceans, whence its English and Latin name. It does much damage to poultry in the inhabited districts; when hunting in the woods it follows its prey by scent, but in the open it is said to hunt by sight.

Crab-eating Ichneumon, ĭk-nū'mŏn, a mungoose (*Herpestes urva* or *cancrivorus*), native to southern Asia from the slopes of the Himalayas to southern China and Assam. It is said to be partially aquatic in habits and to live on frogs and especially on crabs, whence its name. It is, however, little known scientifically.

Crab-eating Raccoon, a kind of raccoon (q.v.) native to South America (*Procyon cancrivorus*), considerably larger than the northern raccoon and having shorter fur and proportionately much larger teeth. It is found from Panama to Colombia and Guiana. The darker sort, found further south, has often been considered as a distinct species, and called the black-footed raccoon. In habits, these South American raccoons are much like their northern relatives.

Crab Grass, or **Finger Grass** (*Panicum sanguinale*), belongs to the natural order *Gramineæ*, or grass family. It is a very common annual grass found throughout the United States and thriving in warm weather. It has erect or decumbent stems which often grow two or three feet high and bear from 4 to 15 erect or spreading spikes, which carry the flowers and fruit. It is cultivated in the southern States for hay and pasturage. The hay is easily injured if wet while curing. Its value is similar to that of Bermuda grass. It was introduced from Europe, where it is a weed, although it is cultivated on sandy land in Bohemia, the fruit being used for porridge. In the northern parts of the United States, owing to its strong roots it is difficult to eradicate and is regarded as a bad weed.

Crab Island, West Indies. See VIEQUES.

Crab-louse, one of the wingless *Hemiptera* of the family Pediculidæ or suctorial lice (*Phthirius inguinalis*). It is different in shape from the other lice, having a short and broad crab-like appearance. It is whitish, with the thick legs and claws reddish, and is nearly one tenth of an inch in length. The crab-louse infests the pubic regions of the human body, sometimes occurring among the hairs of the arm-pits, or even of the eye-brows. The insect attaches its eggs in great numbers to the hairs, as may easily be seen with an ordinary reading-glass; and the young half burrow beneath the skin, clinging tenaciously. The itch or disease called phthiriasis is due to the attacks of this repulsive pest, when occurring in great numbers. The virulence of the disease in ancient writings was probably exaggerated. Sharp suggests that in the cases of disease attributed to this insect the patient was suffering from some other disease, but being in a neglected and filthy condition was horribly infested with these disgusting creatures. Red precipitate, and any oily or greasy applications, together with frequent use of carbolic acid soap are efficient remedies.

Crab-spider, a small spider of the family *Thomisidæ*, so-called on account of its laterally bent legs and side-wise progression. The body is much depressed and the ocelli arranged in two parallel transverse rows. The *Thomisus vulgaris* and other species are common in the United States. They spin no webs except for the support of the cocoon, but pursue their prey which, owing to their flat bodies, they are enabled to seek in crevices. The claws or talons of this spider are very large and strong; sometimes they are removed, set in gold, and used as tooth-picks, being supposed to have medicinal properties as prophylactic of tooth-ache. The name is also applied to the bird-catching spider (q.v.).

Crabb, George, English lawyer and philologist: b. Palgrave, Eng., 8 Dec. 1778; d. Hammersmith, Eng., 4 Dec. 1854. He studied in Germany, and on his return to England published a series of German text-books which were long in use. In 1829 he was admitted to the bar. He was the author of 'Dictionary of English Synonyms' (1816); 'An Historical Dictionary' (1825); 'Mythology of All Nations' (1847); 'A Technological Dictionary'; 'A History of the English Law'; 'A Digest and Index of All the Statutes at Large'; 'A Technical Dictionary of Terms Used in Science and Art'; and 'A Dictionary of General Knowledge.'

Crabbe, George, English poet: b. Aldborough, Suffolk, 24 Dec. 1754; d. Trowbridge, Wiltshire, 3 Feb. 1832. Having been educated for the medical profession, he settled as a surgeon in his native village, but finding his practice insufficient to afford him a livelihood, resolved to trust to his talent for poetry for support. With this view he proceeded to London, and after a year, when on the point of being thrown into jail for debts unavoidably contracted, as a last resource, in an auspicious moment, he applied to Edmund Burke for assistance, transmitting to him at the same time some

verses as a specimen of his abilities. In these sketches Burke at once recognized the hand of a master. He invited the poet to Beaconsfield, watched over his progress, and afforded him the benefit of his taste and critical skill. Under his auspices the 'Library' was prepared for publication, and by it Crabbe was at once raised to fame. But the efforts of Burke did not stop here. By his advice and assistance — notwithstanding the irregularity of his education — Crabbe was admitted to holy orders, and obtained ample preferment. In 1783 appeared the 'Village,' which placed Crabbe's reputation on a permanent basis. Two years afterward it was followed by the 'Newspaper.' 'The Parish Register' appeared in 1807. In it Crabbe first fully developed the style which may be regarded as peculiarly his own — that minuteness, yet force and truthfulness of description, that searching analysis of human character, which stamps him as an original as well as a great poet. 'The Borough' appeared in 1810, followed in 1812 by 'Tales in Verse,' and in 1819 by 'Tales of the Hall.' The latter years of Crabbe's life were spent in the peaceful discharge of his professional duties at Trowbridge in Wiltshire. Consult 'Lives' by his son (1835); Kebbel (1888); Ainger (1902); Stephen, 'Hours in a Library' (1876).

Crabeth, krā'bĕt, **Dirk** and **Wouter,** wow'tėr, two famous Dutch glass painters of the 16th century: b. Gouda. Both traveled in Italy, Wouter especially being influenced by Raphael, and then each established a glass factory at Gouda. Wouter's paintings are found in France and Italy, but the best work of both brothers is in the St. Janskerk in Gouda, where Dirk painted seven windows, of which 'Driving the Traders from the Temple,' 'The Baptism by John,' and 'The Last Supper' are the finest, and show more brilliant coloring than those of Wouter. The others are: 'The Sacrifice by Elijah Before the Priests of Baal'; 'Washing the Disciples' Feet'; 'Queen of Sheba Before Solomon,' and 'The Sacrilege of Heliodorus.' Wouter died about 1601, 20 years after his brother. His work was of wider range than Dirk's, including some portraits and archer groups in the Museum of Gouda, and excelled it in drawing and in treatment of lights. Portraits of the brothers, who were bitterly jealous of each other, are in the St. Janskerk. Wouter's grandson Wouter was an historical painter.

Cra'bro (Lat. "hornet"), a genus of hymenopterous insects; belonging to the section *Aculeata,* or sting bearers, and to the sub-section *Fassores* (burrowers). The hornet (*Crabro vulgaris*) is the type of this genus, which is now raised to the rank of a family named *Crabronidæ.* Some insects of this family excavate their nests or retreats in woods. In the United States they build principally in fences, trees, etc.

Crabtree, Charlotte (best known by her stage name 'Lotta'), American actress: b. New York 1847. She made her first appearance on the stage when six years old in an amateur performance. At the age of 10 she played the part of Gertrude in the 'Loan of a Lover' at Petaluma. In 1863 she appeared in New York in spectacular plays at Niblo's Garden, and first gained a reputation in John Brougham's 'Little Nell and the Marchioness.' She soon became a favorite with the American public in pronounced comedy, playing parts especially written for her. Her chief successes have been as 'Topsy,' 'Sam Willoughby,' 'Fire-fly,' 'Musette,' 'Zip,' 'Bob,' 'The Little Detective,' and 'Nitouche.'

Cracker. See Biscuit.

Cracker Industry, The. The history of the cracker or biscuit industry in America is a story of phenomenal development. Perhaps no other single industry is so far-reaching in its sources of supply, or enters into so many homes with its perfected product, as that under consideration.

The name biscuit, derived through the French from the Latin, means "twice baked," and had its origin in the fact that the military bread of the Romans was twice prepared in the oven. As applied to the product of bakeries, this term was brought from England to America, and came into general use here probably not much earlier than the middle of the 19th century. In Europe all articles of food in the shape of small cakes made from flour, with sweeting or flavoring added, have always been and still are called biscuits. Goods of this variety, however, were at first unknown in the United States, and the term generally applied to the first crude productions made of plain and unsweetened dough was cracker. This latter name has ever since retained its significance in this country in connection with the plain, usually crisp, unflavored grades of goods, which, however, when introduced afterward into Europe, were there all absorbed into the generic title biscuit, the name cracker falling into disuse. We have gradually adopted to some extent in America this more sweeping classification, but the distinction between the specific name cracker and the general term biscuit it is well to bear in mind.

The first cracker produced in the United States, so far as known, was pilot or ship bread, a large, round, clumsy, crisp affair, which supplied the demand of the merchant marine for an article of food that would, unlike ordinary bread, keep for a prolonged period. Then another variety was originated, the cold-water cracker, which differed from the first chiefly in its smaller size, more compact texture, and greater hardness. For a long time these two crackers were the only goods known to the trade. They were both made of unleavened dough (flour and water and a little salt), mixed and kneaded by hand; and each cracker was rolled out and shaped separately before being placed, one at a time, on a long-handled sheet-iron shovel or peel, and transferred in order to the floor of the oval-shaped tile oven then in use. It was not until some time later that raised or fermented dough was used in the manufacture of crackers, and it is only within the past 50 years that any great variety has been produced.

The first cracker bakery in the United States of which we have any trustworthy record was that of Theodore Pearson at Newburyport, Mass., in 1792. His specialty was pilot or ship bread, and in that town the manufacture is still carried on, the name Pearson having long been a household word in all that part of the country. At Milton, Mass., in 1801, Joshua Bent erected his first oven, which doubt-

less was a small affair, as it was carried on no more than three days in the week by himself and family, the product then being loaded into his wagon and sold in the surrounding towns. This was the beginning of the baking of the celebrated Bent's water-cracker, which has achieved a more than national reputation. A little later, in 1805, Artemas Kennedy established himself at Menotomy, now Arlington, Mass., afterward moving to Westford, and finally to Milton. The elder Kennedy died in 1832, and in 1834 one of his sons, Jason, started a similar enterprise in Charlestown. Jason's cousin, also named Artemas Kennedy, who was his foreman, came in 1840 to Cambridgeport, Mass., and commenced baking for himself. Continued success marked the business. In 1861, when Mr. Kennedy died, its conduct devolved upon his son, Frank A. Kennedy.

In Boston the oldest recorded bakery was that of Richard Austin, who started in Ann Street about 1830. He was succeeded by his brother Thomas in 1843, and the business continued under various titles, in which the names of both J. B. Fowle and A. L. Graves appeared at different times, until it came in 1885 into the hands of J. W. Austin, a descendant of the first Austin. At a later date came several other firms of prominence in New England, among them Thurston, Hall & Company, of Cambridgeport; John S. Carr, of Springfield; Parks & Savage, of Hartford, Conn.; C. D. Boss, of New London, Conn.; and the New Haven Baking Company, of New Haven, Conn.

In New York the oldest existing firm is the house of Treadwell & Harris. Ephraim Treadwell, the founder, began business in 1825. About this date, and during the quarter century following, the firms of Robert Spier, Erastus Titus, John T. Wilson, C. T. Goodwin, J. Bruen, and J. Parr were also in business in the same city; but none of them is now in existence. Later, in 1850, Garrett B. and Edwin O. Brinckerhoff started business on Madison Street(removing in 1857 to Elizabeth Street, where the Brinckerhoff branch of the New York Biscuit Company is still carried on. At Albany, N. Y., Belcher & Larrabee established themselves about 1860. In 1871 the firm name was changed to E. J. Larrabee & Company. Mr. John Holmes, an Englishman, entered their service in 1870, and in 1877 formed in New York a partnership with G. H. Coutts, under the firm name of Holmes & Coutts. The famous brands of this house at once forced their way to the front, and gave their owners both fame and fortune. A little later J. R. Vanderveer and D. M. Holmes erected, also in New York, a model establishment, and in a few years made their names recognized as manufacturers of the highest grade of goods.

Meanwhile, following the lead of New England and New York, other bakeries were springing up all over the country. It would be impossible to present any adequate list of these, and the mention of the following more important firms must suffice: Hetfield & Ducker, of Brooklyn; Walter G. Wilson and A. J. Medlar & Company, of Philadelphia; James Beatty, J. D. Mason, and J. R. Skillman, of Baltimore; Haste & Harris, of Detroit; the Margaret Bakery, of New Orleans; C. L. Woodman, D. F. Bremner, and the Dake Bakery, of Chicago; Garneau, Dozier & Company (later known as Dozier & Weyl), of St. Louis, and S. S. Marvin & Company, of Pittsburg, Pa. These and many other smaller houses joined in the race for recognition and competed with one another over the country, sending their representatives from Maine to Oregon and from the Lakes to the Gulf, besides exporting no small quantity of goods to parts of South America, Africa, and Australia.

Turning our attention at this point to the mechanical processes employed in the manufacture of the goods which the foregoing names represent, we discover in the 25 years during the middle of the century a development no less remarkable than rapid. Until about 1840 machinery in the biscuit business was almost unknown, all the goods being worked up and put into the oven one piece at a time by hand. As the demand increased a machine was finally invented which rolled out the dough, already prepared by hand, into a thin sheet. This sheet, passing along on an endless belt or apron, was cut into the required shape by a stamp rising and falling automatically. In this way about a dozen crackers were cut out at a time, and it became possible to bake five or six barrels of flour a day — an important increase over the preceding average rate of one barrel. Except in size and capacity the ordinary cracker-machines of to-day differ but little from the first crude invention. The machines for making fancy goods, however, were of a later date and of correspondingly greater variety, and must not be confounded with those used for making the plain, unsweetened crackers.

In 1849 the discovery of gold in California, and the consequent demand for crackers as a suitable article of pioneer food, proved a marked stimulus to the biscuit trade. Up to this time the first machines had been turned by man-power. Gradually horse-power and then steam-power were introduced, and the capacity of the various existing plants enlarged. The War of the Rebellion gave a second great impetus to the industry, and the old-time flat-tile ovens being taxed beyond their capacity to meet the increased demand for hard bread for the use of the army and navy, a mechanical reel oven, consisting of a series of long iron pans revolving in a framework, similar in action to the Ferris wheel, the whole located in a large brick oven-chamber, was invented, which practically revolutionized the cracker business. This change at once caused the capacity of a single oven to jump from the earlier rate of six barrels to 25 or 30 barrels of flour a day. The size of these reel ovens has been gradually increased, until at the present time almost all the large plants have a daily capacity of from 40 to 50 barrels per oven.

Commensurate with the growth of the business was the increase in the variety of goods produced. In 1840 but five kinds of crackers were known, these being the original pilot-bread, the hard cold-water cracker, the soft or butter-cracker, the square soda, and the round sugar-biscuit; the last three differing from the others in containing shortening, butter or lard, and in being the product of a fermented dough. This fermentation or raising greatly increased the lightness and softness of texture of the cracker, and in consequence rapidly met the approval of the public. It will be noticed from the above statement that, with the exception of

the sugar-biscuit, no sweet or fancy biscuits were manufactured here at that time. In England, however, fancy cakes of several kinds were on the market; and some years before the War of the Rebellion the two large English firms, Huntley & Palmer, and Peak, Frean & Company, began sending different lines of their fancy biscuit to America. They established agencies in nearly every large city of the Union, even as far west as California, and their goods were sold in all the principal retail grocery houses in the United States. Recognizing the growing importance of this new line of trade, but unable to procure any machinery in this country to supply it, Belcher & Larrabee, of Albany, already mentioned, sent to England in 1865 for the necessary cutters and machines to compete with the foreign imports. Their attempt was successful from the start, and thus began in America the production of sweet or fancy biscuit, which, gradually extending, has become at the present day the most profitable element of the biscuit industry. Shortly after the above date American mechanical skill started into action, and soon H. J. McCollum, of New York, and Denio & Roberts, of Boston, the only prominent makers of bakers' supplies at that time, were equipping the various plants with machinery which, at less cost, rivaled in capacity and operation that of England. In consequence the importation of English goods decreased, and the American varieties, being equally good, almost entirely took their place.

Encouraged by this success at home, several American firms, among them Holmes & Coutts, Wilson of Philadelphia, and F. A. Kennedy, made an attempt about 1880 to introduce into England and France some of our brands of unsweetened goods; for it will be remembered that in Europe unflavored biscuit — or plain crackers, as we call them — was at that time utterly unknown. For a time this attempt proved successful; but the two large English firms above referred to, finding a growing demand for these new importations, sent men to the United States to study the processes and the grades of flour used here. The result, as may be expected, was but the complement of their earlier experience with their own specialties in America. The English ovens soon produced all the grades of common crackers exported from here, and the American trade, in consequence, declined. Nor has it been possible since that time to revive it to any great extent, owing to the almost prohibitory competition of foreign cheaper tin packages in which the goods must be placed to be shipped, and cheaper labor. American goods are, however, still exported in medium quantities to Africa and South America, while in many of the large cities of Europe some of the specialties of a few firms can be found.

Originative skill and strict business application have produced new machinery, by which the industry, though perhaps still somewhat short of perfection, has reached a high rank in the scale of magnitude and efficiency. A great many of the processes involved have been revolutionized, machinery taking the place of the former hand labor. As an instance, the dough, which until 20 years ago was mixed and kneaded by hand in long boxes, is now entirely prepared in large iron mixers by means of a revolving paddle, some of these machines being capable of handling as much as 12 barrels of flour at a time. Machines, also, to produce an almost endless variety of fancy cakes and biscuits have been invented and introduced, resulting in an ever-increasing list of new goods. When Joshua Bent first established his bakery at the beginning of the century only two kinds of crackers were known. To-day the number reaches in the aggregate at least 500 different grades and varieties. Some of the greatest successes in this increase have been the result of accident, while others are the perfection of long and costly experiment.

In 1890 three large companies were formed, comprising together nearly all the largest and most prominent plants in the country. The first of these, the New York Biscuit Company, included the leading houses of New England and New York, with an immense factory in New York, the largest and most complete in the United States. The second was the American Biscuit and Manufacturing Company, with one factory in New York, and doing its principal business in the West and South. The third was the United States Baking Company, its largest factories situated in Indiana, Ohio, and Pennsylvania. These three companies represented an aggregate capital of $25,000,000, and in 1894 their consumption of flour approximated 1,400,000 barrels. A fourth, somewhat smaller, company, the National, has since been formed, which has plants situated respectively in Denver, Col., Cedar Rapids, Ia., Des Moines, Ia., Rock Island, Ill., and New Orleans, La.

The first three of these companies were absorbed in February 1898 under the style of the National Biscuit Company, with a capital of $55,000,000, and bakeries in all the principal American cities. This combination revolutionized methods of advertising and introduced many novelties in the form of new biscuits and air-tight packages.

FRANK A. KENNEDY,
National Biscuit Company.

Cracker State, a nickname applied to Georgia.

Crackers, an opprobrious name applied to the "poor whites" of the Southern States.

Cracklin, or **Crackle Ware,** chinaware ornamented by a network of small cracks in all directions. The ware receives the small cracks in the kiln, with the effect that the glaze or enamel which is afterward applied appears to be cracked all over.

Cracovienne, krā-kō-vī-ĕn', a lively Polish dance in two fourths time, in which the dancers arrange themselves in couples, the one partner standing before the other. First one couple sings two stanzas to an air called the 'Krakoviak,' while the other couples group themselves round, then another couple takes the place of the first, and so on in succession.

Cracow, krā'kō, the old capital of Poland, in 1815–46 capital of a republic of the same name now forming part of Austrian Galicia, is situated on the left bank of the Vistula, where it becomes navigable, and consists of Cracow proper, or the old city, and several suburbs. It is the see of a bishop, is well built and regularly fortified. The cathedral, a fine old Gothic edifice, contains monuments of many Polish kings, of Kosciusko, etc. The university was founded in 1364, but gradually fell into decay,

and was reorganized in 1817. It has a library of 300,000 volumes. On a hill near the town stands the monument of Kosciusko, 120 feet high. Pop. (1900) 91,323 (21,000 being Jews); with all its suburbs, 94,696.

Cracow, University of. See CRACOW.

Craddock, Charles Egbert. See MURFREE, MARY NOAILLES.

Cradle, an infant's bed or cot, usually oscillating on rockers or suspended in such a way as to admit of a swinging motion. Such cradles were used by the Greeks and Romans. In technical language the word is applied to a number of mechanical contrivances employed in various trades or arts. As a nautical term, a cradle is the basket run on a line and carrying to land persons from a wrecked vessel; the frame supporting a ship on the ways, and in which it slides down when launched; and the frame supporting a ship hauled over a marine railway. The frameworks sustaining heavy guns in transportation, are also called cradles. In agricultural use the cradle consists of a sort of broad scythe for cutting grain. It is furnished with a set of long parallel fingers for catching the grain and laying it in swaths. The cradle or rocker employed in placer-mining consists of a box agitated by hand and used for washing out gold-bearing earth.

Cradle of Liberty, a name by which Faneuil Hall, in Boston, is known. During the Revolution it was the favorite meeting place of the American patriots. The name is also sometimes applied to the city of Boston.

Craft, William, a fugitive slave from Macon, Ga., where he hired himself of his owner and worked as a joiner. After years of planning he and his wife Ellen — who was almost white — escaped. At last, Ellen wearing "a suit of gentleman's clothes," which they had "bought, piece by piece, of different dealers, at different times, by stealth," and William attending as her servant, they made their way to Boston, where they became parishioners of Theodore Parker (q.v.), the anti-slavery minister of the Twenty-eighth Congregational Society, 25 Oct. 1850. When the Crafts had been about two years in Boston, Parker learned that slave-hunters were after them, had them secreted (though William soon armed himself and went about his business), and warned the slave-hunters for their own safety to leave the city, which they did. The Crafts, never having been formally married, requested Parker to marry them, and he did so November 7, at a colored boarding-house in Boston. On a table some one had laid a Bible and a bowie-knife. The minister gave William the book, for the good of his own soul and of Ellen's, and in his right hand placed the knife, for their defense should need be. The Crafts soon after went to England, bearing a letter from Parker to the Rev. James Martineau.

Crafts, James Mason, American chemist: b. Boston 8 March 1839. He graduated at the Lawrence Scientific School, Harvard, 1858; studied chemistry and other sciences at Freiburg, Heidelberg, and the Paris Ecole des Mines 1860–5. He was professor of chemistry at Cornell 1869–70, at Massachusetts Institute of Technology, 1870–80, and of organic chemistry at the latter 1892–7. The French government made him a chevalier of the Legion of Honor in 1885, and some of his more striking chemical investigations have been carried on in Paris with Friedel. In 1897 he became president of the Institute of Technology, resigning in 1900, after having seen its income-bearing funds increase two and a half times under his administration. He has published 'Qualitative Analysis' (1869); and papers read before the French Academy of Sciences, giving results of his researches on silicic compounds, arsenic ethers, thermometry, etc.

Crafts, Wilbur Fisk, American Congregational clergyman: b. Freyburg, Me., 12 Jan. 1850. He was graduated at Wesleyan University in 1869, and Boston University School of Theology in 1872; preached eight years as a Methodist Episcopal minister, but in 1880 joined the Congregational Church. Later he engaged in literary work. He is secretary of the American Sabbath Union, and prominent in reform work; author of 'Successful Men'; 'The Sabbath for Man'; 'Successful Men of To-day'; 'New Testament Helps'; etc.

Craig, James Alexander, American Semitic scholar: b. Fitzroy Harbour, Ontario, 5 March 1855. He graduated at McGill University, Montreal, 1880, and took his Ph.D. degree at Leipsic 1886. He was instructor and professor of Biblical languages in Lane Theological Seminary, 1886–90; professor of Old Testament literature and exegesis, Oberlin Theological Seminary 1891; and since 1893 has been professor of Semitic languages and Hellenistic Greek in the University of Michigan. He has published 'Inscriptions of Salmanassar, King of Assyria, 859–826 B.C.' (1887); 'Hebrew Word Manual' (1890); 'Assyrian and Babylonian Religious Texts' (2 Parts, 1895–97); 'Astronomical-Astrological Texts of the Babylonians' (1899). He is the editor of Scribner's 'Semitic Series,' for which he has prepared a volume on the religion of the Babylonians and Assyrians.

Craig, krāg, SIR **Thomas,** Scottish writer on jurisprudence: b. 1538; d. Edinburgh 26 Feb. 1608. He was educated at the University of St. Andrews, and afterward went to France, where he studied civil and canon law. He returned about 1561, and was placed at the head of the criminal judicature of the country as justice depute. He is now chiefly remembered by his 'Treatise on Feudal Law' (1603).

Craighill, krāg'il, **William Price,** American military engineer: b. Charlestown, Va., 1 July 1833. He graduated at West Point 1853; superintended the building of Forth Sumter 1854–5; built the defenses of Pittsburg 1863; and on 13 March 1865, was brevetted lieutenant-colonel for faithful and meritorious services during the War. Later he was employed on the defenses of New York and Baltimore, and in the improvement of navigation on southern rivers. He became brigadier-general and chief of engineers 10 May 1895, and was retired at his own request 1 Feb. 1897, after 40 years' service. His publications include: 'Officer's Pocket Companion' (1861), partly translated from the French of De Douve; a translation of Dufour's 'Cours de Tactique' under the title of 'Principles of Strategy and Tactics' (1863); and with Mendell, of Jomini's 'Précis de l'art de la guerre,' 'The Art of War' (1862).

Craigie, krāg'ĭ, **Pearl Mary Teresa Richards** ("JOHN OLIVER HOBBES"), English novelist and dramatist: b. Boston, Mass., 3 Nov. 1867. She was educated in Paris and London, married R. W. Craigie in England in 1887 and was divorced from him in 1895. Her writings, published under the pseudonym, "John Oliver Hobbes," include 'Some Emotions and a Moral' (1891); 'The Sinner's Comedy' (1892); 'A Study in Temptations' (1893); 'A Bundle of Life' (1894); 'Journeys End in Lovers Meeting'; 'The Gods, Some Mortals, and Lord Wickenham' (1895); 'The Herb Moon' (1896); 'School for Saints' (1897); 'Osborn and Ursyne,' a blank verse tragedy (1899); 'The Ambassador' a play (1898); 'Robert Orange' (1900); 'The Serious Wooing' (1901).

Craik, Dinah Maria, best known as "MISS MULOCK," English novelist: b. Stoke-upon-Trent, 1826; d. Shortlands, Kent, 12 Oct. 1887. In her twenty-third year she published her first novel, 'The Ogilivies'. This was followed by 'Olive' (1850); and 'Agatha's Husband' (1853); but it was with the story of 'John Halifax, Gentleman' (1857) that she gained and retained her reputation as a novelist. This work has had an extraordinary popularity, having been translated into French, German, Italian, Greek and Russian. She published in all about twenty stories, among which were 'A Life for a Life' (1859); 'Mistress and Maid' (1863); 'A Noble Life' (1866); 'A Brave Lady' (1870); 'Hannah' (1871); etc. Besides these she was the author of a great number of essays on various subjects, such as 'Sermons Out of Church' (1875); 'Plain Speaking' (1882). She published a volume of poems in 1859, reissued with additions in 'Thirty Years' Poems' (1881). Among these 'Douglas, Tender and True', and 'Philip, My King' have been widely popular. In 1865 she was married to George Lillie Craik, a nephew of the professor of the same name. The chief characteristic of her literary work was its refined optimism, and its success with the public was largely due to simplicity of diction.

Craik, krāk, **George Lillie,** Scottish miscellaneous writer: b. Fifeshire 1799; d. Belfast, Ireland, 25 June 1866. He removed to London in 1824, became an extensive contributor to the Penny Cyclopædia in the departments of history and biography, but his first independent work of any importance was his 'Pursuit of Knowledge under Difficulties'. This was succeeded by his 'Romance of the Peerage'; 'Spenser and his Poetry'; 'History of Literature and Learning in England'; 'History of British Commerce'; 'English of Shakespeare'; 'Bacon, His Writings and Philosophy'; etc. From 1837 to 1844 he was joint editor of the 'Pictorial History of England'. In 1849 he was appointed professor of English literature in Queen's College, Belfast, an appointment which he held till his death.

Craik, Georgiana Marian. See MAY, GEORGIANA MARIAN.

Craik, SIR **Henry,** Scottish writer: b. Glasgow 18 Oct. 1846. He was educated at Glasgow University and Balliol College, Oxford, and has been secretary of the Scottish Education Department from 1885. He was knighted in 1897, and is the author of 'Life of Jonathan Swift' (1882); 'The State and Education' (1883); 'A Century of Scottish History' (1901). He has edited 'English Prose Selections,' in five volumes (1892–6).

Craik, James, American physician: b. in Scotland 1731; d. Fairfax County, Va., 6 Feb. 1814. He came to Virginia early in life, and on 7 March 1754 was commissioned as an army surgeon. In 1755 he was a surgeon in Braddock's army and took part in the memorable action on the Monongahela. After serving through the French war in the Virginia regiment he settled as a physician near Mount Vernon, and finally at Alexandria. During the Revolution he was in the medical department. He was Washington's family physician, and ever associated with him on terms of the closest friendship, attending him in his last illness, and being affectionately mentioned in Washington's will as "my compatriot in arms and old and intimate friend" to whom he bequeathed his tambour secretary and the circular chair, "an appendage of my study."

Craik, Robert, Canadian physician: b. Montreal 22 April 1829. He graduated in medicine at McGill University 1854; was house surgeon at the general hospital during the cholera epidemic 1854; demonstrator in practical anatomy at McGill University 1856–60; professor of clinical surgery 1860–7; professor of chemistry 1867–79; registrar 1869–77; treasurer 1875–1901; dean of the faculty of medicine and professor of hygiene and public health 1889–1901. He has devoted much attention to scientific farming, and is a successful breeder of prize pedigree cattle and thoroughbred horses. His publications are: 'Nature of Morbid Poisons and Germ Theory of Disease' (1854); 'Papers on Purpura and Tetanus' (1855); 'Hyoscyamus Poisoning' (1858); 'Antisepsis in Successful Ovariotomies and Compound Joint Injuries' (1869–71); 'Medical Education' (1890); 'History of the Medical Faculty' (1895); 'Hospital and District Nursing' (1897); etc.

Cram, Ralph Adams, American architect and author: b. Hampton Falls, N. H., 16 Dec. 1863. He was educated at private schools and academies, and has been in practice as an architect in Boston, Mass., since 1889. He has contributed verse to various periodicals and professional articles to the 'Architectural Review' (London) 'Architectural Record,' 'Atlantic Monthly,' 'The Churchman,' and 'Independent.' In book form he has published: 'The Decadent'; 'Black Spirits and White'; 'English Country Churches' (1898); 'Church Building' (1901).

Cram, William Everett, American author: b. Hampton Falls, N. H., 22 June 1871. He is a brother of Ralph Adams Cram (q.v.). He has written: 'Little Beasts of Field and Wood' (1899); 'More Little Beasts' (1901); and in collaboration with Witmer Stone, 'American Animals; Guide to the Mammals of North America North of Mexico' (1902).

Crambe, krăm'bē. a genus of plants belonging to the natural order *Cruciferæ*. The best-known member of this genus is sea-kale, a hardy perennial found on the coasts of Great Britain, as well as France and the shores of the Baltic. The common people on the western shores of England from time immemorial have been in the habit of watching when the shoots

begin to push up the sand or gravel in March and April, then cutting off the young shoots and leaf-stalks while still blanched and tender, and boiling them for food. When cultivated in gardens the young spring-shoots are blanched by being earthed up, and resemble asparagus. One species is the tartar-bread of the Hungarians. It is eaten as a salad, either raw or boiled.

Cramer, Michael John, author and minister of the Methodist Episcopal Church: b. Schaffhausen, Switzerland, 6 Feb. 1835; d. Carlisle, Pa., 25 Jan. 1898. He graduated at Ohio Wesleyan University, Delaware, O., 1860, and served as chaplain in the United States army 1864–7; was United States consul at Leipsic 1867–70; United States minister to Denmark 1870–81; United States minister to Switzerland 1881–5. He was appointed professor of systematic theology at Boston University 1885–7, resigning in that year on account of ill-health. He became associate editor of the 'Theological Quarterly Review' in 1889, and contributed largely to the 'Methodist Review,' the 'German Theological Review,' and other periodicals. After filling the chair of church history at Drew Theological Seminary for a year he became in 1897 professor of philosophy in Dickinson College.

Cramp, Charles Henry, American shipbuilder: b. Philadelphia, Pa., 9 May 1828. He was graduated at the Central High School of his native city, and entered the shipyards of his father, William Cramp. He soon established the prestige of the firm of William Cramp & Sons, which he incorporated and of which he became president. Their shipyards in Philadelphia are the most extensive in the United States, executing contracts for the governments of the United States, Russia, Japan, etc., and exercising a great influence upon modern naval development.

Cramp, acute, painful sensations usually located in a voluntary muscle. It is a form of local clonic spasm in the muscle and may be due to one of several causes, the most important of which, however, are over-exertion with consequent tire and cold, or it may result from organic disease. Cramps occurring in hollow viscera where there is much involuntary muscular tissue are usually termed colic (q.v.). The muscles most often affected are those of the extremities, especially those of the lower extremities. In the cramps which result from occupation, neuroses, such as occur in telegraphers, typewriters, violinists, musicians, etc., the upper extremities are involved. These cramp-like pains are distinctly of nervous origin. The treatment of general forms of cramp is by means of warmth, massage; bromides and camphor are sometimes useful. Sudden putting of the muscle on vigorous stretch ofttimes will relieve cramp. Cramps attacking swimmers are particularly difficult to handle, but if the presence of mind of the swimmer is not lost, turning on the back and floating may prevent drowning.

Cramp Bark. See VIBURNUM.

Cramp'ton, Charles Albert, American chemist: b. Davenport, Ia., 18 Feb. 1858. He was graduated at the University of Michigan in 1882; was assistant chemist in the United States Department of Agriculture 1883–90; and has been chief chemist of the Internal Revenue Bureau since 1890. He has written extensively on agricultural and food chemistry, his papers appearing for the most part in chemical journals and government publications. Among them are: 'Record of Experiments at Des Lignes Experiment Station, Baldwin, La., 1888' (1889); 'Baking Powders' (Part V. of Food and Food Adulterations, Washington, 1889).

Cramp'ton, Thomas Russell, English engineer: b. Broadstairs, Kent, 6 Aug. 1816; d. London 19 March 1888. His engineering training was received under such men as the elder Brunel, Sir Daniel Gooch, and John and George Rennie. During 1842–8 he made many improvements in locomotive machinery, and in 1843 designed and patented the engine which bears his name. "The characteristic features of the Crampton engine are a long boiler, outside cylinders set in the middle of the engine's length, and large driving wheels placed quite in the rear of the driving box." Napoleon III. made him an officer of the Legion of Honor for this invention. In 1851 he laid the first practical submarine cable between Dover and Calais, his best piece of professional work. Among other works carried out either wholly or in part by him were the Berlin waterworks; the Smyrna railway; and the Varna railway. He also invented a rotary dust-fuel furnace, and an automatic hydraulic tunnel boring machine. The outside fire-box shells on many modern engines are still known as Crampton's.

Crampton's Gap, Battle of. See SOUTH MOUNTAIN, BATTLES OF.

Cranach, krä'näH, **Kranach,** or **Kronach, Lucas,** German painter and engraver: b. Kronach, Germany, 1472; d. Weimar 16 Oct. 1553. His family name is said to have been Müller, and the name by which he afterward called himself is said to have been taken from his birthplace. In 1504 he became court painter to Frederick the Wise, elector of Saxony, and in 1508 he was ennobled. In 1509 he traveled through the Netherlands and at Malines painted the portrait of the future emperor Charles V., then a child of nine years. He was the intimate friend of Luther, of whom he painted various portraits, several of them still extant. After the death of the elector Frederick he still remained attached to the Saxon court, for he received as much favor from Frederick's successors — John the Constant and John Frederick the Magnanimous. Cranach's portrait of the latter is contained in the New York Metropolitan Museum. After the battle of Mühlberg, in 1547, in which John Frederick was taken prisoner by the troops of Charles V., Cranach showed his attachment for his master by following him from prison to prison until in 1552 he was set at liberty, when he returned with Cranach at his side to Weimar. He engraved both on copper and wood, and also illuminated manuscripts, and was remarkable for his rapidity of execution. He painted a large number of Madonnas, perhaps the most celebrated of which are to be seen in the cathedral of Glogau and the Pinakothek of Munich. Another favorite subject with him was Christ blessing the little children. Perhaps the most beautiful of his paintings on this subject is contained in the city church of Naumburg. There is a remarkable picture by him in the cathedral of Meissen, representing Christ between Mary and John, with a choir of angels

above. See Heller, 'Das Leben und die Werke Lucas Cranachs' (2d ed. 1844); Schuchardt, 'Lucas Cranach des Aelteren Leben und Werke' (1851–61).

Cranach, Lucas, German painter: b. 4 Oct. 1515: d. 25 Jan. 1586. He was the second son and a pupil of Lucas Cranach, whose manner he copied so faithfully that many of his father's works are assigned to the son. Moreover, each used a similar mark, a crowned serpent with wings. According to Schuchardt, the son varied his mark by showing the wings of the serpent folded instead of erect, as in the pictures signed by the father. His 'Crucifixion' and 'The Lord's Vineyard,' symbolical of the progress of the Reformation, are in the Stadt Kirche at Wittenberg. Other pictures of his may be found in Dresden, Berlin, and Munich.

Cranberry, several trailing species of the genus *Vaccinium,* of the natural order *Ericaceæ.* Two of these species are extensively cultivated in the United States for their acid fruit which ripens in the autumn and may be kept until spring, and which finds an important culinary use in the making of sauce, pies, etc., but is never eaten as a dessert fruit. The crop of 1900 was reported to be 987,516 bushels, produced mainly in Massachusetts, New Jersey, and Wisconsin, the balance being made up from smaller areas in the northern States. Though one of the species (*V. oxycoccus*) is a native of Europe as well as America, it has not developed European horticultural varieties. Indeed, in Europe the cranberry is cultivated to a much smaller extent than in America.

The two species from which the cultivated varieties have been derived are *V. oxycoccus,* the smaller cranberry, and *V. macrocarpon,* the larger cranberry. Both are natives of northern swamps and marshes, especially such as are rich in peat; the latter species is confined to North America. Both are trailing vines bearing small evergreen leaves, inconspicuous flowers and globular or pyriform red fruits borne on slender curved stalks, which suggested the name *crane-berry* — the neck of a crane. The American species is most cultivated and has developed the largest number of horticultural varieties, but the smaller cranberry is considered by many to produce finer flavored fruits. The general types of berries are, globular, bell-shaped, and bugle-shaped, with numerous varieties in each class.

Commercially, cranberries are grown in low, wet ground, though they are sometimes raised upon drier soils. The land selected must be drained, so that standing water will be at least a foot below the surface of the soil during summer; it must be retentive of moisture, since the plants quickly suffer in dry seasons; it must be level in order to be readily flooded in very dry weather, in winter and when insects are seriously troublesome; it must be situated where injury from frosts will be as little as possible. Late spring frosts injure the blossoms; early autumn ones, the fruit. Further, there must be sufficient water to quickly flood the field. Bogs in which sphagnum moss grows upon a peat or muck soil are preferred and are considered specially promising if plants related to the cranberry grow naturally upon the land. Draining the bog and clearing it of trees, brush, roots, moss, etc., is followed by the digging of permanent open ditches two to four feet deep. These spread the water and remove it in times of flooding, etc. After the land is prepared it is usually covered with a few inches of sand to keep down weeds and thus reduce the cost of maintenance. In this sand cuttings six or eight inches long are set at intervals of from 12 to 15 inches apart each way. Beyond the removal of weeds no cultivation is generally given. The third or fourth year a full crop may be expected; 50 barrels being a good yield, though four times that amount has been obtained. When the beds become too full of vines they are mown or burned over to start a fresh growth, and every fourth or fifth year a fresh covering of an inch or so of sand is given. Sanding is not practised in some localities. The cost of preparing and planting a bed as above indicated varies from $300 to $500 an acre. Harvesting is done by hand when highest grades are picked; by raking and combing for the less choice.

Several diseases and insects attack the cranberry. Of the former the most serious is probably the scald, which appears most frequently in hot muggy seasons as a soft reddish-brown spot on the fruit, which quickly swells and gets hard, but later shrivels and either drops off or remains attached to the vine. The leaves are also more or less affected. Promptly sanding the bog lightly is found to be the most satisfactory method of treatment. It is usually most easily done while the bed is flooded. Red galls are often troublesome upon the leaves. This is controlled by burning the beds over in the autumn to kill the spores of the fungus. A large and conspicuous distortion and reddening of the green parts may sometimes prove destructive. The leading insect enemies are two caterpillars, one of which attacks the foliage, the other the fruit. The former, known as the black-headed fireworm may be controlled by the application of kerosene or Paris green. The latter, a kind of span-worm, may be destroyed by spraying with an arsenite when the leaves are falling and the fruit is setting. Generally, perhaps the beds are flooded to destroy these and other insect pests.

Several other plants bear the name cranberry. Among the best-known are: *Vaccinium vitis-idæa,* known as low-bush cranberry, wolf-berry, mountain cranberry, and cowberry. It is a native of Europe and America and is often found in the markets, but is not cultivated. Its fruits reach American markets not only from the northern United States and eastern Canada, but often from Norway, Sweden, Denmark, and Germany. The high-bush, high cranberry, or cranberry-bush, is a shrub which attains a height of 12 feet and bears scarlet berries which persist during winter. The fruit is scarcely edible. This plant is the original species from which the snowball or guelder rose has been developed. In both forms it is a very attractive and popular ornamental shrub.

Consult: Bailey, 'Cyclopædia of American Horticulture' (New York 1900–2); White, 'Cranberry Culture' (New York); Webb, 'Cape Cod Cranberries'; Special Bulletin *K,* New Jersey Experiment Station, 'Insects Injuriously Affecting Cranberries'; 'Proceedings of the American Cranberry Growers' Association' (Trenton, N. J., 1880–1903).

Cran'brook, Gathorne Gathorne-Hardy, Earl, English statesman: b. Bradford 1 Oct. 1814. Educated at Shrewsbury and at Oriel

College, Oxford, he was called to the bar in 1840, and in 1856, after unsuccessfully contesting Bradford nine years earlier, was elected to Parliament as a Conservative by Leominster. In 1865 he defeated Mr. Gladstone in the celebrated Oxford University election; in 1878 he was raised to the peerage as Viscount Cranbrook. He was under-secretary of state for the Home Department (1858–9), president of the Poor-law Board (1866–7), home secretary (1867–8), war secretary (1874–8), secretary of state for India (1878–80), and lord president of the council (1885–92).

Cranch, Christopher Pearse, American artist and poet: b. Alexandria, Va., 8 March 1813; d. Cambridge, Mass., 20 Jan. 1892. He was a son of William Cranch (q.v.). He studied at Columbian University, Washington, D. C.; was graduated at the Harvard Divinity School 1835; preached in Unitarian pulpits for a few years, and then gave himself up entirely to painting and poetry. He studied in Italy 1846–8, 1853–63, when he returned to America and was elected a member of the National Academy, but exhibited nothing after 1871. He was an intimate friend of Lowell and Longfellow; a man of versatile if not commanding talent; and one whose friendship was highly cherished by the few favored with it. Some of the best known of his paintings are: 'Val de Moline, Amalfi, Italy' (1869); 'Venice' (1870); and 'Venetian Fishing Boats' (1871). His well-known poem 'Thought' appeared in 'The Dial' (1840). His published works include: 'Poems' (1844); 'The Last of the Huggermuggers' (1856); 'Kobboltozo' (1857); a blank verse translation of the 'Æneid' (1872); 'Satan: a Libretto' (1874); 'The Bird and the Bell, and Other Poems' (1875; 2d ed. 1890); 'Ariel and Caliban' (1887).

Cranch, William, American jurist: b. Weymouth, Mass., 17 July 1769; d. Washington, D. C., 1 Sept. 1855. He was graduated at Harvard in 1787; admitted to the bar in 1790; appointed an associate judge of the United States circuit court for the District of Columbia in 1801; and chief justice of that court in 1805. He held this office till his death, and during a period of over half a century had only two decisions overruled by the supreme court. His reports of cases decided in the circuit court (1801–41) were published in six volumes; and those of the United States supreme court (1801–15) in nine volumes, with supplementary issues in 1835.

Cran'dall, Charles Henry, American writer: b. Greenwich, N. Y., 19 June 1858. He was for five years on the staff of the New York *Tribune,* and in book form has published: 'The Season; a Social History of New York' (1883); 'Representative Sonnets' (edited) (1891); 'Wayside Music' (1893); 'The Chords of Life' (1898), the last two being volumes of poems.

Crandall, Charles Lee, American civil engineer: b. Bridgewater, N. Y., 20 July 1850. He was graduated from Cornell University in 1872 and has been connected with that institution as instructor and professor of engineering from 1874. He has published: 'Tables for Computation of Railway and Other Earthwork' (1886); 'Notes on Descriptive Geometry' (1888); 'Notes on Shades, Shadows, and Perspective'; 'The Transition Curve' (1893).

Crandall, Prudence. See PHILLEO, PRUDENCE CRANDALL.

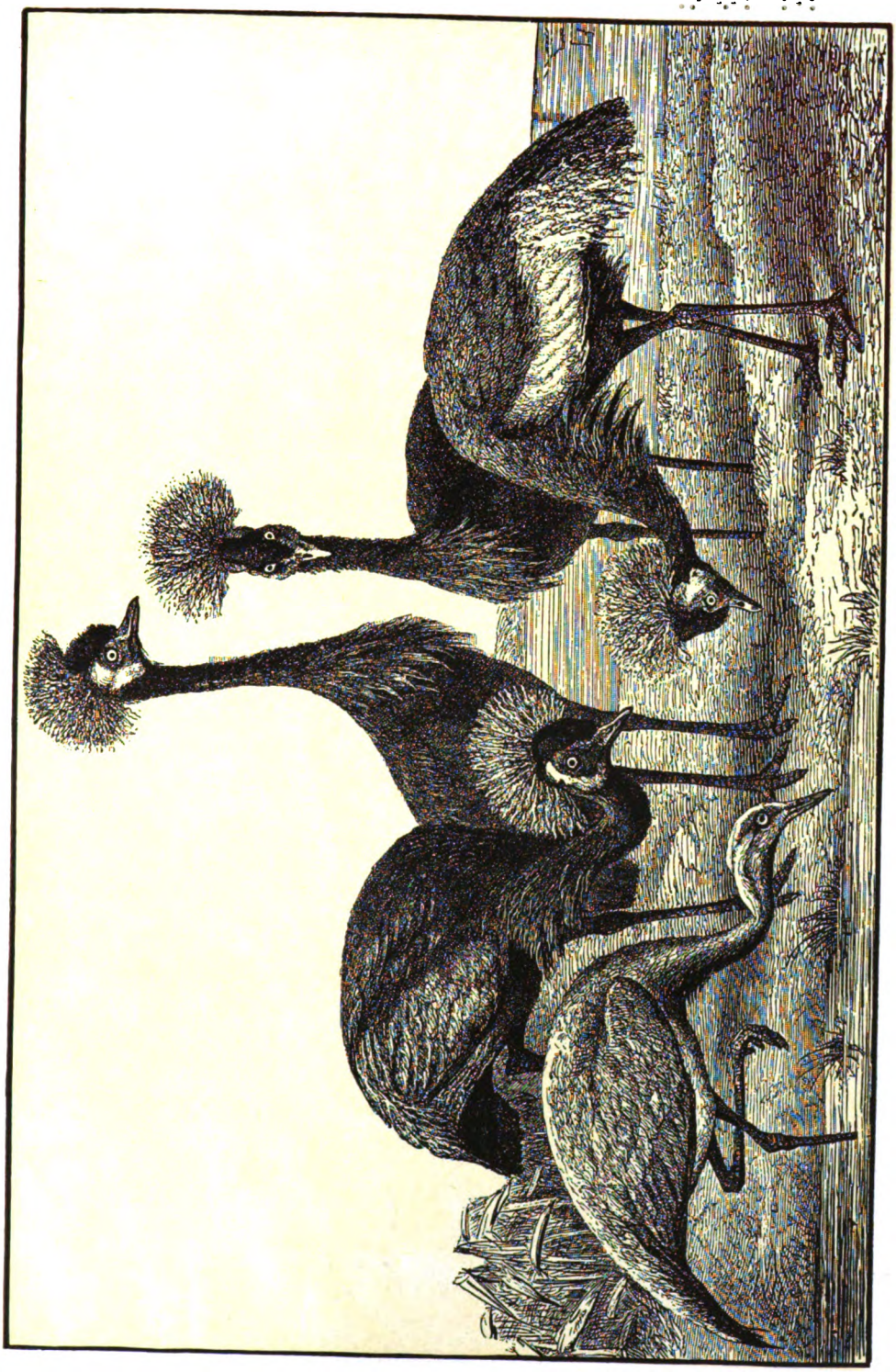
Crane, Bruce, American painter: b. New York 1857. He studied under A. H. Wyant, and paints chiefly landscapes, using American subjects. Among his works are: 'An Old Mill Pond on Long Island'; 'On Shrewsbury River'; 'Winter'; 'Harvest Field'; 'Signs of Spring'; and 'Peace at Night.' He is a member of the American Society of Artists; and won a medal at the Pan-American Exposition in 1901.

Crane, Ichabod, the country schoolmaster in Irving's 'Legend of Sleepy Hollow,' who was frightened away from the Hollow by his adventure with the Galloping Hessian.

Crane, Stephen, American novelist and poet: b. Newark, N. J., 1 Nov. 1870; d. Badenweiler, Germany, 5 June 1900. 'The Black Riders and Other Lines' (1895), a collection of verse, was his earliest volume, followed by his 'Red Badge of Courage' (1896) which excited a widespread interest in its author and seemed to presage a career of more than ordinary brilliancy. His later works are: 'Maggie: a Girl of the Streets' (1896), 'George's Mother' (1896); 'The Little Regiment' (1897); 'The Third Violet' (1897); 'The Open Boat' (1898); 'The Eternal Patience' (1898); 'Wounds in the Rain' (1900); 'Great Battles of the World' (1901); 'Whilomville Stories.' During the Spanish-American war he was a reporter in Cuba for the New York *Journal.*

Crane, Thomas Frederick, American scholar: b. New York 12 July 1844. He was educated at Princeton College, and became professor of romance languages at Cornell University in 1881. Besides many contributions to periodicals, he has written: 'Italian Popular Tales' (1885); 'Pictures of the French Revolution' (6th ed. 1892); 'French Romanticism' (3d ed. 1890); 'Popular Songs of France' (1891), etc.

Crane, Walter, English artist and writer: b. Liverpool 15 Aug. 1845. He became apprentice to W. J. Linton, the well-known wood engraver, in 1859, and soon began to illustrate books. In 1888 he became first president of the Arts and Crafts Exhibition Society. In the following year he became associate of the Royal Society of Painters in Water Colors, and from 1893 till 1896 was director of design in the Manchester Municipal School of Art. Mr. Crane's principal publications are: 'Picture Books' (1865–76); 'Baby's Opera' (1877); 'Grimm's Household Stories' (1882); 'The First of May' (1883); 'The Sirens Three: a Poem' (1885); 'Flora's Feast' (1889); 'Queen Summer' (1891); 'Renascence' (1891); 'Claims of Decorative Art' (1892); 'Decorative Illustrations of Books' (1896); 'Spenser's Faerie Queene' (1895–7); and 'Shepherd's Calendar' (1897). Among his pictures are: 'Renascence of Venus' (1877); 'Fate of Persephone' 1878; 'Europa' (1881); 'The Bridge of Life' (1884); 'Freedom' (1885); 'La Belle Dame Sans Merci,' 'England's Emblem' (1895); 'The Rainbow and the Wave' (1896); 'Britannia's Vision' (1897); and the 'World's Conquerors' (1898). Mr. Crane belongs essentially to the imaginative and poetic school so prominent among recent artists. He has prominently identified himself with the Socialist movement as lecturer, writer, and artist.



The Demoiselle Crane (Grus virgo).

The Crested Crane (Balearica pavonina).

Crane, William Henry, American actor: b. Leicester, Mass., 1845. He made his first appearance on the stage when 18 years old and soon won recognition as a comedian. His role in 'The Henrietta,' in which he was associated with Stuart Robson, was his first great success. His first starring tour after dissolving connection with Robson was undertaken in 1889, when he appeared in 'The Senator.' He played 'David Harum' in 1900 and attained great popularity in that role.

Crane, Winthrop Murray, American paper manufacturer: b. Dalton, Mass., 27 April 1853. He is the owner of important paper mills in his native town, and has charge of the manufacture of silk fibre bank note paper for the government. He was lieutenant-governor of Massachusetts 1897–9, and governor of the State 1900–2. In December 1901 he was offered, but declined, the position of secretary of the treasury.

Crane, the English name, with cognate words in most other European languages, originally applied to a large European wading bird, the *Grus communis* of ornithologists, but now extended to include allied species in all parts of the world. The cranes constitute a family (*Gruidæ*) most closely related to the rails (*Rallidæ*), with which they are usually placed in the order *Grallæ*. Although having the form and aspect of the herons (*Ardeidæ*) with which these birds are originally placed by Linnæus in his genus *Ardea,* the two are by no means closely allied.

The *Gruidæ* have the following characteristics: Bill longer than head, straight, rather slender, and compressed, but strong and not very acute; the two mandibles sub-equal; nostrils large, elliptical, completely perforated, situated near the middle of the bill at the anterior end of a wide, shallow nasal furrow; plumage firm, with few, flowing, elongated feathers, and lacking powder-down tracts; wings moderate, with the first and fifth primaries sub-equal; tail is short, consisting of 12 feathers; head usually partly naked, with warts or wattles, sometimes crested; neck and legs very long, the latter largely naked and tarsi scutellate in front; feet strong, with anterior toes elongated and provided with a rudimentary web, hallux very short, elevated. Fifteen species or more are known from various parts of the globe, most of which belong to the typical genus *Grus,* though under modern usages this may be subdivided. Eastern Asia is the stronghold of the cranes, claiming one half of the species. Three occur in North America, but, although very large birds, they are not generally well-known. The white or whooping crane (*G. americana*) stands between four and five feet high; it is pure white with black wings. It inhabits the Mississippi valley and the country to the north, but was once more widely distributed. It is remarkable for the resonant, piercing call, the volume of which is due to the great length of the trachea, two feet or more of which occupies a cavity within the keel of the sternum. The sandhill cranes (*G. canadensis* and *G. mexicana*) which are somewhat smaller, and gray or brown in color, likewise inhabit the interior plains of North America.

The common crane of Europe (*Gros communis*) has attracted so much notice that its habits are more familiar. These birds are of considerable size, and remarkable for their long necks and stilt-like legs, which eminently fit them for living in marshes and situations subject to inundations, where they usually seek their food. This is principally of vegetable matter, consisting of the seeds of various plants or grains plundered from grounds recently plowed and sown. They also devour insects, worms, frogs, lizards, reptiles, small fish, and the spawn of various aquatic animals. They build their nests among bushes or on tussocks in the marshes, constructing them of rushes, reeds, etc., surmounted by some soft material. They lay but two eggs, for the incubation of which the male and female alternately take their place on the nest. During the time one is thus engaged, the other acts as a sentinel; when the young are hatched, both parents unite in protecting them.

The cranes annually migrate and perform journeys astonishing for their great length and hazardous character, transporting themselves from the tropical heat of southern India and central Africa to the icy wastes of Lapland and Siberia. They are remarkable for making numerous circles and evolutions in the air when setting out on their journeys, and generally form two lines meeting in an angle forward, led by one of the strongest of their number, whose trumpet-like voice is heard as if directing their advance, when the flock is far above the clouds and entirely out of sight. To this call-note of the leader the flock frequently respond by a united clangor, which, at such a distance, does not produce an unpleasant effect. From the sagacity with which these birds vary their flight, according to the states of the atmosphere, they have, from the earliest ages, been popularly regarded as indicators of events; and their manœuvres were attentively watched and interpreted by the augurs and aruspices among the Romans — a circumstance which, together with their general harmlessness and apparent gravity of demeanor, led to their being held in a sort of veneration, even by some civilized nations. When obliged to take wing from the ground, cranes rise with considerable difficulty, striking quickly with their wings, and trailing their feet along and near the ground until they have gained a sufficient elevation to commence wheeling in circles, which grow wider and wider until they have soared to the highest regions of the air. When their flight is high and silent, it is regarded as an indication of continued fine weather; they fly low and are noisy in cloudy, wet, or stormy weather. Against approaching storms the cranes, like various other birds of lofty flight, readily guard by ascending above the level of the clouds, and the atmospheric currents which bear them. When a flock of cranes is engaged in feeding, or while it is at rest, and the birds are standing on one foot asleep, with the head under the wing, one of the number acts as sentinel and keeps a vigilant watch, alarming the whole if any enemy approach, or the slightest danger threaten.

Cranes are said on good authority to mate for life, and to return annually to the same nesting site; but, except during the breeding season, they are not gregarious. The European crane was formerly common in the marshy districts of Great Britain, where it was known to breed in the 16th century, but now occurs only as a winter straggler. Cranes of various species,

both native and exotic, are common in zoological gardens, where their stiff-legged dances and other antics excite much amused interest. One of the most frequent is the elegant demoiselle crane (*Anthropoides virgo*) of southern Asia and the Mediterranean countries. Consult Tegetmeier, 'Natural History of the Cranes' (1881).

Crane, a mechanical device for lifting heavy objects. See HOISTING APPARATUS.

Crane-fly, or **Daddy-long-legs,** species of *Tipula,* etc., of the dipterous family *Tipulidæ.* These flies are very common and known by their large size and long sprawling legs. The antennæ are rather long and slender, and the hind-body long, slender, and cylindrical. They possess a distinct ovipositor, with two pairs of long horny pointed valves. The larva is a footless grub, like a maggot, which lives under stones in brooks or in damp soil; its head is distinct, and in this respect the larva is more primitive and generalized than are those of most flies. It breathes by a pair of spiracles situated at the extremity of the body. There are many species of crane-flies in the United States.

Crane's-bill, the common name of the typical genus of the geranium family, *Geraniaceæ,* so named because of the long slender beak of the fruit of the plant. The genus has about 175 species, which are widely distributed throughout the temperate regions of the world, of which 16 are found in North America. The plants are mostly useless weeds, although some of them have very showy flowers. Other common names of American species are alum-root, red robin, etc. See GERANIUM.

Craney Island, an island in Norfolk County, Va., near the mouth of the Elizabeth River and west of the entrance. Here is situated a lighthouse 50 feet in height, standing on an iron pier. There are government powder magazines on the island.

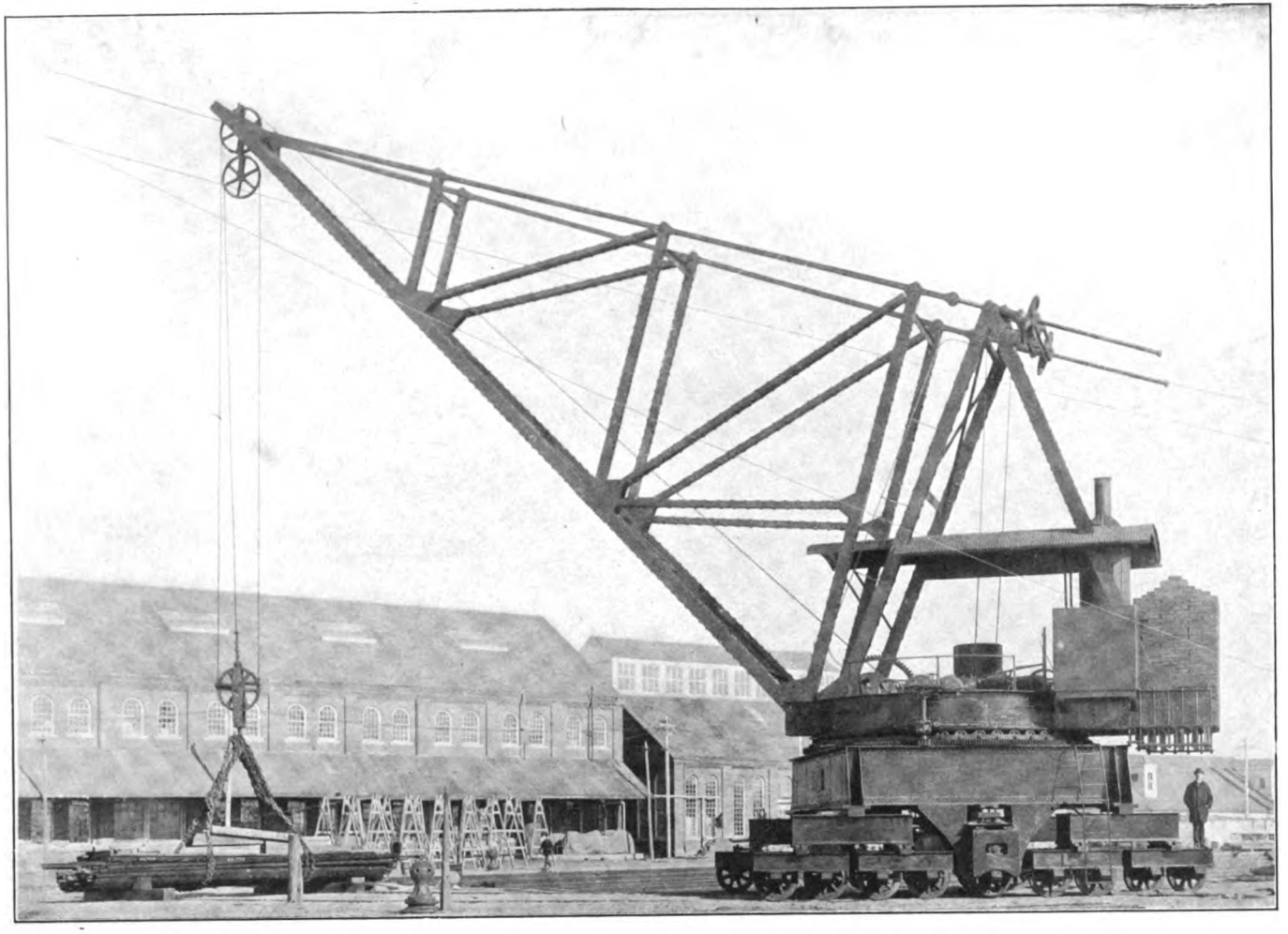
Craney Island, Battle of, 22 June 1813, in the War of 1812: a British fiasco. The island is at the mouth of Elizabeth River, Va., where it opens into Hampton Roads, and lies close to the shore at the west, separated by a shallow strait and opposite a tidal creek. To guard the entrance to Norfolk, Portsmouth, and the navy yard, a battery of seven guns had been placed on the island, with about 700 men, and 15 or 20 gunboats were anchored across the river channel. Admiral Warren ordered Sir Sydney Beckwith with 800 men to land on the mainland and take the island in rear, while Capt. Pechell with 700 in barges landed on the island from the northwest, out of range of the gunboats. Beckwith came to the rear of the island, found the creek and strait too deep to risk fording — or according to Warren's report, the island was too strongly fortified to attack — and reembarked without an effort, 40 men deserting. Pechell's boats grounded in shoal water some hundreds of feet from the island; the seamen sounded and found deep mud below; three of the barges were sunk by the American guns, and the American troops waded out to musket-range and fired at the marines, killing three and wounding 16, while 20 deserted to the Americans. The remaining boats took in their comrades and retired. There were no American losses.

Cran'ford, a popular story by Mrs. Gaskell, published in 1853. Cranford is a village in England (identified as Knutsford); and the story of the quaint ladies there — who scorned the "vulgarity of wealth" and practised "elegant economy" — is told by Mary Smith, a sympathetic and discerning young person from the neighboring town of Drumble. The book not only holds its place as one of the best stories of its kind, but increases in popularity with each year and may be said to have already become an English classic.

Cranganore, krăn-gă-nōr' (*Corangalur*), India, a town in Hindustan, in the presidency of Madras, on the Malabar coast, lying north of a small bay, 16 miles north of Cochin. It has much historic interest, especially as one of the earliest seats of Christianity in India. Syrian Christians are said to have been settled here since 345. Pop. 10,000.

Cranial Nerves, 12 important pairs of nerve branches which have their origin close to the brain stem and are connected with some of the most important functions of the body. The first or olfactory, the second or optic, the fifth or trigeminal, and the eighth or auditory, are largely sensory in their function, whereas the third or oculomotor, fourth or trochlear, sixth or abducens, seventh or facial, the ninth or glosso-pharyngeal, tenth or vagus, eleventh or spinal accessory, and twelfth or hypoglossal, are largely motor in their function. The sensory nerves originate in ganglia situated outside of the nervous axis, whereas the origin of the motor nerves is found in the medulla.

The first or auditory nerve originates in the mucous membrane of the nose and sends its fibres backward into the brain, where perceptions of smell are located. The second or optic nerve originates in the ganglion cells of the retina and then passes by an extremely complicated series of tracks to the occipital area of the brain. Here sight memories are stored, and destruction of this portion of the brain results in a form of aphasia (q.v.). The fifth nerve is a mixed nerve, containing both sensory and motor fibres. The sensory fibres originate largely from the Gasserian ganglion, and the fibres are distributed over the surface of the face, neck and head, conveying sense impressions of touch. Branches also go to the teeth, and toothache is usually an affection of these branches of the fifth nerve. The motor portion of the nerve originates in the medulla and is distributed to a number of the muscles of the jaw and throat. The eighth nerve originates in the organ of Corti in the ear and passes by a very complicated series of fibre tracks into the temporal lobe, where sense impressions of hearing are stored. The ninth, tenth and eleventh nerves are mixed, containing both motor and sensory fibres, the sensory fibres innervating the pharynx, tonsils, œsophagus, stomach, mucous membrane of the larynx, the motor fibres being distributed to the various muscles of the tongue, pharynx, larynx, heart and lungs. The tenth nerve is of particular interest in that it is the great nerve of the heart and lungs, being the chief inhibitory or regulatory nerve of the heart. Of the purely motor nerves the third or oculomotor is distributed to a number of muscles of the eye. The fourth innervates the muscles of the eye, as does also the sixth. The seventh innervates



FORTY TON LOCOMOTIVE CRANE.

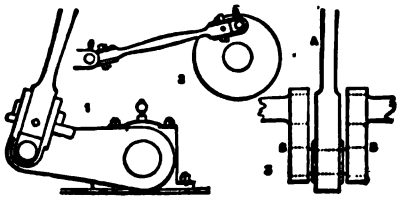
IN USE BY THE U. S. GOVERNMENT AT PORT ROYAL, S. C.

the muscles of the face, and in facial palsy this nerve is affected. The twelfth nerve is exclusively motor, originates in the medulla and is distributed to the muscles of the tongue and associated muscles at the base of the skull. The cranial nerves are continuous with the spinal nerves, but are more highly specialized. Consult 'Cranial Nerves' in Buck, 'Reference Handbook of the Medical Sciences,' Vol. III.

Craniol'ogy, a scientific study of the cranium. It is generally held to be the same as phrenology, but the examination of the cranium is an essential part of anatomy, altogether independent of the inferences with regard to the mental proclivities which may be deduced from it. The comparison of different crania is also essential to archæology and ethnology, and notably to anthropometry. The capacity of the brain-pan is a secondary object of study, the primary one being the comparison of the three dimensions, from the bulge of the eye-brow to the back of the skull, from the root of the ear to the top of the skull, the horizontal or profile line, and the line from the tip of the nose to the base of the ear. Especially important are the angles made by these lines. These measurements are lateral. Vertical measurements are the greatest breadth of the skull and of the jaw bones, and frontal measurements are the maximum width and height of the eye-socket and its horizontal and vertical distances and the greatest breadth of the nasal opening. To criminologists the comparative dimensions of the sides of the face are of further importance. Large divergence of one side is frequently a mark of the criminal and degenerate.

Cranium. See SKULL.

Crank, in machinery, a lever or arm on a shaft, driven by hand (for example, a winch-handle), or by a connecting-rod, its object being



Crank.

to convert reciprocating motion into rotary motion. Engine-cranks which convert the to and fro motion of the piston into continuous rotation of the crank-shaft are connected to the piston-rod end by the connecting-rod. They are, when single, of steel, wrought iron, or cast iron, the crank in this case being either a simple arm, enlarged at one end to fit over the shaft, and with a pin at the other end embraced by the rod end (fig. 1); or else a disk centred on the shaft, with crank-pin as before (fig. 2). This last form is well balanced. When double, as is usual in large engines (fig. 3), they are now often built up of steel, the two arms being shrunk on to the shaft, and pin on to them. In two positions during each turn, a connecting-rod exerts no power of rotation, namely when rod A and crank-arms B are parallel (as in fig. 3 and opposite position), and are the dead centres; all the push or pull of the rod only causes pressure on shaft-bearings. To carry the crank over these points a heavy wheel (fly-wheel) is attached to the shaft, which stores up energy during other parts of the revolution, and gives it out at these points, or two or more cranks are so placed on the shaft that when one is on its dead centre, the others are exerting nearly their maximum effort, which is when rod and crank are at right angles.

Cran'mer, Thomas, English prelate and reformer: b. Aslacton, Nottinghamshire, 2 July 1489; d. Oxford 21 March 1556. He was educated at Cambridge, and in 1523 was chosen reader of theological lectures in his college, and examiner of candidates for degrees in divinity. In the course of conversation on the meditated divorce of Henry VIII. from Catharine of Aragon Cranmer remarked that the question of its propriety might be better decided by consulting learned divines and members of the universities than by an appeal to the Pope. The opinion thus delivered gained the favor of the king and Cranmer was sent for, made a king's chaplain, and commanded to write a treatise on the subject of the divorce. In 1530 he was sent abroad with others to collect the opinions of the divines and canonists of France, Italy, and Germany, on the validity of the king's marriage. At Rome he presented his treatise to the Pope, and afterward proceeded to Germany, where he obtained for his opinions the sanction of a great number of German divines and civilians, and formed such intimate connections with the rising party of the Protestants as probably influenced greatly his future conduct. In January 1533 he was announced as the new archbishop of Canterbury, and on 30 March he was consecrated at Westminster. Soon after, he set the papal authority at defiance, by declaring invalid the marriage between Henry and Catharine, and confirming the king's marriage with Anne Boleyn. Next year an act of Parliament was passed for abolishing the Pope's supremacy, and declaring the king chief head of the Church of England. The new or revised English translation of the Bible, now appointed to be placed in churches, received the name of 'Cranmer's Bible.'

On the death of Henry, in 1547, the archbishop was left one of the executors of his will, and member of the regency appointed to govern the kingdom during the minority of Edward VI. He proceeded to model the Church of England according to the notions of Zuinglius, rather than those of Luther. By his instrumentality the liturgy was drawn up and established by act of Parliament, and articles of religion were compiled, the validity of which was enforced by royal authority, and for which infallibility was claimed. The exclusion of the Princess Mary from the crown, by the will of her brother, was a measure in which Cranmer joined the partisans of Lady Jane Grey, apparently in opposition to his own judgment. With others who had been most active in her elevation, he was sent to the Tower on the accession of Mary. He was tried for treason, and being condemned was sentenced to death, but was spared by the queen, though he lost his position as archbishop of Canterbury. In March 1554 he was sent to Oxford with Ridley and Latimer, and after being kept in prison for nearly a year and a half they were formally tried. Cranmer's trial took place before a papal commissioner, on the charges of blasphemy, perjury, incontinence, and heresy,

and he was sentenced to be degraded and deprived of office. After this, promises were made, which induced him to sign a recantation of his alleged errors. The triumph of his enemies was now complete, and nothing was wanting but the sacrifice of their victim. To make the tragedy more impressive, he was placed on a scaffold in St. Mary's Church, the day he was to suffer, there to listen to a declaration of his faults and heresies, his extorted penitence, and the necessity of his expiating, by his death, errors which Heaven alone could pardon, but which were of an enormity too portentous to be passed over by an earthly tribunal. Instead of confessing the justness of his sentence, and submitting to it in silence, or imploring mercy, he calmly acknowledged that the fear of death had made him belie his conscience; and declared that nothing could afford him consolation but the prospect of extenuating his guilt by encountering, as a Protestant penitent, with firmness and resignation, the fiery torments which awaited him. He was immediately hurried to the stake, where he kept his right hand, with which he had signed his recantation, extended in the flames, that it might be consumed before the rest of his body, exclaiming from time to time, "That unworthy hand." Consult Life by Todd (1861); Hook, 'Thomas Cranmer' in 'Lives of the Archbishops' (1868); Lingard, 'History of England,' Vol. V.; Froude, 'History of England,' Vols. I.–VI.; Green, 'History of the English People,' Vol. II. (1879); Mason, 'Thomas Cranmer' (1898).

Cran'nog, a fortified lake dwelling. The term is especially limited to the buildings in Ireland and Scotland because of its Gælic origin and is not used of the Swiss lake-dwellings. They date from the stone age, at least in theory, although it seems that most of those explored are certainly of historic time, and in some cases are as late as the 9th or 10th century. Of great archæological value are the refuse heaps near them. The Irish crannogs were first studied by Wilde in County Meath. Consult Munro, 'Ancient Scottish Lake-dwellings or Crannogs' (1882). See LAKE DWELLINGS.

Cran'ston, Earl, American Methodist bishop: b. Athens, Ohio, 27 June 1840. He graduated at Ohio University 1861; served in the cavalry during the Civil War, rising to the rank of captain, 1862–4. He entered the Methodist Episcopal ministry, 1867; was publishing agent of the Church 1884–96, when he was elected a bishop. During 1898–1900 he visited China, Japan, and Korea in the discharge of his episcopal duties.

Cranston, R. I., a town in Providence County, on the New York, New Haven & Hartford Railroad. Cranston was originally a part of Providence, but was incorporated as a separate township in 1754. The villages that are included in the town are among the most prosperous in the State. The chief industry is the manufacture of cotton goods. The town is the site of the State prison, and of reform schools for boys and girls. Pop. (1900) 13,343.

Crantara, krăn'tă ra, a fiery cross which formed the rallying symbol in the Highlands of Scotland on any sudden emergency. The Highlanders appear to have borrowed it from the ancient Scandinavians, of whose use of it Olaus Magnus gives a particular account. As late as the insurrection in 1745 the crantara was circulated in Scotland, and on one occasion it passed through the district of Breadalbane, a tract of 32 miles, in three hours. After Charles Edward had marched into England, two of the king's frigates threatened the coast with a descent. The crantara was sent through the district of Appin by Alexander Stuart of Invernahyle (who related the circumstance to Sir Walter Scott), and in a few hours a sufficient force was collected to render the attempt of the English hopeless.

Crapaud (F. Crapaud, "toad"), **Jean,** or **Johnny,** a nickname applied to Frenchmen, as that of John Bull is similarly applied to Englishmen.

Crape, a light, transparent stuff, like gauze, made of raw silk, gummed and twisted on the mill, woven without crossing, and much used in mourning. Crapes are either craped (that is, crisped) or smooth. The silk destined for the first is more twisted than that for the second, it being the greater or less degree of twisting, especially of the warp, which produces the crisping given to it when taken out of the loom, steeped in clear water, and rubbed with a piece of wax for the purpose. Crapes are all dyed raw. This stuff came originally from Bologna, where tradition says it was made in the 7th century; but till of late years Lyons has had the chief manufacture of it. It is now manufactured in various parts of Great Britain. The crape brought from China is of a more substantial fabric. A woolen imitation is craped by machine rollers.

Crapelet, Charles, shärl krăp-ē-lā, French printer: b. Bourmont 13 Nov. 1762; d. Paris 19 Oct. 1809. He came to Paris at the time when great attention was beginning to be paid to the improvement of typography in finish and elegance. He practised his profession there for 20 years, and his editions are highly esteemed for their correctness. The most remarkable productions of his press are 12 copies, in letters of gold, of the *Oiseaux dorés* of Audibert.

Crapelet, Georges Adrien, zhôrzh ä-drē-ĕñ, French printer and author: b. Paris 13 June 1789; d. Nizza 11 Dec. 1842. He maintained the reputation of his father, Charles Crapelet (q.v.), and the works which he published are esteemed for correctness and beauty of execution. Among them there are editions of La Fontaine, of Montesquieu, Voltaire, Rousseau, and Sismondi's 'Histoire des Français.' The idea of publishing a collection under the title of 'Anciens monuments de l'histoire de la langue Française' originated with him. He wrote an account of the progress of the art of printing in France and Italy in the 16th century, and its influence upon literature (8vo. 1836), and was the author of 'Souvenirs of London,' and of a history and description of that city, beside several translations from the English.

Crappie, krăp'ĭ, a widely distributed American sunfish (*Pomoxys annularis*) with a confusing number of local names, such as "bachelor," "Campbellite," "new-light," "tin-mouth," or "paper-mouth," etc., in the central Mississippi valley, and "sac-à-lait," and "chinquapin" in the Gulf States, where it is especially numerous. It is silvery olive in color, mottled with dark green on the upper part of the body, with vertical bars on the high fins. It may readily be

distinguished from the calico bass by the fact that its dorsal fin has not more than six spines. It will take a minnow-bait with the avidity of a black bass, but will not make so keen a fight. Its range has lately been very widely extended by the efforts of the United States Fish Commission. Consult: Jordan & Evermann, 'Food and Game Fishes of America' (1902). See SUNFISH.

Crash'aw, Richard, English poet: b. London 1616; d. 1649. He was educated at the Charterhouse and at Cambridge. In 1637 became a Fellow of Peterhouse, and having been admitted to orders, was noted as an eloquent and powerful preacher. In 1634 a volume of Latin poems, under the title of 'Epigrammata Sacra,' had been published anonymously by him at Cambridge. In 1644 he was ejected from his fellowship by the Parliamentarians, and proceeded to Paris, where he became a convert to the Roman Catholic faith. He was afterward a canon in the church of Loretto. A collection of poems by him, entitled 'Steps to the Temple, Sacred Poems, with other Delights of the Muses,' was published in 1646; and a posthumous volume 1652, 'Carmen Deo Nostro.' Gilfillan published some of Crashaw's poems in his edition of 'British Poets'; and an edition by Grosart was published in 1872.

Crassulaceæ, a natural order of plants, orpine family, which has 15 genera, and upward of 500 species, widely distributed throughout the world. They are herbs or shrubs, mostly fleshy or succulent. The best-known species of the family are the orpine or live-forever (*Sedum telephium*), and various stonecrops. The family is particularly rich in tropical species, which are known for the beauty of their flowers, and are cultivated in hothouses, and used for bedding out in warm dry locations.

Crass'us, Lucius Licinius, Roman orator: b. 140 B.C.; d. 91 B.C. He is introduced by Cicero, in his treatise 'De Oratore,' as the representative of that writer's own opinions on the subject of oratory. He was unfortunate as a legislator, inasmuch as the law proposed by him, to compel all who were not citizens to depart from Rome, was a main cause of the Social war. He was distinguished for his love of the arts; and his mansion upon the Palatium is cited, both for its architecture and for the statuary and paintings with which it was adorned, as having been one of the most noteworthy buildings in ancient Rome.

Crassus, Marcus Licinius, Roman triumvir, surnamed DIVES: b. about 115 B.C.; d. 53 B.C. When Sulla landed in Italy, 83 B.C., Crassus joined him and rendered him important services, for which he was rewarded with donations of confiscated property, besides being allowed to purchase confiscated estates at an almost nominal value. He was exceedingly fond of wealth, and also exceedingly skilful and by no means scrupulous in the ways and means of accumulating it. In 71 B.C. he was created prætor, and took the command against Spartacus and the revolted slaves. Spartacus was defeated and slain, along with a great number of his followers, and 6,000 captured slaves were crucified along the road between Rome and Capua. In 70 B.C. Crassus was elected consul, having Pompey as his colleague; was censor in 65 and with Cæsar and Pompey made up the first triumvirate in 55.

Cratægus, a genus of plants placed by American botanists in the apple family (*Pomaceæ*). The genus includes about 50 species, natives of the north temperate zone, Mexico, and the Andes of parts of Central America. The name is from the Greek, meaning "strong," and the plants are so called from the toughness of their wood. Twenty or more of the genus are found in North America. They are all large shrubs or small trees, more or less thorny; hence the name thorn, which is generally applied to them. The best-known American species is *C. crus-galli* or cockspur thorn, a shrub or small tree with a maximum height of 30 feet, the thorns numerous and slender, which blossoms in May and June in thickets from western Quebec westward to Manitoba and southward to Florida and Texas. The wood is heavy, weighing about 45 pounds to the cubic foot. The hawthorn, hedge-thorn, May-bush or quickset is *C. oxyacantha*. The scarlet thorn, haw or red haw, is *C. coccinea*. It is a small tree, reaching 30 feet high, growing in the same region as *C. crus-galli*. The wood is hard, of a reddish brown color and weighs about 53 pounds per cubic foot. The azaroles (*C. azarolus*), natives of the Levant, are occasionally cultivated for their fruit, which is about the size of the Siberian crab, and is used either for dessert or for pies. *C. orientalis* (or *odoratissima*) and *C. tanacetifolia* have also fruit of considerable size. The latter is much eaten in Armenia. *C. mexicana* has a large fruit, like a small apple, but not eatable. It is, however, very ornamental. The wood of most of the species much resembles that of the hawthorn. It is common to graft the rarer species on the hawthorn.

Crater (Gr. κρατήρ, a bowl), the opening on the tops or sides of volcanic mountains, through which the lava and ashes are ejected. The crater of Etna, like many of the most ancient volcanoes, does not retain the bowl-like shape to which the name owes its origin; that of Vesuvius, however, preserves the typical form. Variations in the form of the crater are due to varying violence of the eruption. The more powerful eruptions tear off the mountain top and produce the hollowed cup.

Crater, one of Ptolemy's northern constellations. It is sometimes considered a part of the constellation Hydra, and contains 35 stars visible to the naked eye, the three largest being of the fourth magnitude.

Crater Lake, a small lake in the Cascade Mountains, in Oregon, remarkable for its wall of perpendicular rock, from 1,000 to 2,000 feet high, a form due to volcanic action in geological times.

Craterus, krăt'ē-rŭs, Macedonian general: d. 321 B.C. After the death of Alexander the Great, he received, together with Antipater, the government of Macedonia and Greece. He assisted Antipater in the Lamian war, and also against the Ætolians and Perdiccas, and fell in a battle against Eumenes.

Crates (krā'tēz) **of Athens,** Greek comic poet: flourished about 450 B.C., and contemporary with Cratinus. Eminent as an actor, he often performed the principal parts in the plays of Cratinus. As a comic poet he was the first Athenian who ventured to follow the example of Epicharmus so far as to bring drunken char-

acters on the stage. Aristotle in his 'Poetics' bears testimony to the excellence of his works. Little, however, is really known of them. Meineke, who has made a careful analysis of the statements of ancient writers on the subject, gives the titles of 14 ascribed to him. Fragments of eight of these are still extant.

Crates of Mallus, Greek grammarian; flourished about 150 B.C. He founded the celebrated Pergamene school of grammar, and became the great rival of Aristarchus, of the Alexandrian school. From his work on Homer, he is said to have been called 'Ομηρικος. He wrote commentaries on Hesiod, Euripides, and Aristophanes. Only a few fragments of his works are preserved.

Crates of Thebes, Greek Cynic philosopher: flourished about 320 B.C. He was born at Thebes, but early removed to Athens, where he became the pupil of Diogenes, and afterward one of the most eminent in that school of philosophers. According to Diogenes Laertius, he lived a Cynic of the straitest sort. Fearing that the quiet of philosophical pursuits would be disturbed by the cares of wealth, of which he had an abundance, he is said to have thrown his money into the sea; or, according to another account, to have placed it in the hands of a banker, with the condition that if his sons should have the misfortune to be fools, they should inherit the property, and that otherwise it should be distributed to the poor. "For," said Crates, "if they are philosophers, they will not need it."

Cratinus, krą-tī'nŭs, Greek comic poet: b. about 520 B.C.; d. 422 B.C. The 'Archilochoi,' supposed to have been his earliest production, was not exhibited till he was upward of 70 years of age; but he lived to achieve much for his profession, and at the advanced age of 97 died at the height of his fame, having just triumphed over Aristophanes himself. He found the Greek comedy a mere plaything, employed to excite merriment and laughter, and at once converted it into a terrible weapon for the chastisement of public and private vice. Horace particularly commends the public spirit and the impartial justice with which he exercised his censorship over the morals of his age. The uniform testimony of ancient writers places Cratinus in the first rank as a comic poet. His great rival, Aristophanes, was fully aware of his power. In the 'Knights' he compares him to a torrent carrying everything before it. According to the best authorities he wrote but 21 dramas, 9 of which were successful in the Dionysiac contest. Not a single one of his dramas is now extant; only a few fragments remain to attest the excellence of his admired productions.

Cratinus, Greek poet of the middle comedy, contemporary with Plato, the philosopher, and sometimes confounded with his elder and more celebrated namesake preceding. Eight plays are ascribed to him.

Cratippus, krą-tĭp'us, Greek historian, contemporary with Thucydides. He continued the work of the great historian, and brought it down, according to Plutarch, to the time of Conon. The well-known words of Dionysius: "He wrote what Thucydides left unwritten," evidently show that Cratippus not only continued the history of Thucydides, but also supplied whatever omissions he thought he found in it.

Cratippus, Greek Peripatetic philosopher: b. Mitylene about 75 B.C. He appears to have been held in the highest estimation by the great men of his age. Cicero calls him the prince of all the philosophers whom he had known. Pompey visited him after his defeat at Pharsalia, and received at his hands the consolations of philosophy; and Brutus went to Athens, to which city Cratippus had latterly betaken himself, to listen to his prelections, even while making preparations to meet Octavius and Antony. Nothing that he wrote has survived.

Cravat (Fr. "a Croatian," see below), a neckcloth or tie worn about the collar. The ancients left the neck unconfined, only wrapping it in case of sickness. The earliest necktie was a small cord fastening the collar, a starched band of fine linen attached to the shirt. With the introduction of ruffs these ties went out. The modern form of the cravat dates from 1660, when a regiment of Croats (or Cravates, as the French called them) came to France wearing a bandage about the neck, consisting of common stuff for the soldiers, and of muslin or silk for the officers, with the ends disposed in a bow, or garnished with a tuft or a tassel, and hung over the breast. The fashion was taken up and the military and the rich wore fine cravats, with the border embroidered or edged with broad lace. Those of the soldiers consisted of a scrap of cloth, of cotton, or, at the best, of black, plaited taffeta, bound round the neck by two small cords. Afterward the place of these cords was supplied by clasps or a buckle, and then cravats took the name of stocks. Under Louis XVI. the stocks yielded to the cravats *à la chancelière.* The last flourished but for a moment; the Revolution came, and with it disappeared cravats and even tight breeches.

Soon after this epoch (1796) the cravat recovered its popularity, and increased to an incredible degree of extravagance. Some persons enveloped the neck with whole pieces of muslin; others with a padded cushion, on which were wrapped numerous folds. In this way the neck was puffed out so as to be larger than the head, with which it was imperceptibly confounded. The shirt collar arose above the ears, and the upper edge of the cravat buried up the chin and the mouth nose-deep; so that it was impossible to incline the head in any direction. This fashion of wearing voluminous cravats lasted for a considerable time, but common sense at last brought in the simpler style of neckties that has since prevailed.

Craven, Alfred Wingate, American civil engineer: b. Washington, D. C., 20 Oct. 1810; d. Chiswick, Eng., 29 March 1879. He was graduated at Columbia College in 1829, and was largely employed in railroad construction and management. His most important work was in New York, in connection with its sewerage, its supply of Croton water, and the improvement of Fourth Avenue. From the organization of the Croton water board, in 1849, till 1868, he was its engineer, and planned and supervised the construction of the great works of that period. He was a founder, director many years, and president, 1869–71, of the American Society of Civil Engineers.

Craven, Charles, English colonial officer. He was governor of South Carolina from 1712 to 1716, and had been previously secretary to the proprietors. They ordered him in 1712 to sound Port Royal River, and probably he built Beaufort soon afterward. In 1715, on the occurrence of an Indian war, he displayed great vigor and talent, and expelled from the province the invading savages.

Craven, Elijah Richardson, American Presbyterian clergyman: b. Washington, D. C., 28 March 1824. He graduated at Princeton 1842, and from its Theological Seminary 1848. Ordained in the Presbyterian ministry 1850, he held pastorates at Somerville and Newark, N. J., 1850–87, when he became secretary of the Presbyterian Board of Publication and Sabbath-school Work. He was the American editor of Lange's 'Commentary on the Book of Revelation.'

Craven, Pauline de la Ferronays (MADAME AUGUSTUS), French novelist: b. Paris 1820; d. there 1 April 1891. Her 'Family Memoirs'; 'The Story of a Sister'; 'The Labor of a Soul'; and other fictions are as well known in English translations as in their original French.

Craven, Thomas Tingey, American naval officer: b. Washington, D. C., 30 Dec. 1808; d. Boston, Mass., 23 Aug. 1887. He joined the navy in 1822; was promoted captain in June 1861, and the same year was given command of the Brooklyn, with which vessel he took part in the capture of New Orleans and the later actions on the Mississippi. In 1862 he was placed in command of the Niagara, and during the remainder of the war he served along the coasts of England and France. He was promoted rear-admiral in October 1866; retired in December 1869.

Craven, Tunis Augustus Macdonough, American naval officer: b. Portsmouth, N. H., 11 Jan. 1813; d. 5 Aug. 1864. He entered the navy in 1829; in 1857 surveyed the isthmus of Darien; coasted about Cuba to intercept slave ships; and in the Civil War had part in preventing the capture of the fort on Key West. Given the rank of commander he joined Farragut's fleet off Mobile, commanding the monitor Tecumseh. In the battle of Mobile Bay the Tecumseh was sunk by running upon a torpedo, and Craven and almost all his crew lost their lives.

Crawfish. See CRAYFISH.

Craw'ford, Francis Marion, American novelist: b. Bagni di Lucca, Italy, 2 Aug. 1854, his father being Thomas Crawford the sculptor (q.v.). He was educated at Trinity College, Cambridge, and afterward studied Sanskrit and other subjects on the European continent. In 1879–80 he was editor of the 'Allahabad *Indian Herald*' and for nearly 20 years subsequently resided mainly in Italy. His novels and other writings include: 'Mr. Isaacs' (1882); 'Doctor Claudius' (1883); 'A Roman Singer' (1884); 'An American Politician' (1884); 'Zoroaster' (1885); 'A Tale of a Lonely Parish' (1886); 'Marzio's Crucifix' (1887); 'Saracinesca' (1887); 'Paul Patoff' (1887); 'With the Immortals' (1888); 'Greifenstein' (1889); 'Sant' Ilario' (1889); 'A Cigarette-maker's Romance' (1890); 'The Witch of Prague' (1891); 'Khaled' (1891); 'The Three Fates' (1892); 'The Children of the King' (1892); 'Don Orsino' (1892); 'Marion Darche' (1893); 'Pietro Ghisleri' (1893); 'The Novel: What Is It?' (1893); 'Katharine Lauderdale' (1894); 'Love in Idleness' (1894); 'The Ralstons' (1895); 'Constantinople' (1895); 'Casa Braccio' (1895); 'Taquisara' (1896); 'A Rose of Yesterday' (1897); 'Corleone' (1897); 'Ave, Roma Immortalis' (1898); 'In the Palace of the King' (1898); 'Via Crucis' (1899); 'The Rulers of the South' (1900); 'Marietta' (1901); 'Cecilia' (1902); 'Man Overboard' (1903). As a novelist Crawford is characterized by excellence in the depicting of character and general carefulness in the handling and collection of his materials. Several of his novels have been translated into German, and he himself produced French versions of 'Zoroaster' and 'Marzio's Crucifix.' In recognition of his merits as a writer the French Academy bestowed on him the Monbrun prize and a gold medal.

Crawford, George Washington, American lawyer: b. Columbia County, Ga., 22 Dec. 1798; d. 22 July 1872. He was graduated at Princeton 1820; was attorney-general of Georgia 1827–31; a member of the State legislature 1837–42; and Whig representative in Congress 1843. He was elected governor of Georgia 1843, and re-elected 1845. He was secretary of war in President Taylor's cabinet 1849–50, resigning upon the death of the President.

Crawford, Isabella Valency, Canadian poet: b. Dublin, Ireland, 1851; d. 1887. She was a well-known Canadian writer, and furnished many stories for American publications. In 1884 she published a collection of poems highly commended by critics.

Crawford, John Martin, American physician: b. Herrick, Pa., 18 Oct. 1845. He was graduated at Lafayette College 1871, and at Pulte Medical College, Cincinnati, 1878, where he became professor of physiology and physical diagnosis 1881–9. From 1889 to 1894 he was United States consul-general to Russia, and while there made the first complete English translation of the Finnish epic poem 'The Kalevala' (1888). He also edited and translated a five-volume work on 'The Industries of Russia.'

Crawford, Mary Caroline, American author: b. Boston, Mass., 5 May 1874. She was educated at Radcliffe College, and besides contributing editorially and otherwise to various New York and Boston journals, was literary editor of the 'Boston Budget' 1898–1902. She has published 'The Romance of Old New England Roof Trees' (1902); 'The Romance of Old New England Churches' (1903).

Crawford, Nathaniel Macon, American Baptist clergyman: b. near Lexington, Ga., 22 March 1811; d. near Atlanta, Ga., 27 Oct. 1871. He was graduated at the University of Georgia in 1829; was professor of mathematics in Oglethorpe University, Ga., 1837–41, and was ordained to the Baptist ministry in 1844. He was professor of biblical literature in Mercer University, Ga., 1847–54; president 1854; and professor in the Western Baptist Theological Seminary at Georgetown, Ky., 1857–8, when he resumed the presidency of Mercer University. Besides some minor works on the tenets of his Church he wrote 'Christian Paradoxes' (1858).

Crawford, Thomas, American sculptor: b. New York 22 March 1814; d. London, Eng., 16 Oct. 1857. His most famous works comprise 'Orpheus and Cerberus'; 'Adam and Eve'; 'Hebe and Ganymede'; 'Mercury and Psyche'; and 'Dancing Jenny.' His statue of the 'Genius of America' is placed on the dome of the capitol at Washington, and for the State of Virginia he made the equestrian statue of Washington, at Richmond.

Crawford, William, American soldier: b. Berkeley County, Va., 1732; d. Wyandot County, Ohio, 11 June 1782. He was a surveyor by profession, and an associate of Washington, who trusted him greatly. He served with the Virginia riflemen through Braddock's campaign; was promoted captain on Washington's recommendation in 1761, and served through the Pontiac war 1763–4. When the Revolution broke out he joined Washington with a company of Virginians; was at the battles of Long Island, Trenton, and Princeton; on frontier duty 1778; and was colonel when he resigned in 1781. In May 1782, at Washington's request, he commanded an expedition against the Wyandot and Delaware Indians on the Sandusky River. They met the Indians 4 June, and in the engagement which followed Crawford was captured and subsequently tortured by his captors before being burned at the stake. Consult Roosevelt, 'Winning of the West' (Vol. II., 1889); Butterfield, 'Expedition Against Sandusky' (1873).

Crawford, William Harris, American statesman: b. Amherst County, Va., 24 Feb. 1772; d. Albert County, Ga., 15 Sept. 1834. In 1783 he settled in Georgia, was admitted to the bar in 1798, and entered on practice in Lexington. He was elected to the State senate in 1802, and to the United States Senate to fill a vacancy in 1807 (fighting two duels during the canvass); was re-elected for a full term in 1811; was chosen president of the Senate pro tem. in 1812; and, refusing the secretaryship of war, was appointed minister to France in 1813. Two years later he became secretary of war, and the next year secretary of the treasury, and held the latter office till March 1825. He was urged as a candidate for the presidency several times, received the nomination in 1824, and in the election had 41 electoral votes. No choice for President having been reached, the election was decided in the House of Representatives, but meanwhile Crawford had been stricken with paralysis, which precluded his effectual candidacy.

Crawford, William Henry, American educator: b. Wilton Centre, Ill., 1855. He was graduated at Northwestern University 1884, and from Garrett Biblical Institute. After five years' pastoral work in the Methodist ministry he became professor of the history of theology in Gammon Theological Seminary 1889–93. In 1893 he was elected president of Allegheny College, Meadville, Pa. He was one of the judges to select the names for the Hall of Fame in New York.

Crawford Notch, the picturesque pass in the White Mountains, New Hampshire, between Mounts Webster and Wiley, which rise about 2,000 feet above the Saco River, which flows through the Notch.

Crawfordsville, Ind., city and county-seat of Montgomery County, on Sugar Creek, and the Chicago, Cleveland, Cincinnati & St. Louis and the Vandalia and Monon Route railroads; 44 miles west of Indianapolis. It is the trade centre of an extensive agricultural region, with annual dealings of $3,500,000. It is the seat of Wabash College, and has foundries, planing- and flour-mills, electric lights, waterworks, high school, daily and weekly newspapers, two national banks, and an assessed property valuation of $5,000,000. Pop. (1900) 6,649.

Crawfurd, Oswald, English novelist. He was the son of a former English envoy to Siam, and governor of Singapore, and was educated at Eton and Oxford. After serving as a clerk in the Foreign Office he was English consul at Oporto, Portugal, 1867–91. He has published: 'Travels in Portugal, by John Latouche'; 'Round the Calendar in Portugal'; 'Portugal: Old and New'; 'British Comic Dramatists'; 'Lyrical Verse from Elizabeth to Victoria'; 'Four Poets' (1899); 'Two Masques,' a book of verse; and the novels, 'The World We Live In'; 'Beyond the Seas'; 'Sylvia Arden'; 'The New Order.'

Crawshaw, krâ'shâ, **William Henry,** American educator: b. Newburg, N. Y., 6 Nov. 1861. He was graduated at Colgate University, Hamilton, N. Y., 1887, and was elected professor of English literature there the same year. Since 1897 he has also been dean of the college faculty. He has published: 'The Interpretation of Literature' (1896); 'The Literary Interpretation of Life' (1900); and an edition of Dryden's 'Palamon and Arcite' (1898).

Crayer, krī'yėr, **Gaspar,** Dutch painter: b. Antwerp 1582; d. 1669. He was a pupil of Raphael Coxis, and became, by the study of nature, one of the greatest historical and portrait painters. At the Spanish court in Brussels he painted the portrait of the Cardinal Ferdinand, brother of the king, and received a pension. He established himself in Ghent, where he constantly executed works for the court, laboring with industry and perseverance till his 86th year. The city of Ghent alone had 21 altar-pieces by him. In Flanders and Brabant are many of his works, and some of his pictures are in the public collections at Vienna and Munich. His paintings are praised for fidelity to nature, excellent drawings, and a coloring approaching the manner of Vandyke.

Crayfish, or **Crawfish** (Fr. *écrevisse,* so not connected with "fish"), a fresh water crustacean of the family *Astacidæ,* order *Decapoda.* They are known by their large size, lobster-like shape, the abdomen being as long as the cephalothorax, and ending in a broad tail-fin. The first pair of legs end in large claws (chelæ), not so large in proportion as those of the lobster, and those of each leg are nearly equal in size. Crayfish attain a length of three to six inches, and live in streams or ditches, sometimes abounding in great numbers. They dig holes in the banks, from a few inches to a yard in depth, probably, like the lobster, using their big claws for this purpose. They lie at the mouth of their burrow with their claws extended ready to seize any passing insects, snails, tadpoles, or frogs, and sometimes larger animals, and, like the lobster, they will not refuse carrion, and occasionally feed on succulent roots. The European crayfish spawns in the early spring, the eggs hatching

in May and June. As in all fresh-water crustacea the young are hatched in the form of the parent, there being no metamorphosis,— in other words, development is direct. As in the lobster, if an antenna or leg is lost it is gradually renewed, growing at every molt. For some time after they are hatched the young adhere by the hooked end of their claws to the swimmerets of the mother, and are carried about under cover of her abdomen. During this period the young crayfish are very sluggish, and take no food, being nourished by the food-yolk still persisting in the front part of the body. The European crayfish molts eight times in the course of the first year, and five times during its second year; in the third year only twice, that is, in July and September. At a greater age than this the females molt only once and the males twice a year.

The crayfish of the Old World belong to the genus *Astacus,* while those of North America east of the Sierra Nevada belong to the genus *Cambarus,* the latter differing by the absence of gills on the fifth or last pair of legs. An interesting feature in geographical distribution is the occurrence of half a dozen species of the European genus *Astacus* in the streams draining the Pacific coast from British Columbia to California. East of the Rocky Mountains, from the Great Lakes to Guatemala, there occur between 30 and 40 species of *Cambarus.* These extend to eastern New York west of the Hudson River, and a single species (*C. bartoni*) occurs under stones in certain lakes of northern Maine as also in Lake Champlain and the Great Lakes, extending southward to Kentucky and the District of Columbia.

The presence of the Eurasian *Astacus* on the Pacific coast indicates their gradual migration from eastern Asia, at a time when Bering Strait was dry land. In certain characters the Amurland and Japanese *Astaci* differ from the Ponto-caspian and the west American *Astaci* and approach the *Cambari* of eastern North America. This is also paralleled in the distribution of many plants and insects.

The family to which the crayfish belongs dates as far back as the Jurassic Period, and in Europe *Astaci* first appear in the Upper Cretacean. In North America fossil *Astaci* (*Cambarus primæves*) occur in the Lower Tertiary beds of the western border of Wyoming. Cope discovered fossil *Astaci* in the late Pliocene beds of Idaho. *Astacus* probably originated in western America, since it is found fossil throughout the Tertiary.

Crayfishes are of no little economic importance from the fact that in the course of their extensive fossorial operations they undermine dams, and it is supposed that the inundations of the Mississippi River and the breaks in the levees may be due largely to the mining habits of these animals. For the blind crayfish see CAVE-DWELLING ANIMALS. Consult: Huxley, 'The Crayfish' (1880); Hagen, 'Monograph of the North American Astacidæ' in the 'Illustrated Catalogue of the Museum of Comparative Zoology,' No. III., Cambridge 1870, and for habits and uses, Rathbun, 'Fishing Industries of the United States' (1884).

Crayon, Geoffrey. See GEOFFREY CRAYON.

Crayon, a colored pencil consisting of a cylinder of fine pipe-clay colored with a pigment. Black crayons are colored with plumbago, or made of Italian black chalk. A white crayon is a cylinder of chalk, common in Europe and America. Red chalk is found in France. The holder is a porte-crayon. Crayons are said to have been made in France in 1422. It is hard to say how long ago charcoal, chalk, and ocherous earths were used. Colored crayons are used for pastel-drawing and are quicker and softer in effect than oils or water colors. Their disadvantage lies in their delicacy; they smudge so easily that it is practically impossible to use them for sketching, and they must be kept under glass.

In lithography a crayon is a composition formed as a pencil, and used for drawing upon lithographic stones. It is of a soapy nature, consisting of soap, wax, resins, and lampblack, melted, and sometimes burned, together.

Crazy-weed, a common name in the prairie States for a species of vetch (*Astragalus mollissimus*) of the pea family. It is an herb with purple or yellowish purple flowers, growing on the prairies from Nebraska and Colorado southward to Texas and New Mexico. It receives its name of crazy-weed from the effect it has upon cattle when eaten by them. Another common name is loco-weed, from which arises a local term for an insanely acting person, who is said to be locoed. The same common names are applied to *Spiesia Lamberti,* which grows northward from Minnesota to British Columbia, and south through Texas and New Mexico.

Cream. See DAIRY INDUSTRY.

Cream Nut. See BRAZIL NUT.

Cream of Tartar, a white, crystalline compound of tartaric acid (q.v.) and potassium. Tartaric acid is dibasic, its molecule containing two atoms of hydrogen that are replaceable by metals. Cream of tartar is the substance that is formed when only one of these typical hydrogen atoms is replaced by potassium; and it is therefore known to chemists as hydrogen potassium tartrate, or acid potassium tartrate, to distinguish it from the normal potassium tartrate, in which both of the typical hydrogen atoms of the acid are replaced by potassium. Cream of tartar is obtained from argol (q.v.), which forms about vats or casks in which wine is undergoing fermentation. The argol is dissolved in hot water, and the solution decolorized by albumin or animal charcoal, the cream of tartar being then extracted by evaporation and crystallization, and purified by recrystallization. Cream of tartar is soluble in water, but it does not dissolve as freely as the other familiar compounds of potassium. It constitutes the chief commercial source of tartaric acid and its compounds, and is used in medicine to some extent. The best baking powders consist of cream of tartar, mixed with sodium bicarbonate in the proportion of the relative molecular weights of the two substances. These salts do not act upon each other when dry, but when they are moistened they combine to produce the normal tartrate of potassium and sodium, with the formation of water and the liberation of carbon dioxid gas. The formula of cream of tartar is $KH_5C_4O_6$, and that of sodium bicarbonate is $HNaCO_3$. The reaction that oc-

curs is represented by the equation $HNaCO_3 + KH_5C_4O_6 = H_2O + CO_2 + KNaH_4C_4O_6$, the last formula on the right being that of the normal tartrate of sodium and potassium. The carbon dioxid gas that is liberated in the reaction is retained by the dough or batter with which the baking powder is mixed, and serves to make it porous, or "light."

Creameries, Co-operative. See DAIRY INDUSTRY.

Creamery. See DAIRY INDUSTRY.

Cre'asote, a variant spelling of creosote (q.v.).

Creasy, SIR **Edward Shepherd,** English historian: b. Bexley, Kent, 12 Sept. 1812; d. London, 27 Jan. 1878. He was educated at Eton, and Cambridge. He was called to the bar at Lincoln's Inn in 1837, and was for about 20 years a member of the home circuit. In 1840 he was appointed professor of history at the London University, and in 1860 was knighted and made chief justice of Ceylon. His principal works are: 'The Rise and Progress of the British Constitution' (1834); 'The Fifteen Decisive Battles of the World' (1851), a book famous in both England and America. Less known, though still of considerable merit, are his 'Imperial and Colonial Constitutions of the Britannic Empire'; a 'History of the Ottoman Turks' (1854–6); a 'Historical and Critical Account of the Several Invasions of England'; 'The Old Love and the New,' a novel; and a 'History of England' (1869–70).

Creatine, krē'a-tĭn, or **Kreatine,** a crystalline, nitrogenous substance having the formula $C_4H_9N_3O_2 + H_2O$, and known to chemists as "methyl-guanido-acetic acid." It exists in the muscular flesh of mammals, birds, reptiles, and fishes, and also, in smaller quantities, in brain-tissue, and in urine. It may be extracted by chopping up lean muscular flesh (freed from fat), rubbing it with water at about 140° F., and removing the water by pressure. The liquid so obtained is heated on a water bath to coagulate the albumin, and then strained. Sub-acetate of lead is added to the filtrate so long as it gives a precipitate, excess of lead is removed by sulphuretted hydrogen, and the filtrate is concentrated on a water bath. Crystals of creatine then separate out, the yield being larger if two or three volumes of alcohol are added. The crystals are redissolved, decolorized by filtration through animal charcoal, and purified by recrystallization. Creatine crystallizes in monoclinic prisms, containing one molecule of water. Its aqueous solution has a bitter taste, and is neutral to litmus. With silver nitrate it gives a white precipitate, which is soluble in caustic potash. If a small quantity of silver nitrate is added to a saturated solution of creatine, together with just sufficient caustic potash to dissolve the precipitate formed, the solution presently solidifies to a transparent gelatinous mass, which, when heated, deposits metallic silver. Creatine is dissolved by strong acids, losing one molecule of water, and becoming converted into creatinine. It is also decomposed by boiling with baryta water, yielding sarcosine ($C_3H_7NO_2$) and urea (CH_4N_2O). Creatine may be prepared synthetically by allowing an alcoholic or aqueous solution of sarcosine and cyanamide, $C(NH)_2$, to evaporate spontaneously, crystals of creatine separating out as the evaporation proceeds. See also CREATININE.

Creatinine, or **Kreatinine,** a crystalline substance having the chemical formula $C_4H_7N_3O$, and closely allied to creatine (q.v.), from which substance it may be obtained by the removal of one molecule of water by the action of mineral acids or dehydrating agents. It may also be prepared directly from human urine, though, according to Johnson, slight differences exist between the substances obtained from creatine and from urine; for example, both reduce Fehling's solution, but the creatinine prepared directly from urine has a reducing power about 20 per cent greater than that prepared from creatine. Differences in solubility are also said to exist. Creatinine crystallizes in prisms, which may be anhydrous, or may contain two molecules of water. It is very soluble in hot water, its solution being neutral to litmus according to some authorities, but alkaline according to others. It forms well-crystallized salts with acids, and in alkaline solution it slowly takes up water and becomes transformed into creatine. Physiologically, creatinine is to be regarded as a derivative from creatine; for, according to Carpenter, "the latter predominates in the juice of flesh, almost to the exclusion of the former, while the former predominates in the urine, almost to the exclusion of the latter."

Creation (Lat. *creatio,* from *creare,* to create), **The.** Creation is the act of creating or bringing into existence, also something created or caused to exist; specifically the act of bringing into existence the universe, likewise the universe itself. The Old Testament account of the creation contained in Genesis i.–ii. 4 (first clause) is received by those who accept the literal authority of the Bible. Genesis ii. 4–7 (second clause) contains, according to many of the later biblical critics, another and quite distinct narrative of the creation. According to the first and generally accepted account, God created the heaven and the earth in the course of six — or, including the rest-day, seven — successive days. On the first day he created light, and called the light day and the darkness night; on the second day he made the firmament and divided the waters; on the third day appeared the dry land, while the waters were gathered together in seas, and plants began to grow upon the earth; on the fourth day the lights were set in the firmament; on the fifth day God created aquatic and bird life; on the sixth day he made land animals and created man. On the seventh day God rested from his work, and from this part of the account came the institution of the Sabbath, as having been hallowed for man by the example and decree of God himself. Various attempts have been made to bring this narrative into harmony with the discoveries and speculations of modern scientific and philosophical thought; but at the present time there appears to be a feeling, as well among scholars as among people at large, that such endeavors can only be unprofitable; while the record of primitive theorizing upon the origin of the world may well be left to tell its own story, however variously interpreted, to the modern mind.

Other ancient cosmogonies have long engaged the attention of students, and in the different early accounts of creation brought to light from

the literary and monumental remains of antiquity much valuable material has been found for the study of comparative records bearing upon history and religion. Among the old cosmogonies, that contained in the Babylonian and Assyrian legend of creation is especially interesting, from the points of resemblance between itself and the account above given from the book of Genesis. The two are variously regarded by specialists, some treating them as independent variants of one original tradition or myth, while others hold that the narrative of Genesis is a borrowing from the Babylonian legend.

It is now more than 30 years since the learned world was startled by the announcement that Assyriologists had discovered a remarkable version of the history of the creation, which closely resembled the main narrative of Genesis, and appeared to be based upon the archetype from which one of the earliest editors or writers of the Hexateuch drew many of his statements. The credit of the discovery of the cuneiform creation records in the British Museum belongs, undoubtedly, to Sir Henry Rawlinson. L. W. King, of the British Museum, has continued and completed, as far as is possible, up to the present time, the work begun by Rawlinson. As the result of his labors we are able to form a connected idea of the whole of the Babylonian story of the creation. Formerly only 21 tablets and fragments inscribed with portions of the legend were known, but now no less than 49 separate tablets and fragments have been identified as containing portions of the cuneiform texts of the creation series, and the details of the story can now be followed consecutively.

The great Babylonian poem of creation was divided into seven sections, or tablets, and the whole work was known by the title 'Enuma Elish,' which also forms the opening words of the text. It contained 994 lines. Each of the seven sections contained, on an average, 140 lines, and each section was intended to describe the events of one "day" of creation. It is difficult not to think that such artificial divisions of the legend indicate that we are dealing with a comparatively late recension of it, and this may well be the case when we remember that the oldest copies of it which we possess date from the reign of Assurbanipal (668–626 B.C.); no one who takes the trouble to read the seven tablets and who is familiar with ancient cosmogonies and theogonies will have the slightest doubt that the original form of the Babylonian and Assyrian history of creation is many thousands of years old. It is very probable that the Semitic Babylonians were only the borrowers and not the inventors of this remarkable work.

At the beginning of all things, according to the legend, Apsu and Tiamat were water deities and typified chaos; to these were born Lahmu and Lahamu, and later appeared Anshar and Kishar, and still later Anu and other gods came into being. One of the fragments of the first tablet mentions the birth of Nudimmud (Ea), and shows that Marduk, who is made to take the leading part in the later tablets of creation, was supposed to be in existence, like Mummu and Gaga. In the earlier episodes of the creation story, it is Ea and not Marduk who is the hero, and it was Apsu, a god of chaos, who rebelled against the gods. Apsu disliked the new order of things and the creation of the universe for the simple reason that the beings who formed members of the new world disturbed his peace and rest; as soon as he had made up his mind as to what was likely to happen, he called Mummu, his minister, and with him went to Tiamat and took counsel with her, and complained that "he could get rest neither by day nor by night." The putting of the house of the world into order by the gods destroyed his peace of mind. Of the conflict which took place between Ea and Apsu and his ally Mummu we know little, but that the great god did not succeed in inflicting a decisive defeat on Apsu and his allies is clear from the fact that, later, Anshar found it necessary to exhort Marduk to do battle with Tiamat. Marduk slew her, and split her body into halves. The actual account of the creation of the world by Marduk begins toward the end of the fourth tablet, where it is said that one half of the body of Tiamat formed a covering for heaven, and that Marduk, having formed E-shara, made the great trinity of Anu, Bel, and Ea to dwell therein.

In the fifth tablet we hear of the fixing of the constellations of the zodiac, the founding of the year, etc., and it seems as if this section contained an account of the creation of vegetation. The sixth tablet told the story of the creation of man, and it seems as if Marduk made man with the view both of punishing the gods and of providing a creature who should at all times worship him. Marduk, or Bel, instructed Ea to cut off his (Marduk's) head, and the man was formed out of the blood which flowed from the god's body. Marduk is made to tell Ea that he intends to create man from his own blood and from the "bone" which he will create. The Assyrian word for "bone" is *issimtu*, which is the exact equivalent of the Hebrew *'esem*, "bone," which occurs in Genesis ii. 23, in connection with the account of the creation of woman.

The creation of man was the final act of creation, and when this was accomplished, the gods assembled in their council chamber in Upshukkinaku, with Marduk at their head, and they sang to him a hymn of praise, the text of which forms the seventh section of the creation story and contains 50 addresses to the god. How Marduk managed to survive his decapitation is not told us, and we can only surmise that he met the gods in their council chamber in some sort of spiritual body. The parallels which may be drawn between parts of this legend and the book of Genesis are taken by many scholars to prove that the Jews borrowed large portions of their religious literature from their kinsmen, the Babylonians, and that the seven days of creation were imagined long before the days of Abraham. Consult: Smith, 'Assyrian Discoveries'; 'The Chaldæan Account of Genesis'; Sayce, 'Fresh Light from the Ancient Monuments'; Jastrow, 'Religion of Babylonia and Assyria'; Jensen, 'Die Kosmologie der Babylonier'; Delitzsch, 'Babel und Bibel' (1903).

Creation, Natural History of, a book by Ernst Heinrich Haeckel (q.v.), published in 1868. It is a brilliant exposition of evolution theories in their most extreme form. Darwin said of it: "If this work had appeared before my essay had been written, I should probably never have completed it." The acceptance of the work is shown by eight editions of the German original within 10 years, and translation into 12 languages.

Creation, The Story of, a book with the subtitle, 'A Plain Account of Evolution,' by Edward Clodd (q.v.). It is an instructive study of what evolution means, and how it has been supposed to have operated in the upward development from the lowest level of the two kingdoms of living things, animals and plants. The book is especially adapted to popular reading. In another work of the same general character, 'The Childhood of the World: A Simple Account of Man in Early Times,' Mr. Clodd has in a most interesting manner dealt with the latest stage of the evolutionary creation, showing how the theory is supposed to explain the origin and early history of the human species. A third volume, on the same plan of popular exposition, 'The Childhood of Religions,' covers the ground of the earliest development of man in a spiritual direction, and especially explains the origin and growth of myths and legends.

Creationism. (1) In theology, the doctrine that a soul is specially created for each human fœtus as soon as it is formed in the womb; opposed to Traducianism (q.v.), which teaches that the souls of children as well as their bodies are begotten by reproduction from the substance of the parents; and to Infusionism (q.v.), which holds that souls are preexistent, and that a soul is divinely infused into each human fœtus as soon as it is formed by generation. Many theologians, however, regard the mode of the soul's coming into being as a part of the mystery which envelops the whole subject of the existence and transmission of life; (2) a term for that theory of the origin of man which is opposed to evolutionism (see EVOLUTION); the doctrine of the creation of all things by the Creator's fiat, and not through evolutionary processes.

Crébillon, Claude Prosper Jolyot de, klōd prŏs-pār zhōl-yō dė krā-bė-yôṅ, French novelist: b. Paris 14 Feb. 1707; d. there 12 April 1777. He was the younger son of Prosper Jolyot de Crébillon (q.v.), and succeeded as an author in an age of licentiousness. By the subtleties with which he excuses licentious principles, Crébillon contributed to diffuse a general corruption of manners, before confined to the higher circles of Parisian society. His own morals, however, appear to have been the opposite of those which he portrayed, and we are told of his cheerfulness, his rectitude of principle, and his blameless life. Of his works the best are: 'Lettres de la Marquise' (1732); 'Tanzaï et Néadarné' (less licentious, but full of now unintelligible allusions); 'Les Egarements du Cœur et de l'Esprit' (1736); 'Le Sopha' (1745). It is still a disputed point whether he was the author of the 'Lettres de la Marquise de Pompadour.'

Crébillon, Prosper Jolyot de, French dramatist: b. Dijon, France, 15 Feb. 1674; d. Paris 17 June 1762. His first piece, 'La Mort des Enfants de Brute,' was rejected by the players. He burned the manuscript, and resolved to have no more to do with the drama; but subsequently wrote 'Idoménée,' which, in 1705, was brought upon the stage. The faults of the play were overlooked in consideration of the youth of the author and the promising talent which it displayed, and his talents, after the appearance of his 'Atrée,' in 1707, were loudly applauded. A taste for unnatural declamation had been excited by Corneille's tragedy, 'Rodogune,' and this manner was carried to excess by Crébillon in the 'Atrée.' In 1709 appeared his 'Electre,' which is as declamatory and as intricate as his earlier plays; yet it suited the taste of the age. His *chef-d'œuvre,* at least according to La Harpe, is his 'Rhadamiste' (1711). In eight days the 'Rhadamiste' passed through two editions, and Paris and Versailles vied with each other in admiring it. Crébillon had been told that his talent lay in the terrible, and thought, therefore, that he could not exert himself too much in scenes of horror. 'Xerxes' (1714) exceeded in this respect all that he had before written, but soon disappeared from the stage. 'Semiramis' (1717) was severely censured, but 'Pyrrhus' appeared in 1726, and met with a good reception, contrary to the expectation of the author, who, in this work, had abstained from the frightful and shocking.

When Madame de Pompadour wished to humble Voltaire, Crébillon was thought of as a fit instrument for her purpose. The king gave him the office of censor of the police, a yearly pension of 1,000 francs, and an appointment in the library. Thus freed from pecuniary anxiety, he finished his 'Catiline,' which was represented in 1749 with all the pomp that the court theatre could display. To make some atonement to the character of Cicero, thought to have been wronged in his 'Catiline,' he wrote at 76 the 'Triumvirate, or the Death of Cicero,' which was brought upon the stage in his 81st year. The defects of this piece were overlooked, from respect to the age of the author. In general Crébillon shows none of the true elevation of the tragic art, but only an imitation, sometimes a happy one, of the manner struck out by Corneille. He was a man of a proud and independent character, disdained to flatter the great, and passed much of his life in a condition bordering on poverty. In 1731 he became a member of the Academy. Consult Dutrait, 'Etude sur Crébillon' (1895).

Crèche, krāsh (Fr. "crib," "manger"), a sort of public nursery where, for a small payment or, as in America, usually for nothing, the children of women who have to go out to work are fed, nursed, and taken care of during the work hours of the day.

Crécy-en-Ponthieu, krā-sē ŏṅ pôṅ-tyėr, or **Cressy,** a village in the French department of Somme, on the Maye, 12 miles north of Abbeville. Crécy has a 15th century church and is celebrated on account of the brilliant victory obtained here, 26 Aug. 1346, by Edward III., with 40,000 English soldiers, over a French army amounting, according to Froissart, to 100,000 men under the command of the Count of Alençon. In this great battle perished the flower of the French chivalry, as well as the blind king of Bohemia, who was fighting on the side of France. The Black Prince distinguished himself greatly, bore the brunt of the fight, and gained his spurs. After this battle, tradition says, the Black Prince assumed the crest of the slain king of Bohemia, which consisted of three ostrich feathers with the motto *Ich dien,* "I serve," but this is more than doubtful. The battle of Crécy was one of the first in which cannon were used by English troops. Pop. about 1,400.

Credence, a small table placed near the altar or communion table, at its south side, on

which the bread and wine intended for consecration are placed in readiness. In the Greek Church this is called the *trapeza prothescos*, or simply *prothesis*, but is always placed north of the altar, usually in a structural side-chapel. Archbishop Laud was a great stickler for the credence, and it was sometimes used in the English Church.

Credi, Lorenzo, lō-rĕnd'zō krā'dē, Italian artist: b. Florence 1459; d. there 12 Jan. 1537. He was a fellow pupil of Leonardo da Vinci in the school of Verocchio, and so closely followed his style that some of his copies of Leonardo's works are scarcely to be distinguished from the originals. His 'Holy Families,' of which he painted a great number for private collections, are gracefully designed and highly finished. His most esteemed works are a 'Madonna and Child with Saints Julian and Nicholas,' now in the Louvre, and the 'Nativity' at Florence.

Credit, in political economy, the postponement of the payment of a debt agreed upon by the parties. It implies confidence of the creditor in the debtor; and the credit system implies general confidence in people's ability to meet their obligations. The modern credit system does not rest on good faith alone, but its extensive use in commercial transactions is made possible by the use of bonds, drafts, checks, promissory notes, etc. By means of a credit system a comparatively small stock of money can be made to do duty for carrying on a number of different transactions, but it is indispensable for every good system of credit that money be instantly available when required. Public credit is the confidence which men entertain in the ability and disposition of a nation to fulfil its engagements with its creditors. The term is also applied to the general credit of individuals in a nation. The credit of the government does not always flourish or decline at the same time as private credit, yet there is some correspondence between the two, as general individual confidence can rarely if ever persist in the midst of distrust of the government, and a firm confidence in the government tends to promote a corresponding confidence among citizens.

Crédit Foncier, krā-dē fôn-sē-ā, in France, a mode of raising money on land, the peculiarity of which is that the advance must not exceed one half of the value of the property pledged or hypothecated, and that the repayment of the loan is by an annuity terminable at a certain date. Several companies have been established by the government with the privilege of making loans.

Credit Insurance. See INSURANCE, CREDIT.

Credit, Letter of, an order given by bankers or others at one place to enable a person to receive money from their agent or agents at another place; when it is an order on more than one person or firm it is known as a circular letter of credit.

Crédit Mobilier, krā-dē mō-bē'lĭ-ĕr (Fr. krā-dē mō-bē-lē-ā), a large company, incorporated under the name of Société générale du Crédit Mobilier, in France in 1852, and sanctioned by the then existing government. Its objects were: (1) To take in hand and originate trading enterprises of all kinds, on the principle of limited liability. (2) To supersede or buy up trading companies; and to substitute scrip and shares of its own for the shares and bonds of the company. It had at the time of its formation a capital of 60,000,000 francs, and did a very extensive business. In 1855 the directors proposed to issue bonds to the amount of 240,000,000 francs, but financiers feared so large an amount of paper currency, and the issue was forbidden by the government. The prosperity of the company declined after this, and the management changed in 1871.

Crédit Mobilier of America, the source of the most tremendous legislative scandal in American history. The national government in 1864 had chartered a "Union Pacific Railroad," with $100,000,000 capital, to complete a transcontinental line west from the Missouri River; and offered to assist it by a loan of $16,000 to $48,000 a mile according to location, over $60,000,000 in all, and a land grant of 20,000,000 acres, worth $50,000,000 to $100,000,000. Even this offer attracted no subscribers; it meant building 1,750 miles of road through desert and mountain, at enormous cost of freightage for supplies, with frequent bloody encounters with Indians, and no probable early business to pay dividends. Then a House committee, of which Oakes Ames (q.v.) was a member and probably advised the plan, added an authorization to the railroad to issue its own bonds dollar for dollar with the government's, the former to be first mortgage and the latter second; the bonds might be issued 100 miles in advance of construction. In other words, the government assumed all the risk. Still the stock had no marketable value on its own basis as an investment, but only through the government's offers in excess of probable cost, which made it worth while for capitalists to take it up and earn them. Mr. Ames, the soul of the enterprise, and a few associates, knew that this cost would not be much more than half the government's loan and gift together. To gain possession of the balance, it was decided to form the stockholders of the Union Pacific into a duplicate corporation under another name, as a construction company, to which the railroad company should turn over its bonds and stocks as payment for work and supplies. Thus the Union Pacific would be stripped of everything but its roadbed and equipment, while its double would pay business rates and pocket the remainder. Besides Mr. Ames, the chief managers were Thomas C. Durant, vice-president of the Union Pacific (John A. Dix being president), Cornelius S. Bushnell, and John B. Alley. They and their associates bought up a moribund Philadelphia concern called the "Pennsylvania Fiscal Agency," chartered in 1859 and organized as a loan and contract company in 1863, and rebaptized it the "Crédit Mobilier of America," oddly, as its French prototype was bankrupt and not in good savor. The Union Pacific stockholders took the same amount of stock in it as in the road. The history of the details by which it accomplished the objects of its being cannot be given here. In 1866 the government extended its offer to such mileage as the Central Pacific should build east from its California lines, and the two companies began a race to secure the benefits. Probably the Central Pacific gained as much profit as the Crédit Mobilier, but that was legitimately earned for its stockholders; and even the Crédit Mobilier's action would have been less obnoxious but for the collusion of government directors and public representatives. The net result was that the

nation paid $94,650,287.28, and the Crédit Mobilier $50,720,958.94, leaving a profit of $43,929,328.34, counting at par the stock and bonds with which the Crédit Mobilier paid itself; on the statement of the trustees, they realized only $23,366,319.81 in cash. But this was certainly much understated; and even so, it was all gained in two years, to December 1868. But the rise of Crédit Mobilier stock in a few months from five cents on the dollar to three or four hundred and then out of the market, the payment of over 500 per cent a year dividends, the knowledge that there was only one place they could come from, and the inference that the government trustees must be incompetent or worse, roused suspicious excitement. Then the promoters began to quarrel bitterly over the division of spoils, and to sue each other, and one of them came within an ace of exposing the whole, and outsiders demanded a share as the price of silence or assistance. The Crédit Mobilier needed additional legislation, and procured it by «special legal expenses»; and in the latter part of 1867 the suit of an outsider, H. S. McComb, to obtain stock to which he alleged a claim, laid the mine for the final explosion. Representative Elihu B. Washburne of Illinois had moved an investigation and the fixing of transportation rates, and in alarm Mr. Ames (also a representative) came to Washington with 343 shares of stock, then commanding 100 per cent premium, but which he sold to congressmen and leading government officials at par. In a phrase that became classic, he afterward said that he had put the stock «where it would do the most good.» McComb asserted his right to 375 shares, and to quiet him Mr. Ames, in February 1868, told him the names of the public men to whom he had «sold» the stock. McComb bided his time, and in the presidential campaign of 1872 published those names, or what he alleged to be those; but he added others, or was misinformed, as some of the accused had perfectly clean hands. The list was shocking: the Vice-President of the United States (Colfax), the Vice-President elect (Wilson), the speaker of the House (Blaine), and many other eminent names. When the third session of the 42nd Congress opened in December 1872, the speaker descended to the floor and demanded a committee of investigation containing a majority of his political opponents; which was appointed, with Luke P. Poland of Vermont as chairman. It made a report 18 Feb. 1873, which proved that the speaker had been offered the stock but had refused to touch it, as had Conkling, Bayard, Boutwell, and others. Some had taken it but returned it when law suits were threatened, without retaining the dividends; some kept it and justified it openly as a business investment; some kept it and the dividends till investigation was imminent, and possibly kept the dividends altogether, a few kept both and attempted to deny or explain away the ownership. The report recommended the expulsion of Oakes Ames for using the stock to influence the votes of members of Congress; and of James Brooks, a government director of the Union Pacific, for using his position to obtain stock for himself or his family. The vote on the report was deferred for a week, and the House merely censured both, who by a strange coincidence died shortly after, only a week apart. In the Senate, an investigating committee recommended the expulsion of Senator Pomeroy of Kansas, but no action was taken upon it. Consult: Crawford, 'The Crédit Mobilier of America' (1880); Hazard, same title (1881), paper before the Rhode Island Historical Society; 'Scribner's Magazine,' 'The Crédit Mobilier' (March 1874).

Cree Indians, a tribe of North American Indians of Algonquian stock, living on several reservations in Manitoba and Assiniboia, near Lake Winnipeg and the Saskatchewan River. The tribe numbers about 10,000. See ALGONQUIAN.

Creech, Thomas, English classical scholar: b. Blandford, Dorsetshire, 1659; d. Oxford June 1700. He owes his fame almost exclusively to his translation of Lucretius, the poetical merit of which is not very great, although, in the versification of the argumentative and mechanical parts, considerable skill is exhibited. As an editor of Lucretius, he is chiefly valuable for his explanation of the Epicurean philosophy, for which, however, he was largely indebted to Gassendi.

Creed. See CREEDS AND CONFESSIONS.

Creede, a town and county-seat of Mineral County, Col.; on the Denver and Rio Grande R.R.; 35 miles northwest of Del Norte. It is a mining town named after N. C. Creede, who staked the first claims here in 1889. Nearly destroyed by fire in 1892, it was rebuilt and has public schools, weekly newspapers, and a national bank. Pop. (1900) 938.

Creedmoor, a rifle range belonging to the State of New York, located near Queen's station on the Long Island R.R., just within the boundaries of Greater New York. Each regiment of the 1st and 2d brigades of the National Guard is required to practise at Creedmoor at stated times. The range extends over 85 acres, has 30 targets, and can be used at any distance from 50 to 1,200 yards.

Creeds (Lat. *credo,* «I believe») **and Confessions,** formularies of the Christian doctrines professed by the several churches; of these the earliest is the Apostles' Creed. The existence of this formulary in the age next following the age of the apostles is with great plausibility inferred from the wording of the following passage from the work 'Against Heresies,' written by St. Irenæus, who died about 202, being then 60 or perhaps 80 years old; and the order in which the topics of the Apostles' Creed occur in the passage gives force to the conjecture based on its phraseology; says Irenæus of the Christians of his day: «All teach one and the same *God the Father,* and believe the same œconomy of the *incarnation of the Son of God,* and know the same gift of the *Spirit,* and meditate on the same precepts, and maintain the same form of constitution with respect to the *Church,* and look for the same *coming* of the Lord, and wait for the same *salvation* of the whole man — that is, of the soul and *body.*» Rufinus, who lived in the latter half of the 4th century, gives us the «symbol» of the apostles as it was received by the Roman Church of his time; it is shorter than the form that is now current, but it contains nearly all the articles of the now existing creed and in the same words and the same order. The other principal creeds of the Roman Catholic Church are the Nicene,

properly Nicæo-Constantinopolitan, for its comprises the creed of the fathers of the first Council of Constantinople (381) as well as that promulgated by the Nicene fathers (325). The addition of *Filioque* ("and from the Son") was probably not inserted in this creed till the middle of the 7th century. The Athanasian Creed is not believed to be the work of St. Athanasius, and the earliest date to which it can plausibly be traced seems to be about 430; but its origin may be much later. The Tridentine Profession of Faith, called also the Creed of Pius IV. (1564), contains an exposition of the tenets of the Roman Catholic Church as opposed to those of the Reformed churches.

Very numerous are these latter creeds. The first of them, the Augsburg Confession ("Confessio Augustana") drawn up by Melanchthon and presented to the Emperor Charles V. at Augsburg in 1530, is the most authoritative exposition of the Lutheran tenets; it was added to, explained or modified by other similar documents, as the 'Apologia Confessionis Augustanæ' (also by Melanchthon), a defense of the Confession of Augsburg; the Smalkald Articles (1536), drawn up by Luther; and the Formula of Concord, designed to reconcile differences among the Lutherans and to check a movement toward Calvinism. The chief confessions of faith formulated by the "Reformed," as distinguished from the followers of Luther, are: the 'Confessio Tetrapolitana' (confession of the four towns, namely, Strasburg, Constance, Meiningen, and Landau), and two or three other confessions. These all preceded the Calvinian Confessions, but they contain tenets near allied to those of Calvinism and Presbyterianism. Then came the confessions drawn up by John Calvin or under his influence, the first of these, 'Consensus Tigurinus' (the Zurich agreement), drawn up by Calvin himself, was designed to bring the followers of Zwingli and of Calvin into one communion; the others were the Gallic (or French), the Belgic (or Dutch), and a second Helvetic (or Swiss) confession. These were followed about 50 years after, the latest of them, by the celebrated Decrees of the Synod of Dordrecht (1619). The Articles of the Church of England's faith were, when first promulgated (1552), 42 in number, but later that number was reduced to 39. In 1646 was published the great Westminster Confession of Faith by the Presbyterian divines of England, Scotland, and New England, which in the year 1903 has undergone amendment by vote of the Presbyterian churches of the United States. Dr. Philip Schaff's work, 'The Creeds of Christendom' (1877, 3 vols.) is a trustworthy collection of all the creeds, with instructive notes.

Creeks (named for the same reason as or in translation from their Algonquin name, Muskoki, "creeks," from their many-rivered land), a once powerful confederacy of Gulf Indians, the strongest Indian power south of New York, except the Cherokees. They occupied a large part of Georgia and Alabama, and formed the largest section of the Muskhogean stock. The Muskogi were the dominant tribe, and their language, the *lingua franca*, of the confederacy; others at the outset were the Coosa, Kasihta, Kawita (Coweta), etc.; later came in the Alibamu, Hitchiti, Kosati, Yamasi (Yemassee), Yuchi or Uchee, Natchez, and others, and a band of Shawanoes had been incorporated by desire or force. The Seminoles ("wanderers") of Florida had broken away from them. They numbered probably 30,000 at their highest. Lying between the English spheres in Georgia, the Spanish in Florida, and the French at Mobile, and in Louisiana, each power bid for their support, and they shifted from side to side; but the destruction of the French power and the cession of Florida 1763–83, left the English supreme. In 1763 they had 5,860 warriors and 50 towns; the latter of log houses plastered outside with clay, and as with all the southern tribes, built in an oblong with a space in the centre for public ceremonials, like the classic forum or agora. Their head chief was called mico, besides whom they had a war chief; no chiefs seem ever to have been deposed, but new ones added, and at last they became so burdensome that their number was limited to 500. In the Revolution the Creeks took the English side, and after it many southern Tories took refuge among them and kept them stirred up to hostility; Congress had determined on war, but in 1790 the chiefs were induced to visit New York, and made peace for both Upper and Lower Creeks and Seminoles. This did not prevent attempted raids on Nashville and Knoxville 1792-3. A number of treaties were made with them involving cessions of land in the years after 1786; and from 1800 on, a number of them settled in Louisiana, and later in Texas, where they remained on a reservation till reunited with the others in 1872. In the War of 1812 the English induced one section of them to rise against the Americans, and they perpetrated the massacre of Fort Mimms, 30 Aug. 1813; but American vengeance fell on innocent and guilty alike, and the main fighting force was finally defeated and slaughtered out at Horseshoe Bend, 27 March 1814. Over 2,000 warriors had been killed and their lands ravaged and towns burnt, and they submitted. This gave an impetus to the Georgian impatience to have Congress fulfil its promises of buying up the Indian titles and deporting the tribes; but the obstinate refusal of the tribes to consent led to trickery and violence to obtain the result. (See CHEROKEES; CHEROKEE CASE, some of which applies to the Creeks also.) The party of consent made a treaty 12 Feb. 1825, ceding all their Georgia and part of their Alabama lands, for equivalent lands in Indian Territory and $400,000 in cash; it was made through their chief, William McIntosh, who was at once put to death according to their law. But by a treaty of 24 Jan. 1826, at Indian Springs, the complying party ceded most of their Georgia lands, and by 1828 the other section had been bought over to ratify it. In 1836 some of the Creeks joined the United States forces against the Seminoles, but others began raiding Georgia and Alabama villages. Scott reduced them, and the government at once began deporting them to the Arkansas; 24,594 were removed, and 744 left behind. The government tried to Christianize and civilize them, but they fiercely refused either missionaries or schools; especially Christianity, which to them was a badge of their negro slaves. In 1857 they numbered 14,888. In the Civil War they divided, and after three battles the Confederate section drove the other into Kansas, where many perished, and 1,000 entered the United States army.

After the War they were forced to cede 3,000,000 acres of land, for $975,000. Their government is the same as that of the Cherokees. The number in 1900 was 7,963 of Indian blood; but there are thousands of mongrels, and many of the tribe have taken lands in severalty. The "nation," white, negro, and Indian, numbered in 1900, 40,674.

Creelman, James, American war correspondent and journalist: b. Montreal, Canada, 12 Nov. 1859. He entered the service of the New York *Herald* in 1877; was an editorial writer and correspondent 1877–89; editor of the London edition 1890, and of the Paris edition 1891–2, when he became editor of the New York *Evening Telegram.* He representd the New York *World* in the China-Japanese war of 1894; the New York *Journal* in the Græco-Turkish war 1897, the Spanish-American war 1898, and the Philippine insurrection 1899. He was a volunteer aide on Gen. Lawton's staff in the Philippines, and since 1900 has been the Washington correspondent of the New York *World.* He has published: 'On the Great Highway' (1901), an account of his travels as a correspondent; 'Eagle Blood' (1902), a novel.

Creeper, a local name of a variety of small birds. The term is usually distinguished by prefixes, but most frequently used for the tree-creepers (*Certhiidæ*). With the one exception all of the 12 or 14 species and 5 genera are confined to the Old World, those of Africa and Australia being less typical than the north temperate *Certhia.* The common or brown creeper (*Certhia familiaris*) has a slender curved bill, strong feet with short tarsi, 12 stiff, acuminate tail feathers, and brown plumage streaked with white. In a number of varieties it occurs in temperate North America and Europe, breeding mostly to the north. It is a common little bird in open woodlands. Encircling trees spirally from the base upward, it clings to the bark in the manner of woodpeckers by means of the feet, aided by the stiff tail feathers, and picks insects and their eggs from the crevices with its sharp bill and slender exsertile tongue. The nest is built in any convenient hole at a slight elevation.

Creeping Charlie, a common name of *Glechoma herderacea,* a species of the mint family (*Labiatæ*). It is perennial, has creeping stems, and grows in waste place and woods from Newfoundland to Minnesota, and southward to Kansas and Georgia. The plant is common also in England, and has there received a number of names, the most common being gill-over-the-ground, field-balm, and hay-maids.

Creese, krēs, **Crease,** or **Kris,** the sword or dagger used by the Malays; it is made in many different forms, but usually has a serpentine blade.

Crefeld. See KREFELD.

Creighton, krā'tŏn, **Louise von Glenn,** English historian: b. Sydenham, England, 7 July 1850. In 1872 she was married to Rev. Mandell Creighton (q.v.), then rector of Embleton, Northumberland, but subsequently Bishop of Peterborough 1891–7, and Bishop of London 1897–1901. She is the author of lives of the Black Prince, Sir Walter Raleigh, and the Duke of Marlborough, in Longman's 'Historical Biographies'; 'England a Continental Power'; 'Social History of England'; 'Government of England'; 'First History of England'; 'First History of France.'

Creighton, Mandell, English Anglican prelate and historian: b. Carlisle 5 July 1843; d. Fulham, London, 14 Jan. 1901. He was educated at Merton College, Oxford; ordained deacon in 1870, and priest in 1873. He was vicar of Embleton, Northumberland, 1874–84, and in the latter year was elected to the Dixie professorship of ecclesiastical history at Cambridge, being the first occupant of the chair. In 1885 he became canon residentiary of Worcester cathedral, but in 1891, on his appointment as Bishop of Peterborough, vacated both that post and his professorship. In 1897, he became Bishop of London. The most important of his numerous historical works is his 'History of the Papacy During the Reformation' (1882–94). Other publications of his include: 'Primer of Roman History' (1875); 'Life of Simon de Montfort' (1876); 'The Age of Elizabeth' (1876); 'The Tudors and the Reformation' (1876); 'Cardinal Wolsey' (1884); 'Carlisle' (1889); 'The Early Renaissance in England' (1895); 'The English National Character' (1896); 'Story of Some English Shires' (1897); 'Persecution and Tolerance'; 'Counsels for Church People'; 'Historical Essays and Reviews' (1902). He founded the 'English Historical Review' in 1886, and acted as editor till 1891. At the 250th anniversary of Harvard University in 1886, he represented Emmanuel College, Cambridge.

Creizenach, Theodor Adolf, German poet and literary historian: b. Mainz 16 April 1818; d. 5 Dec. 1877. He was educated at Giessen, Göttingen and Heidelberg, and was prominent among the Jews in Frankfort until his conversion to Christianity in 1854. After that time he taught in the public schools in Frankfort, becoming professor of history and literature at the gymnasium in 1863. He wrote poems published in two volumes (1838 and 1848) and edited the letters of Goethe and Marianne von Willemer.

Crell, Lorenz Florenz Friedrich von, German chemist: b. Helmstädt 21 Jan. 1744; d. Göttingen 7 June 1816. He was a councilor of mines, and successively professor of chemistry at the Collegium Carolinum, in Brunswick 1771–3; of philosophy and medicine at Helmstädt University till 1810; and of chemistry at Göttingen. He published a large number of investigations, as upon putrefaction, the growth of plants in pure water, boracic acid, phosphoric acid, etc.; but is best known by his periodicals devoted to the recording of chemical discoveries, by his translations from French and other journals, and by those of the works of Kirwan, of Blagden, of Crawford, of Dobson, and of Black.

Crema, krā'mā, Italy, an episcopal city in Lombardy, province Cremona, in a beautiful plain on the left bank of the Serio, 25 miles east of Milan. It was founded about 570, and was destroyed in 1159 by Frederick Barbarossa, for taking part with the Guelfs. It was rebuilt in 1185. It is now a well-built town, enclosed by a brick wall and a ditch, and containing an old castle, a cathedral dating from the middle of the 14th century, a picture gallery, and several educational institutions. Pop. about 10,000.

Cremation, the practice of burning the dead, instead of burial. The custom is of ancient origin, and has been revived in modern times, on sanitary grounds. In Greece burial was practised through the 5th century B.C., but with the spread of belief in a future life and the need of purification by fire, cremation became common. It was the Roman custom also, and only with Christianity did earth-burial become the rule in European civilization. In 1873 there was a strong agitation in New York more or less echoed in other parts of the United States, in favor of cremation, and the newspapers published numerous opinions of eminent physicians and others to the effect that burial grounds were an injury to the health of the living, especially in populous sections. There was a similar movement in the leading countries of Europe about the same time. In 1876 Dr. F. Julius LeMoyne established the first crematory in the United States, at Washington, Pa., the first incineration being that of the body of Baron de Palin, in December of that year. This was a semi-private institution, the first thrown open to the general public in this country being the Fresh Pond crematory, operated by the United States Cremation Company of New York. Others were built in leading cities, there being a total of 24 at the close of the year 1900, located as follows: Baltimore, Md.; Boston, Mass.; Buffalo, N. Y.; Cambridge, Mass.; Chicago, Ill.; Cincinnati, Ohio; Davenport, Iowa; Detroit, Mich.; Ft. Wayne, Ind.; Lancaster, Pa.; Los Angeles, Cal.; Milwaukee, Wis.; New York (Fresh Pond), N. Y.; Pasadena, Cal.; Philadelphia, Pa.; Pittsburg, Pa.; San Francisco, Cal.; St. Louis, Mo.; St. Paul, Minn.; Swinburne Island, N. Y.; Troy, N. Y.; Washington, D. C.; Washington, Pa.; Waterville, N. Y. The construction of the cinerators or cremation furnaces is commonly of firebrick and iron, there being a fire chamber below and a body chamber above. Coal is the usual fuel, though natural gas has been employed where available. The furnace is arranged to be heated to as great a temperature as 2,500° F., and at this heat a body is consumed in from one to three hours. The greatest mechanical difficulty in connection with incineration has been the disposal of the gases and fluids, and the leaving of the ashes unmixed with foreign substances. All this has been successfully accomplished by perforating the retort or body chamber to allow the gases to escape, and by keeping the fuel flames from direct contact with the body. When the body is removed from the coffin (which is burned separately) it is wrapped in an alum-soaked sheet, and placed in the retort. The weight determines the length of time it is subjected to the heat, but at the proper interval the attendants remove it, and fan out the ashes of the clothing, which are lighter than the bone ash; then pass a magnet through to remove any iron, and as a result customarily secure from one half to five pounds of pure bone ash, which is sealed in a black tin canister. There is frequently an urn hall in connection with a crematory, having niches in the wall, for storing urns containing the ashes of the dead. Funeral services are often held in this hall.

While cremation has made considerable progress in civilized countries, sentiment has undoubtedly prevented its becoming a very common custom. The method seems unnatural to many, and grates upon their sensibilities, preventing their acceptance of this means of disposing of their dead. It appeals largely to the judgment of those who are of a practical turn of mind, and probably a majority of incinerations are made at the request of the deceased, and not by the wish of relatives. The method of passing a corpse into the retort in view of the mourners is not calculated to afford the sentimental pleasant thoughts in connection with the last look at the remains of one they have loved, and it has been suggested that cremation would be more common if the custom were to cover the coffin with flowers and then carry it out of sight on an elevator, leaving the more unpleasant work to be done entirely out of sight. Notwithstanding these drawbacks there have been recorded a little over 13,000 cremations at the crematories of the United States up to the close of 1900, and a little over 14,000 in the leading countries of Europe. This indicates that cremation is slightly more favored in this country than abroad, though nearly all of the very large cities of Europe are supplied with crematories. The history of modern cremation shows a slow but steady increase in the number of crematories and of incinerations.

The advocates of cremation point out that where burial is resorted to, even though the cemetery be located at a distance from dwellings, there must be contamination of the water and the air, because they are the only means of carrying off the products of dissolution. In these days of reaching out for streams to supply reservoirs for cities and towns, it becomes a difficult problem to insure protection of the water supply from burials in the same watershed.

For further information on this subject, the most complete work is Cobb's 'Quarter Century of Cremation in North America' (1901).

Cremer, Jacobus Jan, yä-kō'boos yän krā'-mėr, Dutch novelist: b. Arnheim 1 Sept. 1827; d. The Hague 5 June 1880. He was a painter, but forsook the pencil for the pen. His series of 'Stories of Betuwe' (a rural district) are specimens of idiomatic expression, faithful portraiture, and unsophisticated humor. The same traits distinguish all his works, 'Daniel Sils' (1856); 'Anna Rooze' (1867); 'Doctor Helmond and His Wife' (1869), etc.; but he is at his best amid rural scenes. He published a volume of 'Poems' (1873).

Crémieux, Isaac Adolphe, ē-zäk ä-dōlf krā-mē-ė, French jurist and politician: b. Nimes 30 April 1796; d. Passy 10 Feb. 1880. He became an advocate in Paris in 1830; in 1842 entered the Chamber, and in 1848 was a member of the provisional government. Imprisoned at the *coup d'état,* he subsequently confined himself to professional work till 1870, when he was a member of the government of national defense. He was made a senator in 1876, and was the founder of the Alliance Israélite Universelle.

Cremnitz. See KREMNITZ.

Cremona, krā-mō'nä, Italy, a city and capital of province of same name, on a plain on the left bank of the Po, 47 miles south of Milan. It is surrounded by walls and wet ditches, and defended by a citadel. The most remarkable edifice is the cathedral, begun in 1107 and completed about 1491. It exhibits little harmony of parts, but has a venerable and impos-

ing appearance, and its interior decorations are of the most costly description. Close by, and connected with the cathedral, is the Torazzo, a Gothic clock tower, 370 feet high, built of brick and having 490 steps to the bell-story. Cremona has considerable manufactures of linen, silk, earthenware, colors, and mustard, the latter of which is much esteemed in Italy. It was at one time celebrated for its violins. Their manufacture was almost wholly confined, for nearly 100 years, to a family of the name of Amati. Antonius Stradivarius and Joseph Guarnerius were also celebrated violin-makers of Cremona.

Cremona was colonized by the Romans 219 B.C. and again 190 B.C., and became a populous and flourishing town. In the war between Vitellius and Vespasian it was plundered and burned by the troops of the latter, but was subsequently rebuilt by Vespasian. After the fall of the empire it eventually fell under the dominion of the Visconti of Milan. In 1796 it was taken possession of by the French, and was included in the Cis-Alpine Republic, and afterward, from 1800 to 1814, in the kingdom of Italy under Napoleon. Pop. 37,400.

Crenelle, krĕ-nĕl′, an opening in an embattled parapet; a loop-hole or embrasure through which to shoot.

Crenic Acid, a vegetable acid having the formula $C_{12}H_{12}O_8$, said to exist in vegetable mold, and in marshes, peat bogs, and the deposits thrown down by ferruginous waters. It is pale yellow in color, and uncrystallizable.

Creodonta, krē-ō-dŏn′ta, an extinct suborder of the carnivora (q.v.), distinguished by many primitive characters, and especially by the scaphoid and lunar bones of the wrist being separate instead of united into a single bone as in modern carnivora. In all modern land carnivores the last premolar tooth in the upper jaw and first true molar in the lower jaw are enlarged and peculiarly adapted to cutting flesh (hence called "carnassials"), working against each other like a pair of shears. This is also the case with one group of the *Creodonta,* from which the modern carnivora are descended. But in most creodonts there is no specialized carnassial, or it is developed from other teeth; these groups evolved on lines similar to the true carnivora, but have left no descendants. One group, the arctocyons, resembled the bears, with omnivorous teeth, plantigrade feet, and large compressed claws. Another group (*Mesonyx, Pachyæna,* etc.) resembled rather the hyenas, with large strong teeth fitted for bone-crushing, and digitigrade feet. Others had the teeth more especially adapted to cutting flesh, the first upper and second lower molar being developed into carnassials in *Oxyæna* and *Patriofelis,* the second upper and third lower molar in *Hyænodon.* Besides these larger forms from the size of a polar bear to that of a prairie wolf, there was a great variety of smaller creodonts, some more or less transitional to the primates, others to the insectivores. The early creodonts appear to represent most nearly the central stock from which most, if not all, of the modern mammals are descended (see CONDYLARTHRA). Creodonts were the dominant carnivora of the Eocene Epoch, and a few survived into the Oligocene, when their place was taken by the true carnivora of more modern type. The evolution in the creodonts and true carnivores of carnassials of remarkably similar form out of different pairs of teeth originally much less alike, is an excellent instance of "convergence" in evolution. W. D. MATTHEW,

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Creole, a person born in America or the West India Islands, of pure European blood; as, a Spanish creole. It is sometimes, also, applied, but wrongly, to any person born within tropical latitudes, of whatsoever color. In South and Central America the creoles enjoy high social privileges, and a creole nobility long existed in Venezuela. They are sallow, finely formed, and dark-eyed. Creole dialects are an interesting example of broken-down grammar. Consult: Thomas, 'Theory and Practice of Creole Grammar' (1869).

Creole Case, 1841–2, one of the landmarks of the anti-slavery struggle. On 27 Oct. 1841 the brig Creole sailed from Hampton Roads to New Orleans with 130 slaves; on 17 November 17 of them rose and overpowered the crew, killed one of the owners, and ran the vessel into the English port of Nassau. The authorities, as wont, imprisoned those directly charged with mutiny and murder, and let the rest go. Webster, then secretary of state, demanded from England the surrender of the whole, as being legal property of a State under the Constitution, engaged on a legal voyage (Coastwise Slave-trade Act of 2 March 1807), and covered by the United States flag on the high seas. This was Calhoun's exact theory. The English government refused, but a new extradition treaty was agreed on (9 Aug. 1842). In the House, 21 March 1842, Joshua R. Giddings (q.v.) presented a set of resolutions which formulated the position of the political anti-slavery party to the end. They were, that the States have exclusive jurisdiction over slavery in their own territory; that the Federal government has exclusive jurisdiction over the high seas; that slavery, as an abridgment of the natural rights of man, can exist only by edict of a municipality and within its power of enforcement (this was Judge Curtis' argument in the Dred Scott case); that a vessel on the high seas has passed from municipal to national jurisdiction, so that Virginia law ceased to apply to the Creole when it left Virginia territory; that the negroes in resuming their natural rights violated no Federal law, and *ex hypothesi* no State law; and that attempts to re-enslave them were violations of the Constitution and laws, the rights of the free States, and national honor. The resolutions roused a storm. John Minor Botts (q.v.) of Virginia moved a counter resolution that no good citizen, and especially no national representative, should provoke contention over a question on which diplomatic negotiations were pending, and which might plunge the whole civilized world into war; and that Giddings' resolutions justified mutiny and murder. He asked a suspension of the rules to give it precedence of Giddings'. Giddings' colleague adopted it and moved the previous question; and after a two days' wrangle on points of order the resolution was passed without debate, 125 to 69. Giddings at once resigned; his constituency immediately re-elected him by an overwhelming majority, and instructed him to

push his resolutions to a vote. As this would "put the Democratic party in a hole," in current slang — the first two clauses being their pet tenets, and the others only obvious inferences from them — they evaded it by abolishing "resolution day" for the rest of the session, devoting the day to other business when it came around.

Creole State, Louisiana, where the direct descendants of the original French and Spanish colonists form an important element in the social fabric.

Cre'olin, a mixture of cresols and creosols derived from the destructive distillation of wood, once used very widely in watery emulsion as antiseptics. The semi-opaqueness of the mixture has rendered creolin obnoxious and its popularity has disappeared.

Creon, krē'ŏn, king of Corinth, as related in Greek legend, and father of Glauce or Creusa, the wife of Jason. The name of a king of Thebes, who was a contemporary of Œdipus. In the legend of the war against Thebes, Creon, the king, is said to have forbidden any one to bury the bodies of Eteocles and Polynices, and their sister Antigone was condemned to death for disobeying this order.

Cre'osote (Greek, "meat-preserver"), a product of the destructive distillation of wood or coal, especially the former. Wood-tar creosote, when freshly prepared, is an oily, transparent liquid, colorless, and of indefinite composition, containing many different chemical substances, chiefly belonging to the aromatic series. It was discovered by Reichenbach in 1832, and for a considerable time was confused with carbolic acid. It has a strong, smoky smell, burns with a sooty flame, and refracts light powerfully. It has been greatly used as an antiseptic, both in dentistry and general surgery, and also for the preservation of meat, from which circumstance it derives its name. Its preservative action is so marked that meat will not decay after it has been treated superficially with a 1 per cent solution. Coal-tar creosote is obtained in the distillation of coal-tar, and is usually understood to include that portion of the distillate which comes over at temperatures between 400° and 760° F., although different temperature limits are used by different distillers. Coal-tar creosote (technically known as "creosote oil") is used for the preservation of timber. For this purpose the timber to be treated is placed in an air-tight cylindrical iron tank, from which the air is exhausted by means of an air-pump. The creosote is then introduced at a temperature slightly higher than 212° F., and the temperature and vacuum are both maintained until the moisture of the wood has been entirely vaporized, and the wood itself impregnated with the oil.

Creosote is also used for fuel, for softening pitch, and as an antiseptic application for the treatment of certain diseases of cattle and sheep. It is but slightly soluble in water, though it mixes readily with alcohol, ether, and many other organic fluids.

For medical purposes "creosote is a mixture of phenols, chiefly guaiacol and creosol, obtained during the distillation of wood tar, preferably of that from the beech." In its physiological action, being a mixture of phenols, it naturally resembles carbolic acid very closely. It is now widely used as a stimulant to digestion and as a tonic in tuberculosis and other wasting diseases. The vapor is of service when inhaled, in diminishing the mixed infections that occur in many cases of tuberculosis. Creosote is not specific for this disease. It is very widely employed in bronchitis and is of service in nausea and as an intestinal antiseptic. Poisoning by creosote is very rare and resembles that of carbolic acid (q.v.).

Crerar, John, American philanthropist: b. New York 1827; d. Chicago 19 Oct. 1889. He entered mercantile life and accumulated a fortune, removing to Chicago in 1862, and adding to his wealth by railway financiering. He readily bestowed large sums upon charitable undertakings, and in his will left $2,500,000 to found the John Crerar Public Library, from which sensational novels and skeptical works should be excluded.

Cresap's War. See DUNMORE'S WAR.

Crescen'do, or **Cres** (Italian), a musical term signifying that the notes of the passage over which it is placed are to be performed with constantly increasing volume of tone. The ancient Romans, as we learn from a passage in Cicero, were aware of its beauty, and practised it continually. Crescendo passages are frequently marked $<$ signifying piano to forte; the corresponding mark $>$ diminuendo, marking the transition from forte to piano.

Crescent (Lat. *crescens,* growing), an emblem representing the moon in her state of increase. The Egyptians and the Greeks decorated their moon-goddesses, Isis and Selene, with the crescent, which announced the returning light of the moon. Athenian citizens of illustrious birth wore crescents of ivory and silver upon their buskins; and the same mark of distinction was granted to the patricians and senators of Rome. It was used by the Romans as an emblem of the eternity of empire. Hence it was found on medals of many cities, particularly of Byzantium, as capital of the Eastern Empire, whence it is supposed to have been borrowed by the Ottomans. Since their establishment in Europe it has been the universal emblem of their empire. During the Crusades, particularly, the crescent was the distinguishing symbol of the Mussulmans, as the cross was of the Christians.

Crescent City, a name by which New Orleans is widely known because the older portion is built around a semicircular bend of the Mississippi. Now the city has spread around another bend farther up stream, and is nearly S-shaped.

Crescentia. See CALABASH-TREE.

Crescentini, Girolamo, jē-rō'lä-mō krĕsh-ĕn-tē'nē, Italian singer: b. Urbania 2 Feb. 1766; d. Naples 24 April 1846. He was styled the Italian Orpheus, because of his exquisite mezzo-soprano.

Crescentius, krē-sĕn'shĭ-ŭs, **John,** Roman patriot; d. 998 A.D. He was a leader of the party in Rome opposed to the rule of the emperor in the 10th century. From 985 to 996 his rule in Rome was practically undisputed, and he was recognized as Patricius by the Byzantine empress. In 996 Otto III. came to Rome, and overthrew the rule of Crescentius temporarily, but the latter resumed his position when the emperor left the city, drove the Pope, Gregory V., from Rome, and supported the anti-Pope, John

XVI. Otto, however, finally defeated Crescentius in 998 and had him beheaded.

Crescenzi, Pietro, pē-ā'trō krĕsh-ĕnd'zē, or **Petrus De Crescentiis,** Italian writer on agriculture: b. Bologna 1230; d. 1307. At the age of 70 he was made senator, and he now carried into execution his principles of agriculture on an estate near Bologna, in the cultivation of which he passed the remainder of his life. He has left a work on agriculture entitled 'Opus Ruralium Commodorum,' a remarkable monument of his time, of which it is far in advance. This work was written originally in Latin. There exists an Italian translation (1478), esteemed very highly on account of the purity of the language, which has given rise to the opinion that Crescenzi wrote in his native tongue. His principles are simple, founded upon experience, and free from many prejudices which continued to prevail in Europe for centuries after. His work was translated into several European languages, particularly for Charles V. of France, in a splendid manuscript (1373), still extant; and no sooner was the art of printing invented than copies of this work were greatly multiplied. The oldest known edition, now very rare, appeared at Augsburg in 1471.

Crescimbeni, Giovanni Maria, jo-vän'nē mā-rē'ä krĕsh-ĭm-bā'nē, Italian scholar and poet: b. Macerata 9 Oct. 1663; d. 8 March 1728. In the Jesuits' college at Macerata he wrote at 13 a tragedy — 'Daris.' At 15 he was a member of an academy, and at 16 doctor of laws. In 1698 appeared his 'Istoria della volgar Poesia,' a work of vast industry, but destitute of method and criticism. He next published his 'Trattato della Bellezza della volgar Poesia' (1700), which passed in a short time through three editions, and like the earlier work was first made capable of being understood and enjoyed by the 'Commentario intorno alla Storia della volgar Poesia' (1702).

Cresco, Iowa, the county-seat of Howard County, situated in the northeastern part of the State, on the Chicago, Milwaukee & St. Paul Railroad. It has foundry, brick, and tile works, and other manufactures; and is the centre of an important dairying and live stock raising region. Pop. (1900) 2,806.

Cresol, krē'sŏl, or **Cressol,** an aromatic compound having the formula $C_6H_4(CH_3)OH$, which may be regarded as derived from phenol by the substitution of methyl (CH_3) for one of the hydrogen atoms in the benzene nucleus. Like all di-substitution benzene compounds, cresol exists in three isomeric modifications, known respectively as orthocresol, metacresol, and paracresol. (See AROMATIC COMPOUNDS.) All three occur in coal-tar, though the ortho- and para-compounds are present in much larger quantity than the meta-compound. The ortho- and meta-compounds readily yield nitroso-derivatives, and are used in the manufacture of coal-tar colors. Orthocresol melts at 90°, and boils at 370°; metacresol is liquid at ordinary temperatures and boils at 394°; and paracresol melts at 97° and boils at 390°; all these temperatures being on the Fahrenheit scale.

Crespi, Giovanni Battista, jō-vän'nē bät tēs'tä krĕs'pē, Italian painter: b. Cerano 1557; d. Milan 1633. He was educated at Venice and at Rome; and studied architecture and sculpture as well as painting. Among his works is 'The Baptism of Saint Augustine' at Milan.

Crespi, Giuseppe Maria, joo-sĕp'pē mā-rē'ä, Italian painter, surnamed LO SPAGNUOLO: b. Bologna 1665; d. there 16 July 1747. His first work was the 'Combat of Hercules with Antæus.' From this time he had continual employment. He painted for Cardinal Ottoboni the 'Seven Sacraments,' now in the Dresden gallery; several pieces for Prince Eugene of Savoy, for the elector of the Palatinate, for the Grand Duke of Tuscany, and for Cardinal Lambertini, his patron, who afterward, when Pope Benedict XIV., conferred on him the honor of knighthood. Crespi has been frequently censured for the singular ideas which he often introduced into his paintings; for example, he represents Chiron giving his pupil Achilles a kick for some fault that he had committed.

Crespo, krĕs'pō, **Antonio Candido Gonçalves,** gōn-säl'vĕz, Portuguese poet: b. of a slave mother in Rio Janeiro 11 March 1846; d. Lisbon 11 June 1883. He graduated in jurisprudence at the Coimbra University, but devoted himself almost exclusively to the Muses at Lisbon. He published two small volumes: 'Miniatures' (1870); 'Nocturnes' (1882), and in collaboration with his wife, Maria Amalia Vaz de Carvalho, herself a notable writer, was author of 'Stories for our Children' (1882). His poems show high sensibility and great power of poetic form and expression.

Crespo, Joaquin, hō-ä-kēn', Venezuelan military officer: b. Miranda, Venezuela, about 1845; d. 17 April 1898. He received a liberal education, became governor of the State of Guarico in 1880, and was president of Venezuela 1884–6. In 1892 he headed a revolution, making himself dictator. Two years later he was again elected president, serving until 1898. He was killed in battle with insurgents.

Cress, various plants of the natural order *Cruciferæ*. The cultivated ones are all used as salads, for which their pungent foliage especially recommends them. The common or garden cress or peppergrass (*Lepidium sativum*), is generally found in private gardens as a spring annual. The seeds may be sown as soon as the soil can be worked and the fresh herbage cut for use in about three weeks. Successive sowings should be made every three or four days. The plant resembles watercress in flavor, and makes an excellent garnish. Virginia cress (*L. virginicum*) is a similar species and is grown and used like the preceding. Winter or upland cress (*Barbarea vulgaris*) is an annual, common in fields in Europe and America and sometimes cultivated for winter use, as is also its close relative (*B. præcox*) which is called early winter or American cress. Watercress (*Nasturtium officinale*) is a perennial aquatic herb common in cool brooks and yielding an important winter salad where the streams do not freeze. Though it does best in gravelly bottomed shallow streams, it may be cultivated in any moist ground, or under greenhouse benches if well supplied with water. Indian cress which is a species of *Tropæolum* is commonly known as nasturtium, a popular garden flower whose foliage, blossom buds, and blossoms are used as salads, and its immature fruits as a substitute for capers. Several other species of *Cruciferæ* are called cress in various parts of the world.

Cresset, krĕs'ĕt, (1) a bowl-shaped article made of incombustible material, used to contain a light, and hung from above or suspended on a pole or placed as beacon on a watch tower or on some prominent place. The cresset-light was formerly the flame from a coil of pitched rope, and in more modern times oil and wick were used. The large lanthorn of ancient days when suspended from the end of a long pole and carried on a man's shoulder was called a cresset. A stone containing bowl-shaped hollows which are sometimes used as cressets, is called a cresset-stone. (2) An iron frame used by coopers who make barrels by hand.

Cressey, George Croswell, American Unitarian clergyman: b. Buxton, Me., 1 April 1856. He was graduated at Bowdoin College in 1875, the University of Leipsic 1880, and Andover Theological Seminary. He was professor of modern languages in Washburn College 1890–2, and at present (1903) is pastor in Northampton, Mass. He has written: 'The Essential Man' (1895); 'Mental Evolution' (1894); 'Philosophy of Religion' (1892); 'Doctrine of Immortality in Liberal Thought' (1897); 'Soul Power' (1899).

Cressida, in Greek legend a daughter of Calchas, the Trojan priest. She is also known as Briseida, and her fame rests upon the legend of her amour with Troilus. The original story of Troilus and Cressida was ascribed to Lollius, a historiographer of Urbino. It was written in Latin and translated by Chaucer. Cressida was faithless to Troilus and became mistress to Diomede.

Cressol. See CRESOL.

Cresson, Elliott, American philanthropist: b. 2 March 1796; d. 20 Feb. 1854. He was a successful merchant in Philadelphia, where he resided all his life, and a member of the society of Friends. He engaged in establishing the first African colony of liberated slaves in the territory of Bassa Cove, and was agent of the national colonization society. He everywhere recommended his measures with the eloquence of sincere conviction, and met with much favor and success. He sailed to England in 1840, where he spent some years in advocating the project of colonization. His time and labor were contributed without pay, and by his will he distributed his estate to a great variety of charities, mostly to institutions already established, but a bequest of a landed estate of over $30,000 was to establish a home for aged, infirm, or invalid merchants or gentlemen, unable to procure the comforts appropriate to their condition in life.

Cresson, Pa., a village in Cambria County, situated among the Alleghany Mountains at an elevation of 3,000 feet. Its fine scenery and the magnesia springs in the vicinity make it a popular summer resort. Pop. of township (1900) 1,572.

Crest (Lat. *crista,* tuft or comb), the rising on the defensive armor of the head, also the ornament frequently affixed to the helmet, such as a plume or tuft of feathers, a bunch of horse-hair, etc. Warriors have always been in the habit of adorning their persons; and the helmet, from its conspicuousness, is very naturally chosen as the place of one of the principal ornaments. The crests of the earlier Greeks were of horse-hair; afterward plumes, especially red ones, were adopted. In the Middle Ages, when rank and honors became hereditary, and particular heraldic devices were appropriated to particular families, the crest became a distinguishing hereditary mark of honor. It denotes in heraldry a figure placed upon a wreath, coronet, or cap of maintenance, above both helmet and shield; as, for instance, the crest of a bishop is the mitre. The crest is considered a greater criterion of nobility than the armor generally. It is commonly a piece of the arms, rests on a wreath of the principal metal and color of the coat of arms, color and metal alternating, or on a cap of maintenance.

Creston, Iowa, a city and county-seat of Union County, about 200 miles west of Burlington, on the Chicago, Burlington & Quincy R.R. It was first settled in 1869; became a borough in 1871, and a city in 1881. The present form of government is by State enactment under a charter, which provides for a mayor and a council of 10 members. Five aldermen are elected each spring. The city has three banks, with a combined capital of $250,000; 15 churches, public and parish schools, a government building, costing $100,000, and a railroad depot, costing $75,000. It is a trade centre for the surrounding country and has machine shops, brickyards, broom and cigar factories, wagon works, etc. Pop. (1904) 8,000.

Cres'wick, Paul, English writer: b. 1866. He entered the life assurance business at 16 and is now in the head office of the Prudential Assurance Company, London. He has published: 'At the Sign of the Cross Keys'; 'The Temple of Folly'; 'Bruising Peg'; 'Under the Black Raven'; 'Robin Hood' (1902); 'In Alfred's Days.'

Creswick, Thomas, English landscape painter: b. Sheffield 5 Feb. 1811; d. Bayswater 28 Dec. 1869. He studied drawing at Birmingham, and early showed artistic talent. His first pictures were admitted into the Academy exhibition when he was only in his 17th year, and his success was afterward continuous. He was elected an associate of the Royal Academy in 1842, and R.A. in 1851. Among his works are: 'England'; 'London Road a Hundred Years Ago'; 'The Weald of Kent'; 'A Roughish Road'; 'On the Clyde'; 'Sunshine and Showers.' Creswick's landscapes are pleasing and attractive, and display much delicate and finished detail. He was also known as an etcher.

Creta'ceous System, or **Chalk Formation,** a name applied by geologists to the series of rocks which occur between the Wealden group, or, when it is wanting, the Oolite and the lower part of the Tertiary formation. It is usually characterized by white, soft chalk, but sometimes, more especially in Italy and the south of France, this chalk is replaced by compact, solid limestones. The cretaceous rocks consist chiefly of carbonate of lime, but usually abound with silex, in the shape of nodules, plates, and veins, and with iron pyrites in nodules and radiated cylinders. The organic remains in the chalk are, with few exceptions, eminently marine, and from the fine texture of the substance in which they have been imbedded, are usually well preserved. They embrace seaweeds, sponges, corals,

echinoderms, mollusks, crustacea, fishes, and reptiles. Deep-sea dredgings in the Atlantic have revealed the fact that a fine, white, organic ooze, resembling the chalk, is still in process of formation in the oceanic abysses at the present day. The American continent shows chalk-beds only in the States of Texas and Arkansas; its cretaceous beds are for the most part made up of marl or greensand, a valuable fertilizer. The Lower Cretaceous occurs in the Gulf States, and the Upper in Rocky Mountain regions, the Chico Series (q.v.) being an important example. See CHALK.

Crete, or Candia (called in the most ancient times IDÆA, from Mount Ida, afterward CRETA, whence the Turkish name KIRID), one of the most important islands of the Turkish empire; situated in the Mediterranean, 81 miles from the southern extremity of the Morea, and 230 from the African coast; is 160 miles long, 7 to 35 broad, and contains 3,326 square miles. A high chain of mountains covered with forests runs through the whole length of the island, in two ranges. On the northern side it declines moderately to a fertile coast, provided with good harbors; on the south side, steeply to a rocky shore, with few roadsteads, and reaches its greatest height in the lofty Psiloriti (the ancient Ida), 8,060 feet high, and always covered with snow. Numerous springs give fertility to most of the valleys, in which, and on the declivities of the mountains, is seen a luxurious vegetation. The air is mild; the summer is cooled by the north winds; the winter is distinguished only by showers of rain. Earthquakes, however, are not infrequent. Agriculture is at a very low stage, and education and the amenities of civilized life are almost entirely absent. The principal products of the island are olive oil, wheat, oranges, lemons, silk, grapes, wine, valonia, carobs, and honey. The inhabitants (estimated at 1,200,000 in ancient times, or 900,000 in the time of the Venetians) are now about 309,250, of whom about a third are Mohammedans. Soap is extensively manufactured, and the exports comprise olive oil soap, wool, carobs, cheese, fruits, valonia, acorns, etc. Most of the harbors are silted up. The capital is Candia, or Megalokastron; Canea is the most important place of trade.

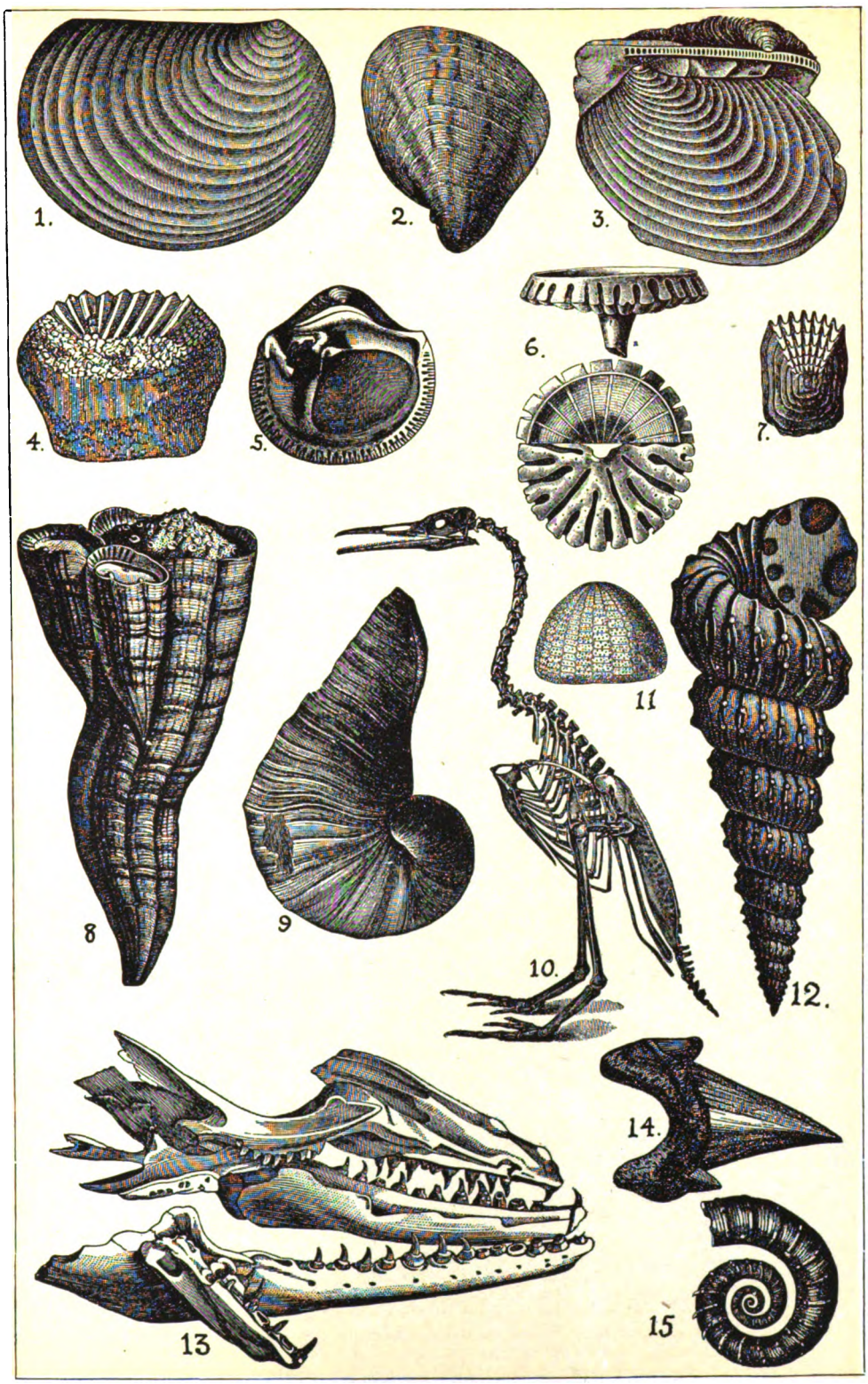
Greek mythology made Crete the scene of many of the adventures of the gods and heroes. Here Saturn is said to have reigned, and afterward Minos. These Cretan myths seem to contain many Oriental and Semitic elements. The island figures little in Greek history, and took no part in the wars with the Persians. It possessed a number of independent towns often at war with each other, but ready to combine against a stranger. Crete was conquered by the Romans 67 B.C. In the year 823 it passed from the Roman emperors of the East to the Saracens, who built the capital, Candia, on the ruins of Heraclea, but were expelled again in 961 by the Greeks. The Byzantine sovereign sold the island to the Venetians in 1204, who fortified most of the cities, won the good will of their new subjects by a mild government, and repelled all the assaults of the Genoese and Turks till the middle of the 17th century. About this time the attacks of the Turks became more determined. They landed a large force in 1645, which soon took Canea and Retimo, and besieged the capital with vigor. The siege, the longest in modern history, lasted over 20 years. To assist the Venetians volunteers from all parts of Europe poured in. The Christians, after having exhausted all means of defense, were compelled to surrender to the Turks 27 Sept. 1669. At the time of the capitulation the garrison consisted of only 2,500 soldiers; 30,985 Christians, and 118,754 Turks were killed or wounded during the siege. Having obtained possession of the capital, the Turks now endeavored to expel the Venetians from the strongholds which remained to them on the island, and before the expiration of the 17th century they had been successful in their efforts.

Three pashas, at Candia, Canea, and Retimo, now governed the island. On account of the feuds of these pashas the inhabitants of the western mountains succeeded in forming a government of their own, under Turkish protection. As the compacts made with them by the Turks were not always observed, they were wont in such cases to take up arms, and though they were often defeated they were never entirely subdued. The pashas having demanded hostages of them in 1821, they joined the Greek insurgents.

Had the mountaineers been armed when the Turks made their first descent on the island, it would probably have been impossible for the invaders to have maintained themselves in Candia, but as it was the island remained under Turkish rule. In 1868 a formidable insurrection, fomented by Greece, was with difficulty suppressed by the Turks, after a tedious conflict. In consequence of this revolt the Turks granted to the Cretans a certain degree of autonomy, but Turkish bad faith produced another revolt nine years later. At that time a new constitution of a parliamentary character was inaugurated, but many of its provisions were annulled in 1889. In 1896 there was again a rising against the Turks, in which, as before, the Greeks took part, one result being the outbreak of war between Greece and Turkey. The Greek troops landed on the island were withdrawn at the instance of the Great Powers, who undertook to secure an autonomous government under Turkish suzerainty and to cause the Turkish troops to be withdrawn. On 6 Sept. 1898 the Mohammedans of Candia rose against the Christians, and the fighting resulted in the death of many of the latter, including some British sailors. The leading powers at once demanded the complete withdrawal of the Turkish troops who had abetted the rebels, and ultimately, on 11 October, the sultan complied with their demand, the troops being soon after withdrawn. Shortly afterward Prince George of Greece was appointed high commissioner or governor of the island. There is now a national assembly elected by the people, and the island has received a regular constitution. Consult: Höck, 'Kreta' (1823–9); Spratt, 'Travels and Researches' (1865); Stillman, 'The Cretan Insurrection of 1866–8' (1874); and Mitchell, 'The Greek, the Cretan, and the Turk' (1897).

Crete, Neb., a city in Saline County in the southeastern part of the State, on the Burlington & M. R.R., and on the Big Blue River. It has several manufacturing industries, including flour-mills. It is the seat of Doane College (Congregational). Pop. (1900) 2,199.

Cretin, krā-tăn′, **Joseph,** American ecclesiastic: b. Lyons, France, 1800; d. 22 Feb. 1857. He was ordained a priest in 1838, and was as-



1. Inoceramus concentricus. 2. Exogyra columba. 3. Inoceramus Cripsi. The hinge, showing ligamentary pits. 4. Ptychodus latissimus. 5. Caprina adversa. The lesser shell: interior. 6. Coeloptychium incisum. From the side, from above, and from below. 7. Scale of Ktenoid. 8. Hippurites Toucasianus. 9. Caprina adversa. 10. Hesperornis regalis. 11. Ananchytes ovata. 12. Turrillites catenatus. 13. Head of Mosasaurus Hofmanni. 14. Tooth. 15. Crioceras Duvali.

signed a charge in his own diocese. His great desire was to work in the foreign missions, and when the opportunity to go to America presented itself, he at once accepted. He was somewhat disappointed when he found himself among civilized people in Iowa instead of among Indians. He was made vicar-general of Dubuque, a position which he held until 1851, when he was appointed bishop for the new diocese of St. Paul. He found only nine priests in his diocese, but new parishes were soon opened, schools established, the orphans and the sick received attention, and provisions were made for the Indian tribes, the Ojibways, the Winnebagoes. Consult: Clarke, 'Lives of Deceased Bishops of the United States.'

Cre'tinism, a peculiar disease in children, sometimes persisting into adult life, frequently due to diminution in the secretion of the thyroid gland and prevalent especially in Alpine valleys, differing from rickets in that it is usually accompanied by goître and commonly results in idiocy more or less marked. Symptoms of cretinism appear, as a rule, during the first year, sometimes not until the child is older. When developed the child is usually very much dwarfed, those of 14 and 15 years of age being not over two or three feet in height. The fingers and toes are short and stumpy, the tissues and skin seem thick and the latter is dark and does not pit. The head is unusually large for the body, the forehead is low, the base of the nose is broad, the lips are thick, the mouth half open, the hair coarse and straight, the teeth appear very late, the abdomen is usually large and hanging, the skin is dry and eczema is common. The voice is usually hoarse and the children do not walk until late in life, perhaps not until the 6th or 7th year. The mental condition is always impaired, cretins being dull, usually good-natured, and they become idiotic. Up to within recent times their condition has been thought to be hopeless, but now with the administration of thyroid gland a number of the cases have been improved. In fact sporadic cretinism invariably improves on the use of thyroid gland, so that cretins of advanced years who have been idiotic and imbecile all their life have been known to recover almost normal functions. See MYXŒDEMA.

Cretonne, krē-tŏn', a cotton cloth with various textures of surface, printed on one side or on both with pictorial and other patterns, and used for curtains and for upholstering. Unlike chintz, it is hardly ever glazed.

Creusa, krē-ū'sa, the name of several celebrated women of Greek antiquity. (1) Daughter of Erechtheus, who, before she was married to Xuthus, gave birth to Ion, the fruit of an amour with Apollo. To her second husband she bore Achæus. (2) The daughter of Priam and Hecuba, wife of Æneas, and mother of Ascanius. In the tumult of the conflagration of Troy, when Æneas fled with the images of his gods, with his father and son, he lost her, and after he had sought her for a long time in vain her spirit appeared to him, saying that the mother of the gods had taken her to herself because she was not willing that she should leave Phrygia.

Creuse, krėz, France, an inland department, south of Indre and Cher; west of Allier and Puy de Dôme; north of Corrèze; and northeast of Haute Vienne; capital, Gueret; area, 2,150 square miles. It is named from the river Creuse, which rises in it, and traverses it diagonally in a northwest direction. The surface is generally rugged, and the soil is thin, rocky, and by no means fertile. Coal is the only mineral worked in this department. Many cattle and notably fine cavalry horses come from Creuse. The chief manufactures are carpets and tapestry. About 15,000 of the inhabitants emigrate in March in search of work, and return about Christmas. The department is divided into four arrondissements. Pop. about 278,000.

Creusot, krė-zō, **Le,** France, a town in the department of Saone-et-Loire, 236 miles south of Paris. Situated in the midst of a district rich in coal and iron, it owes its importance to the establishment here in 1837 of the great iron works of Schneider & Company, which rank among the largest in the world. They occupy 770 acres, and turn out yearly 190,000 tons of pig iron, besides steel rails, iron rails, and locomotives. Pop. 30,000.

Creutz, kroiz, **Gustaf Philipp,** Graf von, Swedish poet and statesman: b. Finland 1731; d. 30 Oct. 1785. He was a member of the learned and elegant circle which surrounded the queen of Sweden, Louisa Ulrica, sister of Frederick the Great. His 'Atis og Camilla,' an erotic poem in five cantos (1761), and his 'Letter to Daphne' are considered as masterpieces in Swedish poetry. He was appointed minister to Madrid, and, at a later period, to Paris, where he remained 20 years, and became particularly acquainted with Marmontel and Grétry. On 3 April 1783 he signed with Dr. Franklin a treaty of amity between the United States and Sweden. His works and those of his friend Gyllenborg are published together under the title 'Vitterhets Arbeten of Creutz og Gyllenborg' (1796).

Creuzer, Georg Friedrich, gā-ōrg frēd rĭh kroit'sėr, German philologist and archæologist: b. Marburg 10 March 1771; d. Heidelberg 16 Feb. 1858. He studied at Marburg and Jena, and in 1802 became professor of philology at Heidelberg. In 1807 the professorship of ancient history was also conferred on him, and he held both chairs till his resignation in 1845. His works treat of mythological subjects and classical history, the most important of them being: 'Die historische Kunst der Griechen' (1803); 'Dionysus' (1808); 'Symbolik und Mythologie der alten Völker, besonders der Griechen' (1810–12); and an edition of Plotinus (1835). His symbolical theory of mythology gave rise to considerable controversy with Hermann, Voss, and others. A collection of his writings was published in 1854 under the title 'Opuscula Selecta.'

Crevallé. See CAVALLY.

Crevasse, krĕ-văs', a breach in an embankment of any kind, made to protect lands from inundation, has from the earliest historical ages been of importance. How to guard against crevasses is a matter studied in all countries where their occurrence is a menace to public safety. Lands may be reclaimed from water by means other than embankments, dams, dykes, or levees (see DRAINAGE). The levees and dykes of all places are under a system of supervision for prevention of crevasses and

other dangers. The levees along the Mississippi, begun in 1717, have been at various times and in certain places rendered ineffective by crevasses,— the water breaking through the levee in weak places where soil has become soft, or through holes made by the crawfish. The guards know the need of repairing at once any openings, however small, and the crawfish is regarded as an enemy. In 1882 the damages reported as caused by crevasses and floods were $27,000,000. Towns and farms were inundated and some lives were lost. In the years intervening between 1882 and 1892, damages reported amounted to $77,000,000; and in 1892, $7,000,000. When floods occur, as in 1897 and 1903, the dangers from crevasses increase. Two great crevasses occurred in 1903 during the floods. The damages amounted to millions. In addition to the danger of the water breaking through, there is that of self-protection, the people in the lower towns being tempted to let the waters above them escape from the channel. (See FLOODS; LEVEE). For other uses of crevasse, see GLACIERS.

Crevaux, Jules Nicolas, zhül nĭk-ō-lä krā-vō, French explorer: b. Lorquin, Lorraine, 1 April 1847; d. 24 April 1882. He took part in the Franco-Prussian war, and was later made a surgeon in the navy. In 1876 he turned his attention to the exploration of South America; he first crossed the Tumachumac Mountains; then explored the valley of the Oyapok and its tributaries and several tributaries of the Amazon. In 1880 he crossed the cordilleras of the Andes and reached the Orinoco by the Guaviare River, a tributary never before explored. He returned to France for a short time, but in 1882 started on another expedition, intending to explore the upper part of Paraguay and some of the southern tributaries of the Amazon; when he arrived at Buenos Ayres he became interested in a plan for the exploration of the Gran Chaco and the Pilcomayo River, and joined an expedition for that purpose. He and all but two of his companions were murdered by the Tobas Indians on the banks of the Pilcomayo.

Crevecoeur, krāv'kėr, **Jean Hector Saint John de,** French agriculturist: b. Caen, France, 1731; d. Sarcelles, near Paris, 1813. He emigrated to America in 1754 and for some years lived on a farm near New York. In 1780 he was arrested by the English as a suspected spy and was confined for several months. He then went to Europe but returned in 1783 and was for a long period French consul at New York, where he enjoyed the friendship of Washington and Franklin. He was the author of 'Lettres d'un cultivateur Américain' (1784); 'Voyage dans la haute Pennsylvanie et dans l' état de New York' (1801). His works were translated into English and Dutch and have been greatly admired for the beauty of their style. Consult Tyler, 'Literary History of the American Revolution' (1897).

Crevillente, krā-vēl-yān'tā, Spain, a city in the province of Alicante, about 20 miles southwest of the city of Alicante. The chief industries are agriculture and weaving. Pop. 10,000.

Crew, Henry, American physicist: b. Richmond, Ohio, 4 June 1859. He was graduated at Princeton in 1882; after five years as instructor in physics at Haverford College, Pa., and astronomer at the Lick Observatory, was elected Fayerweather professor of physics in Northwestern University 1892. He has written: 'Elements of Physics' (1899); is assistant editor of the 'Astrophysical Journal,' and has contributed important papers to the 'American Journal of Science' and 'Philosophical Magazine.'

Crewe, a town of England, in Cheshire, 21 miles southeast from Chester, an important station on the London and Northwestern Railway. It is quite a new town, having been as recently as 1842 an obscure village with about 200 inhabitants. The first portion of it was built by the railway company for the accommodation of its workmen. The railway works comprise forges, rolling-mills, locomotive and carriage works, rail works, Bessemer steel works, etc., and give employment to about 7,000 persons. The railway station is one of the largest and finest on the London and Northwestern Railway, and is the point of convergence of six important lines. There are many churches and chapels, market hall, corn exchange, mechanics' institution and town hall, hospital, school of art, a fine public park, and three recreation grounds. The electric light has been introduced. The town was incorporated in 1877, and gives name to a parliamentary division. Pop. (1901) 42,075.

Crewel-work, work executed with the needle, and consisting of designs sewed in colored silk or woolen threads on a basis of unbleached cotton or linen, toweling, or the like. It is a kind of embroidering. See EMBROIDERY.

Creyton, krā'tŏn, **Paul,** a pseudonym sometimes used by JOHN TOWNSEND TROWBRIDGE in the earlier portion of his literary career.

Cribbage, a card game of an essentially skilful nature, played, mostly by two persons, though three or four can be arranged for; with an ordinary pack of cards. Court cards and tens rank equal, all others according to their "pips," ace counting one. The game is to win 61 points. The scores are kept on a tally, each side of which is perforated with six groups of ten holes each. Each player scores the points he makes by inserting a peg into the hole his count entitles him to, on the board. The cards being shuffled and cut, the dealer, from the undermost half of the cards, deals five to each player, beginning with his adversary. The remaining cards are placed face down on the cards already on the table. Both players then inspect the face values of their five cards, and select two each to be thrown out. In this selection each is guided by the remaining cards he holds, and by the fact of whether or no, in the subsequent stage of the game (hereafter explained) he or his adversary will have the benefit of counting to his score, the "thrown-out" cards. The non-dealer then cuts the cards left on the table, again, and the top card is turned face upward. From that moment, for that hand, this "turned-up" card forms, with the four cards "thrown out," what is known as "the crib," which the dealer in each game, after counting the points made off the cards in his hand, is entitled to add to his game. This turn-up card also is counted in the play of both players with the cards in their hand. In the ordinary course the non-dealer begins the game by laying a card down, face upward, on the table, of which he calls out the value. The opposing player has at once to determine how he can best utilize the card so played. There are several

objects to be attained. You can so play as to ensure scoring yourself, or to prevent your opponents playing a next card, which will make all the pips played count 15 (for which he would score two points) or you can secure, or prevent, two or three tens being played in succession; or a sequence of three or four cards; or a flush, that is, three cards of the same suit; with a variety of other possibilities only to be learned by practice, or close study of rules too intricate to be given here. When all the cards have been played, each player's hand, together with the turn-up, is counted for 15, etc. Then the crib, or "thrown-out" cards and "turn-up" are counted for 15, and added to the score of the player entitled to it, for that time. If neither party has scored 61 points, there is another similar deal and the game proceeds until one or the other does score 61. For rules and full particulars consult Spalding's 'Home Library, No. 20' (1902).

CHARLES QUINCY TURNER,
New York City.

Crichton, krī'tŏn, **James,** surnamed THE ADMIRABLE, Scottish nobleman: b. Perthshire, Scotland, 19 Aug. 1560; d. Mantua, Italy, 3 July 1583. His father was a lord of session, and through his mother he was of royal descent. He was one of the young men selected to be fellow-students of the young king, James VI. He then went to France, where he continued his studies, and also, as he adhered to the Roman Catholic Church, took part in the war carried on by Henry III. against the Huguenots. The beauty of his person, the strength and agility he displayed, joined to his multifarious accomplishments and surprising capacity of eloquent talk, made him the admiration of all. About 1580 he went to Italy, visiting Venice, where he was introduced to the Doge and senate, created astonishment at Venice and Padua, by his brilliant off-hand discourses on philosophy, theology, and other high themes, and his challenge to disputation in any of several languages, and on either side of any controversy. He next went to Mantua, and was appointed tutor to the son of a duke. Attacked in the streets one night by a party of men armed and masked, he overcame them by his superior skill, and recognized his pupil, to whom he at once loyally presented his sword. The young prince immediately ran him through with it.

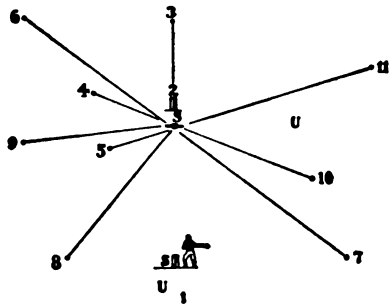
Cricket, the name applied to orthopterous insects of the family *Gryllidæ,* allied to the grasshoppers. Their bodies are somewhat flattened, though in some forms more or less cylindrical, while the abdomen ends in a pair of long, slender stylets. They are active leapers, the hind femora or thighs being enlarged. The males produce a shrilling sound made by raising the upper or fore wings and rubbing them on the hind wings. The noise is due to the clear drumhead-like area in the middle of the fore wings forming a resonant surface; on the hind wings is a raised toothed ridge which rubs on the drumhead above it. The females are silent. They are dull blackish brown. The European house-cricket (*Gryllus domesticus*) has been introduced into New York. It prefers the warmth of the hearth, while our native species live in the open air, the males beginning to sing at the opening of the summer season, which in southern New England is about the 10th of June. See MOLE-CRICKET; TREE-CRICKET.

Cricket, a well-known game, commonly called the national game of England, played in the United States, Great Britain, Australia, and India, the players being arranged in two contesting parties of 11 each. Strutt, one of the best English authorities on ancient sport, adduces some evidence to show that "club-ball," played in the 14th century, may have been the parent of cricket, but both "cat-and-dog" (mention of which occurs in the 16th century) and "stool-ball" (frequently referred to in the 17th century) have a closer affinity. It is stated in Russell's 'History of Guildford' that cricket was played in that town in the middle of the 16th century, but for 50 years subsequently no trace has been found.

Cricket stands pre-eminent in England among the many outdoor pastimes pursued during the summer months. Cricket is not solely an affair of skill; chance is also a factor to a very large extent. Conditions of ground and weather exert such a remarkable influence on the game that in many cases a side which apparently possessed little hope of success has come out of a match victorious. Also a mistake in the field, or an act of carelessness on the part of a batsman, may change the character of the whole game. To excel at cricket it is necessary that the study of the game should begin early; and at nearly all schools a cricket "coach" or tutor is engaged.

Cricket may be played either single-wicket or double-wicket, but it is now so rarely played in the former manner that we can safely confine our attention to the latter. For a double-wicket match game 11 players on a side are necessary, and after the captains have tossed to settle who shall go to the bat first, the loser places his field and the winner sends in two of his surest, safest batters to defend the wickets and to make runs. The disposition of the field depends upon the style of bowling, whether it be fast, medium pace, or slow, and the following diagram will give a pretty clear idea of how the fielders are placed and what dangers the batsman has to guard against. A distance of 22 yards separates the wickets, and by this scale the relative position of the players may easily be estimated. The field having been duly placed, the batsmen having taken their stand, the umpire calls "play," and the bowler sends down his first ball. After five balls have been delivered from one wicket the umpire calls "over," and the whole field changes about till the position of the men bears the same relation to the other wicket that it did to the one first bowled against. These "overs" continue to be bowled from alternate ends by different bowlers until the whole 11 players have tried their hand at the bat and been disposed of. Runs are made by the batsman driving the ball far enough away to give him time to change places with the other batter before the ball returns; each change constitutes a run. Six is the largest number of runs that can be made from a single hit, that being what is allowed when the ball is driven clear out of the grounds. The business of the bowler is to try in every possible way to knock down the wickets in front of which the batsman stands, or else to tempt him into hitting the ball up into the air so that it may be caught on the fly by one of the fielders. Besides being bowled or caught out, a batter may be "run out," that is, have his wickets knocked down by the

ball while he is busy making a run, or he may be "stumped out," which is to have the same thing happen when he incautiously steps out of his ground to hit at a ball. The ball comes to the batter on the first bounce, and the bowler's skill is shown in varying the pitch, speed, and direction of the ball so that the batter may become bewildered and fail to defend his wickets. The best kind of bowling is what is known as "bowling with a break," the peculiarity of which consists in that the ball after striking the ground does not continue straight on, but swerves sharply to the right or left like a "cut" tennis ball.



DISPOSITION OF THE FIELD IN CRICKET.

S, striker; 1, bowler; 2, wicket-keeper; 3, long stop; 4, short slip; 5, point; 6, long slip; 7, long on; 8, long off; 9, cover-point; 10, mid-wicket on; 11, leg; U, umpire.

The great point in batting is to play with a straight bat, that is, as far as possible to swing the bat at right angles to the ground, the advantage thereby gained being that the wickets are more completely covered, and there is less liability of giving a catch. Next in importance is to play forward, that is, to meet the ball as far forward as safety allows and not wait for it to come upon one. Thirdly, it should be the batter's aim to play low; in other words, to hit as many "grounders," or "daisy-cutters," as possible, for they are harder to field, and give no chance for a catch. Two whole days at least are required for a first-class two-innings match. In Canada there are clubs in almost every city, town, and village. In the United States the two chief homes of cricket are in Philadelphia and Boston, although there are good clubs in New York, Detroit, and elsewhere, and also at some of the larger colleges. Consult: Grace, 'Cricket' (1891); Daft, 'Kings of Cricket' (1893); Ranjitsinhji, 'Jubilee Book of Cricket' (1897); and Read, 'Annals of Cricket' (1897).

J. E. SULLIVAN,
New York Athletic Club.

Cricket on the Hearth, a simple story by Charles Dickens, published 1845. It has been adapted for the stage, and used by Joseph Jefferson.

Crillon, Louis des Balbes de Berton de, loo-ē dā bälb dė bĕr-tôn dė krē-yôn, French soldier: b. Murs, Provence, 1541; d. Avignon 2 Dec. 1615. In his first campaign, as aide-de-camp to the Duke of Guise (1557–8), he contributed much to the conquest of Calais. He subsequently distinguished himself in the battles of Dreux (1562), Jarnac, and Moncontour (both in 1569), against the Huguenots. In the famous naval battle of Lepanto fought in 1571, Crillon displayed prodigies of valor, and, though wounded, was appointed to carry the tidings of the great victory to the Pope and the king of France. The massacre of St. Bartholomew (1572), the preparations of which had been carefully concealed from Crillon, was loudly reprobated by him. He fought heroically for Henry IV. against the League and distinguished himself at the battle of Ivry (1590), and at the sieges of Paris and Laon.

Crilly, Daniel, Irish journalist: b. 14 Dec. 1857. He edited the 'United Irishman,' Liverpool, 1876, and joined the staff of the 'Nation,' Dublin, 1880. He represented North Mayo in Parliament 1885–1900, and has published: 'In the Byways with Young Ireland' (1888); 'The "Felon" Literature of Ireland' (1889); 'The Celt at Westminster' (1892); 'Pencillings on Parnassus' (1899); 'In the Footsteps of John Mitchel' (1900–1).

Crime, a word signifying in its legal acceptation any act to which the law attaches a penalty or punishment, without any reference to its moral turpitude. To constitute a crime, there must first be an act, since a mere opinion or intention, however wrong from a moral or religious point of view, if not carried into an act, cannot be treated as a crime, although the criminality of the act when done, may be partially or entirely dependent upon the intention of the actor. The true and only reason for making any given act a crime is the public injury that would result from its frequent perpetration. Each individual instance constituting an individual injury, frequent repetition would make it a social injury. Society accordingly takes the most efficient measures for its prevention, by appealing to the fears of mankind. The crime is first accurately defined, and the requisite punishment attached to it, and then government itself becomes a party to the prosecution of the offender, in order to insure the carrying into effect of the penalty; for the certainty of punishment is even more effectual in preventing crimes than any degree of severity with a probability of escape. But while the only legitimate object of punishment is to protect society against a repetition of crimes, humanity dictates that the reformation of the offender should also, if possible, be effected. But as government has no concern with men, except as members of society, it is obvious that their moral improvement can never be made the primary object of punishment. Self-protection is at once the foundation and the end of the power exercised by society in punishing its members. In preventing the repetition of crimes, punishment is designed to operate both upon the individual offender and upon the community at large. Upon the offender himself it operates by physically disabling him from repeating the offense, or by dissuading him from it through the recollection of past suffering, or by both of these means together. Upon the community at large, it operates only by the terror of example. Consequently it follows that the mode and measurement of punishment are to be determined, not so much by the abstract nature of the offense as by its liability to frequent repetition, and also that no act should be punished at all, the repetition of which does not injuriously affect the temporal welfare of society.

Crimea, krī-mē'a or krī-mē'ạ, **The** (Fr. *Crimée;* German, *Krim;* ancient *Chersonesus Taurica*), a peninsula forming the most southerly portion of the Russian government of Taurida. It has a maximum length, east to west, of 200 miles, and a breadth of 130 miles from north to south, and is estimated to have an area of 10,000 square miles. On the west and south it is washed by the Black Sea and on the east by the Sea of Azof. The coast line is very broken, and the surface is three fourths steppe, with many saline stretches and some excellent pasture land. The other quarter is mountainous, with beautiful scenery and many fertile slopes and valleys. There grapes, olives, and mulberries are grown in profusion and on the northern slope of the mountain range grain fields and orchards are planted. The climate, however, is severe and changeable and the summers are dry. The forests are of limited extent, and seldom contain magnificent timber.

Among domestic animals the first place is due to the sheep, of which there are large numbers of fine-wooled breeds; horned cattle and horses are also reared in large numbers. Of mineral productions the only one of consequence which the Crimea is yet known to possess is salt, which is obtained from lakes in the saline tracts already referred to, in large quantities, and furnishes the material of an active trade, chiefly with the interior, by land transport. The Crimea is now included in the Russian government of Taurida. The chief town and port is Sebastopol, and the population is estimated at about 450,000.

The history of the Crimea extends over 24 centuries, commencing with the earliest annals of Greece. It figures in Greek fable as Cimmeria. Greek settlements were made on the shores of the Crimea in early times; cities were built, one of them Theodosia, which still retains its name. The Bosporus finally became a dependency of Rome, and after the fall of the empire the settlements in the Crimea appear to have had a very precarious existence, at one time placing themselves under the protection of the Byzantine emperors, at another becoming the tributaries of some marauding adventurer, and at another claiming to be their own masters. The time when some offshoot of the Turks first arrived in the Crimea is not well ascertained, but in the 7th century the greater part of it was in the hands of a Turkish tribe called Khazars, and had, in consequence, changed its name to that of Khazaria. In like manner its southern coast, where the Goths had established themselves, was called Gothia. The Crimea formed only a minute portion of the territories of which the Khazars had made themselves masters. Their capital was seated near the mouths of the Volga, probably not far from the present Astrakhan, and their sovereigns, called khazars or khans, lived in a state of splendor which the monarchs of western Europe have seldom equaled. In the 10th century the Russians and Pichengues come upon the scene, and before the end of it the power of the khans is almost broken. The Russian conquests were made chiefly in the north; the Pichengues, on the contrary, make their incursions on the south; and the Crimea, though still retaining the name of Khazaria, was obliged to receive them as its masters. The Pichengues, after maintaining their footing for above a century and a half, were forced to give way to the Comanes, who themselves were, in fact, fleeing before a race much more powerful than either. This was the Mongol Tartars, headed by the celebrated conqueror Genghis-Khan. The Crimea having been included in his conquests, passed, on his death, to his grandson, Batu-Khan, and in 1240 was incorporated in the great empire of the Golden Horde. Batu-Khan was the founder of Baktschi Serai, which continued long to be its capital. Mengli Timur, the second in succession from Batu-Khan, having granted the Crimea to a nephew, to be held as a dependency of the grand khanate, it took the name of Crim, or Little Tartary, from which that which it now bears is evidently derived. Previous to this time the Genoese had frequently visited its shores as traders, but they now applied to the under khan for permission to form a permanent settlement. This was granted, and in consequence in 1280 they founded Kaffa, which is still known by its ancient name of Theodosia. The great object of the Genoese in making this settlement was to exercise a control over the extensive and lucrative trade which was then carried on with the East, by way of the Caspian Sea and the Volga, and thence, after a short land carriage, down the Tanais or Don, into the Sea of Azof. This trade and a large business in slaves so increased the importance of this settlement that the Genoese, who had come as simple traders, began to aspire to be masters. The jealousy of their great rivals, the Venetians, was excited, and open hostilities were carried on, each party contending for an exclusive monopoly of the whole trade of the Black Sea. In this contest the Genoese gained the advantage, and they continued to follow it up by forming permanent settlements, and erecting strong fortifications. In this way they obtained possession of Soldaia, now Soudak, in 1365, and about the same time made themselves masters of Cembalo, which afterward exchanged its name for that of Balaklava. The old castles at both these places are Genoese. While Genoa was thus a rising power, the khans were rapidly declining. To complete their downfall, the terrible Timur appeared, and early in the 15th century the great empire of Kaptschak or the Golden Horde was broken up into fragments. Early in the 15th century the Crimea thus became an independent khanate, and continued so to exist under the line of Gherai, descended from Genghis-Khan, for a succession of reigns. The Genoese in the meantime were growing in power, and succeeded, by interfering in a disputed succession, in gaining complete ascendency over the khanate. The Tartars invited the interference of Turkey, and 1475 an Osman fleet appeared in the Bay of Kaffa. The Genoese offered an ineffectual resistance; and Kaffa, along with all their other settlements, was soon in the possession of the invaders, and the Crimea became a province of the Ottoman empire. The Turks, not satisfied with the Crimea, extended their conquests far into Russia, and provoked Russian reprisals, and soon Russia turned to the Crimea as a possible and valuable maritime province. In 1736 a Russian army of 50,000 men broke through the isthmus of Perekop and made its way into Crimea itself. But the terrible climate forced the speedy return of less than half of the army, all that was left. The contest for the Crimea, thus begun, was steadily persisted in; and the conquest was virtually com-

pleted by the troops of Prince Dolgorouki in 1771. In 1783 the Crimea was united to the Russian empire.

The progress of Russia in this direction naturally held out to her more tempting objects of ambition, and it was generally believed by the western powers of Europe, who were jealous of the growth of her gigantic power, and particularly by England, of whose policy, in consequence of her possessions in the East, the preservation of the Turkish empire had become a primary object, that she aimed at the dismemberment of that empire, and the conquest of Constantinople itself. Among other indications of agressive tendencies, the great naval arsenal of Sebastopol, occupying the most commanding position in the Black Sea, at the extremity of the Crimean peninsula, begun by Catharine II. in 1786, was completed on a scale of which the world has yet seen few examples, and provided to an unlimited extent with all the means both of offensive and of defensive warfare. One main object of this arsenal undoubtedly was to hold out a standing menace against Turkey, and make her destruction certain whenever an opportune period for striking the final blow should have arrived. The Emperor Nicholas, one of the ablest as well as most ambitious of the czars who have ever swayed the Russian sceptre, had satisfied himself that this period was actually at hand. In February 1852 the Porte had given a decision on a dispute between the Latin and Greek churches, the former protected by France, the latter by Russia, as to the protection of the holy places in Palestine, which was deemed favorable to Russia. A new demand, however, was made by this power, which, in November, claimed, in virtue of the Treaty of Kainardji, a protectorate over the Greek Church throughout the Turkish empire. After complicated negotiations, the Porte, under pressure from France, vacillated toward the side of the Latins, and on 22 December delivered the key of the Church of Bethlehem to the Latin patriarch. The diplomacy of England, France, Russia, Austria, Prussia, and Turkey exhausted itself in negotiations over this dispute, and at length, in May 1853, Prince Menschikoff delivered an ultimatum to the Porte, which being rejected, the Russian troops, which had been advanced to the Pruth at the close of the previous year, crossed it and occupied the Danubian principalities. The Porte declared war on 23 Oct. 1853; France on the 27th, and England 28 March 1854. On 26 Jan. 1855 the allies were joined by Sardinia. Happily the common danger had dissipated all the misunderstandings which had arisen between Great Britain and France. Nicholas had selected the Danubian principalities as the scene of warfare, and here the allied army was first conveyed; but after remaining inactive for some time at Varna, it was determined that the Crimea should be made the great battlefield. Accordingly, in the beginning of September 1854, the combined fleets of Great Britain and France, forming, perhaps, when efficiency as well as vastness are considered, the mightiest armament ever conveyed by sea, appeared off the west coast of the Crimea, about 30 miles north of Sebastopol. The disembarkation having been completed on the 16th, the army began to move southward on the 19th, and early on the 20th approached the banks of the Alma. Here the Russian army was found occupying a position which Prince Menschikoff, its commander, believed to be unassailable. After a sharp struggle the Russians were forced to give way at every point, leaving the allies in possession of a victory which is destined to hold an honorable place in military annals. Two days after the allied army continued its march for Sebastopol, the real object of attack; but for strategical reasons, instead of proceeding directly to the north side of the fortress, made a circuit which brought it considerably to the south, in the vicinity of Balaklava. This small harbor, near which the British were stationed, furnished them with facilities for landing the munitions of war, while the same object was gained, perhaps more advantageously, by the French at Kamiesch Bay. It has been alleged that an assault upon Sebastopol, had it been made immediately after the victory of the Alma, would probably have been successful. The defenses were, toward the sea, justly deemed all but impregnable, but those on the land side, from which the czar had never dreamed of the possibility of an attack, were very incomplete. The allies, however, doubting the success of an assault, resolved to proceed in more regular form; and thus commenced one of the most remarkable sieges of modern times. The greatest skill, courage, and perseverance appear to have been displayed both by the besiegers and the besieged. The latter were, however, in almost every respect the more favorably situated. Their munitions of war were almost unbounded; the northern side of the harbor was never invested, so that their communication with the country always remained open; and, contrary to the rule established in regard to siege operations, the number of troops within the town nearly equaled, and at one time greatly exceeded, the number of those who were attempting to take it. The consequence was that not only were defensive works constructed rapidly while the siege made comparatively little progress; but the besieged, who had also the assistance of an army without the walls, were able to assume the aggressive. On 25 October took place the famous battle of Balaklava, distinguished by the heroic charge of the Light Brigade, when, in consequence of the misinterpretation of an order, 600 cavalry rode headlong against the Russian army. On 5 November followed the battle of Inkermann, in which an overwhelming force of Russians was gallantly repulsed. Both Great Britain and France now became more alive to the magnitude of the struggle in which they were engaged. While the siege continued, other important positions in the Crimea were occupied, and the possession of Eupatoria on the west, and of Kertch on the east, both seriously threatened the communications of the Russians, and furnished the means of destroying a large portion of their supplies. The peninsula was thus virtually conquered, and a successful issue of the siege began to be confidently anticipated. At an early period the Russians, by sinking a number of large ships across the mouth of the harbor, had rid themselves of the danger of an attack by sea. The remainder of the fleet within the harbor was still available for defense, and from its powers of locomotion enabling it to change its position so as to meet emergencies, was able greatly to retard the besiegers. Decided progress, however, continued to be made. On 7 June 1855 the Mamelon, a commanding

height, was taken; and on 8 September the flag of the allies waved on the tower of the Malakoff. The Russians on the night of the above day, aware that further defense was impossible, withdrew to the northern side of the harbor, after sinking their ships and blowing up the defenses of the town, which was now taken possession of by the allies. There is no reason to doubt that in another campaign the Russians might have been driven entirely out of the Crimea; but overtures of peace were made, and they gladly availed themselves of them. A treaty of peace was concluded at Paris on 27 April 1856, by which the independence of the Ottoman empire was guaranteed, and her admission to the society (concert) of European powers declared by the other contracting parties, namely, Great Britain, Austria, France, Prussia, Russia, and Sardinia; the Christians in Turkey to remain under the protection of the Sultan, who, by, a firman, allowed them religious liberty; the waters of the Black Sea declared neutral, and only light vessels for coast service allowed to be maintained there; the emperor of Russia and the Sultan not to maintain any military-maritime arsenal on the shores of the Black Sea. Taking advantage of the Franco-German war, Russia, on 31 Oct. 1870 denounced the Treaty of Paris so far as it related to the neutralization of the Black Sea, and in a conference held in London in January 1871, this part of the treaty was given up, while the remainder of the treaty was confirmed. Consult: Telfer, 'The Crimea and Transcaucasia' (1872); Wood, 'The Crimea in 1854 and 1894' (1895); and, for the Crimean war, Kinglake, 'The Invasion of the Crimea' (1863–87), and Hamley, 'The War in the Crimea' (1891).

Criminal Law. See LAW, CRIMINAL.

Criminology, the science dealing with crime and the criminal population. Criminology may be divided into three branches: general, special, and practical. General criminology consists in a summary and classification of results already known and is historical in character. Special criminology is confined to the study of individual criminals, employing the methods of science with instruments of precision. Practical criminology treats of methods and institutions for the prevention or amelioration of crime, including a study of prisons, reformatories, police systems, and criminal law as applied to society. It is in special criminology that most interest of late has been shown; this branch is pervaded with the scientific spirit.

The study of criminals has been theoretical. At present our jurists study law books, not criminals, and yet nearly one half the time of our courts is given to criminals. The individual study of the criminal and crime is a necessity, if we are to be protected from ex-convicts — the most costly and most injurious citizens we have. A complete study of a criminal includes his history, genealogy, and all particulars concerning himself and his surroundings previous to and during his criminal act; also a study of him in the psycho-physical sense — that is, experiments upon his mind and body with instruments of precision — measuring, for example, his thought-time, sense of sight, hearing, touch, taste, smell, pressure, heat, and cold; also an examination of his organs after death, especially of his brain. It is evident that no one person could make an adequate study of a criminal. The microscopical anatomy of the brain alone, with its physiology, is more than the lifework of many men could accomplish. Criminology, therefore, depends for its advancement upon the results of numerous departments of investigation.

In a rigid sense criminology is no more a science than sociology. Like many other branches of study, they are called sciences by courtesy. But the empirical study of human beings, with whatever class it begins, is an important step toward a scientific sociology. Criminology is an initiatory step in the direct study of individuals themselves and their exact relations to their surroundings. The practical and scientific value of such study consists in showing more clearly what normal society is or ought to be, just as the study of insanity gives by contrast an insight into mental health.

As already indicated, knowledge of the criminal's brain, as well as of the brain in general, is very inadequate, so that any definite conclusions are unwarranted. It may be said that the fact of a criminal having mental anomalies and at the same time cerebral or cranial ones, does not show that either one is the cause of the other, although it may justify a presumption that they are in some way related; for such conclusions are based upon the anatomy rather than the physiology of the brain; as to the latter little is known. It is easy to conceive that brain circulation, qualitative, and quantitative, has as much to do in its effect on the mind as anatomical conditions. It is, however, reasonable to assume that every physiological irregularity is based upon an anatomical one; yet the reverse may be assumed also. The probability would seem to be that the physiological and anatomical mutually act and react, one upon the other. To decide which is primary is wholly beyond our present knowledge.

Criminals are not so abnormal as is generally supposed. Probably nine tenths of prisoners are criminals by *occasion;* that is, their crime is due mainly to bad social conditions; their personality differs little or none at all from that of average man, so that many results gained here relate to normal man. Questions can be asked and investigations permitted in prison that would be difficult with normal man outside of prison. The prisoner has much less to lose, and will often make confessions that few outside of prison would care to make, giving the deepest insight into human nature. The exact conditions, such as regularity in habits of life, diet, etc., are known, and thus a more favorable condition of scientific inquiry is afforded. This is especially true in reformatories, industrial schools, houses of refuge, etc.; most of the inmates are entirely normal; it is abnormal surroundings, such as poverty or drunkenness at home, that brought them here, and not abnormal natures in the children themselves. But it may be added that if children remain long enough in such conditions they will be liable to develop whatever criminal tendencies are in them. It is generally admitted that about 10 per cent of inmates are incorrigible; that is, they are criminals by nature. As their incorrigibility is shown by repeated acts, it is not so difficult to select these cases. This is not saying that such and such a case can not be cured, but intelligent prison officials of long experience doubt the probability of reformation. This fact of incor-

rigibility may be a reason why crime has been considered a disease. Reports from the principal penitentiaries of this country show 82 per cent in good health, 11 per cent in fair health. If crime is a disease, it would seem that it has little to do with what is ordinarily designated under this term. Some have sought by the study of criminals' brains to show anatomical anomalies indicating disease; but there is little agreement in these investigations. But if there were agreement, it would only indicate probabilities, not certainties, for comparatively few brains of criminals have been studied. Even in the case of the insane it is not demonstrated that mental disease necessarily involves brain disease; yet most investigators believe that it does, and with good reason. But there have been cases of insanity in which cerebral anomalies have been sought for in vain.

When the cause of a particular crime is found, this may indicate the most active cause, but not the only one. There may be specific remedies for specific cases, but they can only be determined by special study of the individuals. While some cases can not be reached, the great majority can be made susceptible to reformation, or at least improvement. Often the truest and best advice a physician can give to his patient is to keep up the general health, and nature will be his best servant in resisting all attacks of disease. The same principle applies in aiding one to overcome temptations to evil or crime. Such a remedy consists in moral and intellectual habits being implanted in children, which will give a constant resistance to all temptation, and be even an unconscious force when self-control is lost. Little can be expected from palliative remedies as long as this educational remedy is not thoroughly carried out.

It is an undisputed fact that the moral side of education is as difficult as it is important. This becomes most apparent in the education of the dependent, weak, and criminal classes. Any educational system that can succeed here can with slight modification succeed in the community at large, for all men have tendencies, however slight, toward these defects; but, by force of character or surroundings, the great majority have been able to resist to such a degree as not to fall. But it may be asked to what extent methods of education for normal individuals may be adapted to those who are abnormal. An individual may be said to be abnormal when his mental or emotional characteristics are so divergent from those of the ordinary person as to produce a pronounced moral or intellectual deviation or defect. To distinguish such abnormality from disease is difficult, if not impossible; but in general an abnormality is called disease as soon as it reaches a certain degree; but it may also be an excessive degree of the normal, just as in the physical man in a single diseased cell the normal or physiological processes are not changed in kind, but only in degree, or simply act at an inappropriate time.

The purpose of criminological study is to seek out the causes and conditions that lead to crime, on the general principle that the amelioration or prevention of evil doings can not be accomplished by rational methods until we know more definitely the causes, whether they lie more in the individual or more in the surroundings. As far as investigation of criminals has gone, the indications are that the cause of most crime lies in the surroundings, rather than in the criminal, and this is a most hopeful result of such study, because it is possible to change the surroundings, but very difficult to change the nature of an individual. The study of a single criminal in the most thorough manner possible is important from the fact that he represents generally a large number in his type, and in this way a clear insight is gained into the definite nature of those characteristics and special surroundings which lead through their combination into evil doing.

One method of criminology is to study a few cases as thoroughly as possible. In a new field of empirical study the investigation of details is indispensable, if there is to be any attempt at scientific treatment. The reader may, in addition, gain an independent insight into typical cases and the method of treatment in our penal institutions. The value of a single case lies in the fact that repetition is the rule in crime. And for this reason the study of single cases is probably the best method of gaining a definite knowledge of the causes, difficulties, and remedies for crime. The method of gathering the facts is by visiting different reformatories and prisons. One aim is to study only those cases about which enough is known to place their real nature beyond a doubt. We should give in detail the complaints and other records of each case investigated, with the additional testimony gathered from the officers. These facts are of more scientific value than those gathered outside of prison, because they are not only more trustworthy, but the environment of the prisoner is more definitely known. Each complaint generally represents many repetitions of the same offense, for an officer naturally refrains from making complaints, as he may get the ill will of the prisoner, which adds difficulties to the duties of both.

The modern school of criminal anthropology or criminology, holds in general the following principles:

1. Criminology has as its purpose the study of the actual criminal and his crimes as ordinary phenomena, which must be investigated from their genesis to their final development.

2. The law of retaliation must be abandoned; the basis of punishment is the necessity of protecting society. The criminal must be reformed, or he must be separated from society. Punishment is not to satisfy vengeance.

3. In crime the results of two factors are seen reciprocally acting: first the individual peculiarities arising from the nature of the criminal or his psycho-physical organization; second, the peculiarities of external influences, as climate, nature of country and social surroundings, nationality.

4. The causes of crime may be divided into: (*a*) immediate, which arise from the character of the criminal; (*b*) remote, which are hidden in his unfavorable environment, under which organic tendencies are developed.

As an illustration of the study of criminals with instruments of precision, the temporal algometer is given. This instrument (designed by the writer) is pressed against the temple, and as soon as the pressure is felt to be the least disagreeable, the amount of pressure is read on the scale (E). Criminals of the brutal type especially are found to be less sensitive to pain than persons in general.

Criminal Hypnotism.— Almost all the crimes committed by hypnotizers on those hypnotized are violations or outrages of modesty. In the lethargic or cataleptic state the subject is easily influenced; here also somnambulism offers some dangers. The affective sentiments toward the hypnotizer are strongly manifested in many cases; the subject, isolated from the entire world, only sees the hypnotizer. It is easy to comprehend the danger to one in a mental state like this. At this point the actions of a person might seem involuntary, and so not constitute a crime, but the hypnotizer or magnetizer who profits in the somnambulism from similar dispositions of mind is guilty of the crime of violation. In the state of lethargy one does not remember on awakening what transpired in this stage of the sleep, or the recollection is so confused that the testimony can not be trusted. There is also a lucid lethargy, a still less degree of hypnosis. This state is important when the question of simulation arises, but in this state the recollection can generally be trusted. In some cases of violation the victim passes from lucid lethargy to complete lethargy; certain things are remembered, while others are confused or forgotten. Somnambulism can serve for the committing of a voluntary abduction one might say; the individual is plunged into lethargy, and his totally unconscious state serves to carry him away. Certain magnetizers of India were accustomed to employ this means to rob children. But the danger from criminal hypnotism has been exaggerated. While it may afford ways of committing crime, it likewise involves circumstances by which the criminal may be discovered.

Temporal Algometer (Macdonald).

It would carry us too far to enter into any discussion of criminal hypnotism. As one might expect in a subject so recent in its scientific treatment, the question of criminal hypnotism is somewhat indefinite, sometimes contradictory and generally unsatisfactory. As is well known, the older or Paris (Charcot) school maintained that hypnotism is a pathological symptom; while the newer or Nancy school (Liébault, Bernheim) asserted that it is physiological. While the Paris school seems to have receded from its position as to hypnotism in general, it denies criminal hypnotism. But such denial does not come from those who have made extensive experiments on the criminological side.

As to the directly practical side of crime and its prevention, the state has made and is making experiments. But sociological experience of this nature requires much time and numerous tests in order to warrant trustworthy conclusions, and at best they are tentative in nature, for social science is in its formative period. As to the scientific study, cure and prevention of crime, it may be said, in brief, that the method of the scientific study of criminals is a thorough investigation of the criminal himself, both psychologically and physically, so that the underlying and constant cause of crime can be traced out. There is no other rational road to the prevention and repression of crime. Whatever the remedy the causes must be studied first. Negative results are as important as positive, to science. If it should be shown that some crime is incurable, that would be valuable to know, especially what degree of reformation can be expected. If, as Lombroso thinks, crime is to return to the primitive and barbarous state of our ancestors, the criminal being a savage born into modern civilization, then for such there is very little reformation. But these are criminals by nature and constitute a very small proportion — less than one tenth probably. The French school of criminology has shown that the greater part of crime arises out of social conditions, and hence is amenable to reformation by the changing of these conditions.

Education, in the narrow sense of mere intellectual instruction, is not sufficient to reform children who spend one fourth of the day in school, and three fourths on the street, or with criminal, drunken, or idle parents. But are there not reform schools? Yes; but no provision has been made for the little children. Not a few of the inmates of reformatories come there practically incorrigible, and the testimony of prison wardens is that some of the most hopeless prisoners are graduates of the reform schools. The fault is not in the reform schools, but in allowing children to live the first years of their lives in surroundings that almost predestine to crime. Reformatories are expected to erase the indelible criminal impressions made upon children from birth, or before, till the age of six. Instead of deserving criticism, the wonder is that reformatories do as much as they do. In brief, it is useless to expect any great decrease in crime, especially habitual crime, until very young children are properly cared for — that is, until they receive the moral and social education of a home or home-like institution. This is the foundation of all prevention of crime. But much remains to be done after a child has had this good start, for there are still dangers of falling into crime. The method of prevention, from this stage on, consists in moral, mental, and physical training, producing fixed habits. The criminally inclined are especially weak in moral impulse, and below the average in intellect and physique. The education of the will is the main factor, but the training of the intellect and sentiments are necessary to this end. The remedy, therefore, for crime must be general, gradual, and constant. Every reformatory is a school in which emphasis is laid upon moral and industrial habits, which in the young become, as it were, a part of their nervous organization. This is shown by the fact that moral individuals, when hypnotized, unconsciously resist evil suggestions. When passion, perplexity, or temptation cause the loss of self-control, then it is that good habits implanted in childhood and woven into the constitution overcome evil and criminal impulses. All prisons should be reformatories. All men, no matter how old in crime, can at least be improved and benefited — that is to say, the best prisons of the future will be reformatory prisons, and the main means of reform will be the inculcation of good mental, moral, physical, and industrial habits.

The following statements as to the criminal are not based upon experimental research so much as upon the experience of those who have

studied criminals directly or who have had practical control of large numbers in prisons or reformatories:

1. The prison should be a reformatory and the reformatory a school. The principal object of both should be to teach good mental, moral, and physical habits. Both should be distinctly educational.

2. It is detrimental, financially, as well as socially and morally, to release prisoners when there is probability of their returning to crime; for in this case the convict is much less expensive than the ex-convict.

3. The determinate sentence permits many prisoners to be released who are morally certain to return to crime. The indeterminate sentence is the best method of affording the prisoner an opportunity to reform without exposing society to unnecessary dangers.

4. The ground for the imprisonment of the criminal is, first of all, because he is *dangerous* to society. This principle avoids the uncertainty that may rest upon the decision as to the degree of freedom of will; for upon this last principle some of the most brutal crimes would receive a light punishment. If a tiger is in the street, the main question is not the degree of his freedom of will or guilt. Every man who is dangerous to property or life, whether insane, criminal, or feeble minded, should be confined, but not necessarily punished.

5. The publication in the newspapers of criminal details and photographs is a positive evil to society, on account of the law of imitation; and, in addition, it makes the criminal proud of his record, and develops the morbid curiosity of the people; and it is especially the mentally and morally weak who are affected.

6. It is admitted by some of the most intelligent criminals, and by prison officers in general, that the criminal is a fool; for he is opposing himself to the best, the largest, and the strongest portion of society, and is almost sure to fail.

7. It may be said, with a few exceptions, that within the last 30 or 40 years there has been an increase (relative to population) in crime, suicide, insanity, and other forms of abnormality. This is the general verdict of the official statistics of the leading countries of the world.

The objection is frequently made that this relative increase in crime, etc., is due to the more stringent methods of gathering the data. While doubtless this has weight, yet how much it has had to do with the increase is a matter of opinion. In the judgment of those who have spent their lives in dealing first hand with these forms of abnormality better methods of inquiry will not account for the increase. It would seem that this increase is due more to the rapid development of the world in general, rather than to any specific cause.

Bibliography.— Havelock Ellis, 'The Criminal'; Henderson, 'Introduction to the Study of the Dependent, Defective, and Delinquent Classes'; Morrison, 'Crime and Its Causes'; MacDonald, 'Criminology'; 'Statistics of Crime, Suicide, Etc.' (Senate Document No. 12, 58th Congress special session); Lombroso, 'L'Homme Criminelle'; Baer, 'Der Verbrecher in Anthropologischer Beziehung'; Kurella, 'Naturgeschichte des Verbrechers.' For further list of works and literature, see Senate Document mentioned above.

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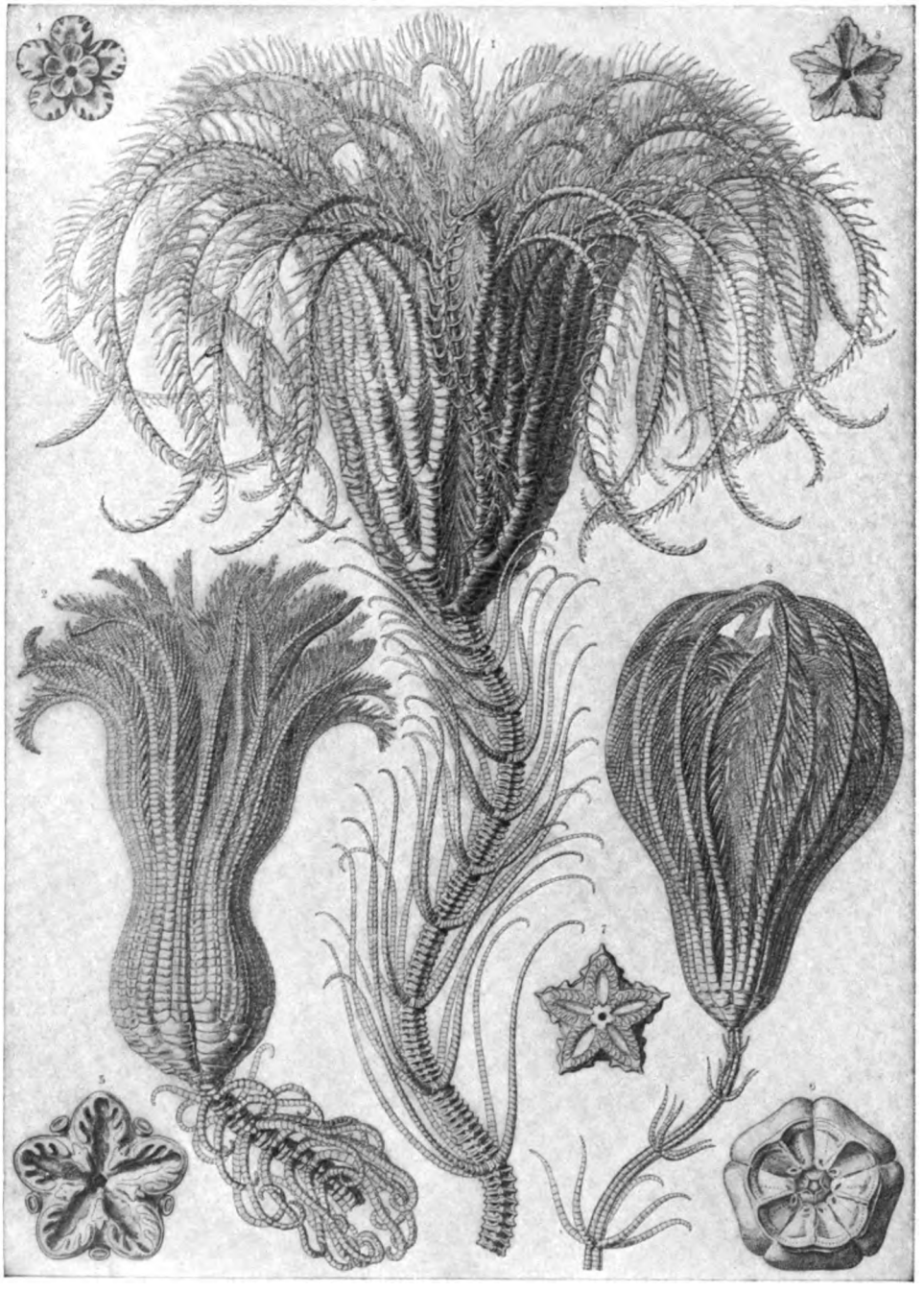
Crimp, an agent who for a commission supplies ships with seamen, the term being applied especially to low characters who decoy sailors by treating them, advancing money to them, and giving them goods on credit, till they have them in their power, frequently getting them shipped off in a drunken state after all their money is spent. They also keep an outlook for emigrants, and take them to low lodging houses, in which they themselves are interested.

Crinan (krē'năn) **Canal,** a canal in Argyleshire, Scotland, joining Loch Crinan and Loch Gilp, cutting off the peninsula of Cantyre from the mainland, and greatly shortening the route from Glasgow to Oban and other parts of the west coast. It is 9 miles long 12 feet deep, and admits vessels of 200 tons. The canal was completed in 1801, having cost more than $900,000.

Crinoid, krī'noid, or **Sea-lily,** a stalked echinoderm usually fixed by a jointed stem so as to have a flower-like form. The body is more or less cup-shaped, with five jointed flexible arms subdivided into branches, and bearing pinnules. The arms may be absent in the blastoids (*Pentremites*) and certain cystideans, but the pinnules remain. There are few existing species, the greater number (nearly 1,000) having become extinct. The most typical crinoid is *Pentacrinus,* which lives attached to rocks in the West Indies at all depths from 20 to 3,000 fathoms; it is about a foot high, the arms much subdivided, the joints of the stem five-sided. In one fossil species the stalk was more than 50 feet long. Crinoids often grew in dense forests. A curious little living crinoid is a slender simple form about two inches high, which lives at the depth of from 100 to 1,000 fathoms on the coast of Norway and in the Straits of Florida in the cold water under the tepid Gulf Stream. It is a survivor of the Cretaceous Period. A north Atlantic shoal-water form is the *Antedon* (*Comatula*), which in its early youth is fixed to the bottom by a stalk, but which becomes free when mature; it also inhabits the Mediterranean Sea. The existing crinoids, more than 200 species, are merely the remnants from a much larger assemblage of fossil forms, which began to live in the Cambrian, culminated in the early Palæozoic Age, and began to decline toward the end of that period. They flourished in greatest numbers about palæozoic coral reefs in shallower water than at present. The most famous American crinoid beds are those of the Subcarboniferous limestones of Burlington, Iowa, and Crawfordsville, Indiana. Thick beds of crinoidal limestones were deposited in various parts of the world at various periods and under favorable conditions from the Ordovician to the Jurassic Period, those of the Carboniferous and of the upper Muschelkalk, the lower beds forming the so-called Trochitenkalk, being especially characteristic, and consisting almost wholly of stems of *Encrinus liliiformis,* the "sea-lily." Crinoids are divided into three classes. The oldest, most generalized and primitive appears to be the class *Cystoidea.* These were more or less spherical in form, either with imperfectly developed arms, or without, and stalked or not. About 250 species are known. They date from the Cambrian Period, culminated in the Ordovician and Silurian Period, then suddenly diminished in numbers, finally dying out before the close of the Permian. The second



CRINOIDS.

1. Metacrinus angulatus. 2. Pentacrinus Maclearanus. 3 Pentacrinus Wyville-Thompsonii.
4, 5, 6. Sections of No. 3 showing formation of structure. 7, 8. Sections of No. 2 showing formation of structure.

class is the *Blastoidea,* or bud-shaped crinoids, represented by *Pentremites,* which were short-stemmed or entirely stemless. The arms are short, recumbent, and apparently soldered to the calyx or body. These have not yet been detected in strata lower than the Silurian and the type became most numerous in the Sub-carboniferous limestones of the United States. Upward of 120 species are known. The third class is *Crinoidea* proper. The three classes are arranged under the sub-branch, *Pelmatozoa,* Consult: Zittel-Eastman, 'Text-book of Palæontology' (1900), which contains full bibliographies.

Crin'oline (Fr., from Lat. *crinis,* hair), properly a kind of fabric made chiefly of horse-hair, but generally applied to a kind of petticoat supported by steel hoops, and intended to distend or give a certain set to the skirt of a lady's dress. Hooped skirts are by no means a new invention of fashion, a somewhat similar monstrosity, supported by whalebone, being worn in the time of Queen Elizabeth and James I., and the fashion being again introduced in the time of George II. The earlier hooped petticoats were called fardingales or farthingales. The crinoline proper came in about 1856, and was worn by women of all ranks, and sometimes reached portentous dimensions, so as to be not only very inconvenient to the wearer and all coming in contact with her, but also the cause of accidents from fire, etc. The immense bell-shaped crinolines fell into disuse about 1866. Crinoline wire was for years a leading branch in the steel trade. A horse-hair and cotton fabric used as a material for making ladies' bonnets is also called crinoline.

Crinum, krī'nŭm, a genus of bulbous-rooted herbs of the natural order *Amaryllidaceæ.* The numerous and widely distributed species are characterized by rather broad, usually persistent leaves, and umbels of few to many funnel-shaped flowers, often deliciously fragrant. The flowers are usually pure white, with bands of purple or red, or tinted throughout with one of these colors. Several species are widely popular as greenhouse specimens and in the warm South and California as outdoor subjects on lawns. *C. americanum,* the Florida swamp lily, is common in wet ground in the Gulf States. *C. longifolium* and *C. moorei* are somewhat hardy, the former as far north as Washington, the latter not quite so far. Both these species blossom continuously through the summer; the others generally have a short season of bloom. More than 20 species with many horticultural varieties are cultivated in American gardens and greenhouses. They differ widely in their demands as to cultivation, for an account of which, and also for a description of the popular species, consult: Bailey, 'Cyclopedia of American Horticulture' (1900–2).

Cripple Creek, a town in El Paso County, Col.; on the Florence & Cripple Creek and the Midland Terminal railroads, 50 miles west of Colorado Springs. It is the trade centre for the Cripple Creek mining district, in which the output of gold in the first half of 1902 was $13,936,392, and the total production of the camp to 1 Jan. 1902 was $116,549,287. The total dividends to 30 June 1902 amounted to $25,817,951. The town has several cyanide mills, smelters, and other mining industries, a national bank, and daily and weekly newspapers. It was founded in 1890, and was nearly destroyed by fire in 1896. Pop. (1900) 10,147.

Crisis, in medicine, the turning-point in a disease at which a decided change for the better or the worse takes place. In regular fevers the crisis takes place on certain days, which are called critical days (the 7th, 14th, and 21st); sometimes, however, a little sooner or later, according to the climate and the constitution of the patient. The word crisis is also figuratively used for a decisive point in any important affair or business, for instance, in politics and commerce. Commercial crises have been in an especial degree the subject of study at the hands of economists, with the result of establishing a curious periodicity in their recurrence. The commercial cycle apparently completes itself in about 10 years, the earlier portion of the period being attended with improving trade, a steady rise in prices, wages, and profits, and a considerable inflation of credit. Excitement, over-trading, and unwise speculation result in serious failures, and there follows a period of distrust and distress.

Crisis, The, the general name given to a series of political articles by Thomas Paine. These are 13 in number, exclusive of a 'Crisis Extraordinary' and a 'Supernumerary Crisis.' The first and most famous, published in the 'Pennsylvania Journal,' 19 Dec. 1776, began with the famous sentence, "These are the times that try men's souls." "It was written during the retreat of Washington across the Delaware, and by order of the commander was read to groups of his dispirited and suffering soldiers. Its opening sentence was adopted as the watch-word of the movement on Trenton, a few days after its publication, and is believed to have inspired much of the courage which won that victory." The 13th, published 19 April 1783, bears the title, 'Thoughts on the Peace, and the Probable Advantages thereof.' It opens with the words, "The times that tried men's souls are over." The pamphlets throughout exhibit political acumen and the common-sense for which Paine was remarkable. As historical evidence of the underlying forces in a unique struggle, and as a monument to patriotism, they possess great and lasting value.

Crisp, Charles Frederick, American jurist: b. Sheffield, England, 24 Jan. 1845; d. Atlanta, Ga., 23 Oct. 1896. He came to the United States when a child, served in the Confederate army 1861–4; was admitted to the bar in 1866; was solicitor-general of Georgia from 1872 to 1877; and judge of the supreme court 1877–82. He resigned the last office to accept a nomination for Congress, of which body he was chosen speaker in 1891, and again in 1893.

Crispi, Francesco, Italian statesman: b. Ribera, Sicily, 4 Oct. 1819; d. 11 Aug. 1901. He studied law at the University of Palermo and settled at Naples in 1846. Since then he has been an important factor in Italian history. He took part in the conspiracies that led to the overthrow of the Two Sicilies, after which he fled to France for a time; served as a major under Garibaldi in 1860, and in 1861 was returned by Palermo to the first Italian parliament, and became president of the Chamber of Deputies in 1876. He was made minister of the in-

terior in 1877, was prime minister 1887–91, and again 1893–6. He was a warm friend of Bismarck and a staunch supporter of the triple alliance of Italy, Germany, and Austria. He became unpopular with the people on account of taxation, and two attempts were made to assassinate him. See Stillman, 'Francesco Crispi: Insurgent, Exile, Revolutionist, and Statesman' (1899).

Crispin and **Crispinian, Saints,** two Roman brothers who suffered martyrdom in one of the general persecutions of the Christians in the Roman empire, either in the year 287 or 300. The legend attached to their names recites that the brothers, in the company of St. Denys, journeyed from Rome to Augusta Suessionum (Soissons) in Gaul, preaching the Christian religion; and after the example of Paul the apostle, lest they should be a burden to anyone, earning their livelihood by exercising their craft of shoemaking. They sold their wares to the poor at a very low price, and well they might, for the raw material cost them nothing, being provided for them gratis by the ministry of angels. A variant of the legend, conceived in a not unusual vein of popular humor would have it that the brothers stole the leather that they might practise a larger charity. The chief magistrate of the town, having learned of the great success of the volunteer evangelists in making converts to Christianity, had them brought before him and, after torture, they were beheaded. The brothers were thereafter regarded as the patron saints of the shoemakers' guild; but, as in the case of Castor and Pollux, one of the pair, Crispin, enjoys alone all or most of the posthumous homage.

Crit'elaus. (1) A celebrated Archæan demagogue, who incited his countrymen to insurrection against the Romans. He commanded the Archæan army at the battle of Scarphæa, 146 B.C., and when overthrown by Metellus, either committed suicide or perished in the marshes of the coast. (2) Greek philosopher of the 2nd century B.C. He was at the head of the Peripatetic School in Athens and eminent as an orator. With Carneades he was despatched on an important embassy to Rome about 155 B.C.

Critias, krĭt'ĭ-ăs, Greek orator: d. 404 B.C. He was one of the 30 tyrants set over Athens by the Spartans. He applied himself with great success to the culture of eloquence, which he had studied under Gorgias, and Cicero cites him among the public speakers of that day. Banished from Athens for some cause that is not known, he retired to Thessaly, where he incited an insurrection among the Penestæ or serfs. Subsequently to this he visited Sparta, and wrote a treatise on the laws and institutions of that republic. Returning to Athens with Lysander, 404 B.C., he was appointed one of the famous 30, his pride of birth and hatred of demagogues having pointed him out as a fit person for that office. After a cruel and oppressive use of the power thus conferred upon him, he fell in battle against Thrasybulus and his followers. Plato, who was a relation of his, has made him one of the interlocutors in his 'Timæus and Critias.'

Substance	Formula	Critical Temperature	Critical Pressure (Atmos.)
Acetic acid	$C_2H_4O_2$	+ 321.C.	57.
Acetone	$(CH_3)_2CO$	+ 233.	52.
Acetylene	C_2H_2	+ 37.	67.
Alcohol	$C_2H_5.OH$	+ 244.	64.
Ammonia	NH_3	+ 131.	113.
Carbon dioxid	CO_2	+ 31.	77.
Carbon monoxid	CO	— 139.	35.5
Chlorine	Cl	+ 146.	93.5
Chloroform	$CH.Cl_3$	+ 268.	54.9
Cyanogen	CN	+ 124.	61.7
Dimethylamine	$(CH_3)_2NH$	+ 163.	56.
Ethane	C_2H_6	+ 35.	45.2
Ethyl acetate	$C_2H_5O.C_2H_3O$	+ 250.	39.6
Ethylene	C_2H_4	+ 10.	51.
Ethyl ether	$(C_2H_5)_2O$	+ 194.	35.6
Hydrochloric acid	HCl	+ 52.2	83.
Hydrogen	H	— 234.	20.
Methane	CH_4	— 81.8	54.9
Methyl alcohol	$CH_3.OH$	+ 232.8	72.8
Methylamine	$CH_3.NH_2$	+ 155.	72.
Methyl chlorid	CH_3Cl	+ 141.5	73.
Methyl ether	$(CH_3)_2O$	+ 130.	59.
Nitrogen	N	— 146.	35.
Nitrogen dioxid	NO	— 93.5	71.2
Nitrogen monoxid	N_2O	+ 36.4	73.1
Oxygen	O	— 119.	50.8
Phosphoretted hydrogen	PH_3	+ 52.8	64.
Sulphur dioxid	SO_2	+ 155.6	79.
Sulphuretted hydrogen	H_2S	+ 100.	90.
Trimethylamine	$(CH_3)_3N$	+ 160.	41.
Water	H_2O	+ 365.	200.

Critical Angle. See Light.

Critical Point, in physics, the state that a gas is in, when its temperature is the "critical temperature," and its pressure is the "critical pressure." It was formerly believed that any

gas could be liquefied, if a sufficient pressure were brought to bear upon it. It was known that reduction of temperature facilitates liquefaction, but it was nevertheless believed that a sufficient pressure would effect the liquefaction at any temperature whatever. Dr. Thomas Andrews, in the Bakerian Lecture for 1869, entitled 'On the Continuity of the Gaseous and Liquid States of Matter' (see 'Philosophical Transactions' for 1869, Pt. II., p. 575), showed that this view is erroneous, and that there exists for every gas a temperature above which it is impossible to liquefy the gas by the application of any pressure whatever. The temperature so defined is called the "critical temperature"; and the vapor tension that a liquefied gas exerts at its critical temperature is called the "critical pressure" of the gas. Similarly, the volume occupied by a unit mass of a gas that is at its critical point is called the "critical volume" of the gas. The critical constants of the various gases and liquids have not yet been determined with as much precision as could be desired. Generally speaking, the critical temperatures are best determined. The critical pressures come next in order of accuracy, though many of the values of these that are now accepted are without doubt materially inaccurate. The experimental determination of the critical volume of a gas is exceedingly difficult, and few of the critical volumes are known with any approach to precision. The table on the preceding page gives some of the values of the critical constants of gases that are provisionally accepted by physicists. The critical temperatures are given on the centigrade scale, and the critical pressures in atmospheres.

One important and curious fact that follows from the existence of a critical point is that the gaseous and liquid states of a given substance may be regarded as continuous with each other, inasmuch as it is possible to cause a substance to pass from one of these states to the other by a continuous process, and without any abrupt change of condition such as is apparent when ordinary condensation takes place. For example, if we heat a cubic foot of carbon dioxid gas up to 50° C., we can then compress it all that we please without producing the least sign of liquefaction; because the critical temperature of this gas is 31° C., and hence liquefaction cannot be induced at any temperature higher than 31° C. Let us now compress it at this temperature until its pressure is (say) 150 atmospheres. It is still a gas, for the reason just given. Finally we cool the gas, still maintaining its pressure at 150 atmospheres, until its temperature becomes 15° C. There can be no doubt that it has now become liquid, and in fact actual experiment proves this to be the case. If the temperature had been maintained at 15° C. throughout it would not have been possible to compress the gas into the liquid condition without a visible, discontinuous passage from the one state to the other; but by the process described above it is possible to convert the substance from the gaseous state into the liquid state in such a manner that the transition is imperceptible to the senses, and is not accompanied by any sudden change of density. For further discussion of the theoretical principles involved in the consideration of the critical state, see MOLECULAR THEORY; THERMODYNAMICS. Consult also: Maxwell, 'Theory of Heat'; Preston, 'Theory of Heat.'

Criticism, the expression of a judgment concerning any subject; specifically the formulating of opinions based upon certain principles, in matters of art, literature, philosophy, etc. Certain canons apply in a general way to all criticism, but each branch has its own particular methods and standards. In its narrow sense, the art of criticism is confined to the study of the beauties or defects of some particular work; in its broadest aspect it includes the establishment as well as the application of principles, for the determination of which it must be largely indebted to philosophy. Aristotle was the first writer to develop a philosophy of criticism, applying it to the study of rhetoric and poetry. In connection with the truth that poetry deals more with "universals" and history with "particulars," he assigns a higher rank to the former and brings out a fundamental distinction pointing to the crucial test for any high performance in art or literature. A work cannot permanently contribute inspiration and enjoyment, without possessing those elements which arise from the essentially and universally human, as contrasted with individual or temporary characteristics. The Augustan Age produced one critic that the world of letters could ill spare. To Horace the art of criticism owes much of permanent value and perennial charm. The traditions of culture, forgotten or dormant during the Middle Ages, and revived by the leaders of the Italian renaissance and the humanists, for a long time produced little that was broad, fundamental, or independent in criticism. In France, Boileau, Voltaire, and others led the way; and Germany is indebted to Lessing for a remarkable impulse given to this province of intellectual effort. Goethe, Schiller, and Schlegel and his brother continued the work. The critical method was effectively applied to history, philology, and science. Without, however, dwelling upon the array of profound and brilliant scholarship displayed in these departments of criticism, but confining the outlook to the field of literature and art, there may be noted among French writers, Taine, Sainte-Beuve, and more recently Brunetière; in England,— Pope, Dryden, Coleridge, Hazlitt, Macaulay, Ruskin, Carlyle, Pater, Matthew Arnold, and Saintsbury; and in America,— Emerson, Ripley, Lowell, Curtis, and Stedman.

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Critique of Pure Reason. See KANT, IMMANUEL.

Crito, krī'tō, Greek philosopher. He was a friend and disciple of Socrates, whom he is said to have supported with his fortune. He made every arrangement for the escape of his master from prison, and used every argument which ingenuity or affection could suggest to induce him to save his life by fleeing from his persecutors. His eloquence was, however, in vain, and Socrates drank the fatal cup. Crito

is a prominent interlocutor in one of Plato's dialogues, which is named after him. He was himself a voluminous writer on philosophical subjects, but all his writings have perished.

Crit'tenden, George Bibb, American military officer: b. Russellville, Ky., 20 March 1812; d. Dansville, Ky., 27 Nov. 1880. He was graduated at the United States Military Academy in 1832, and served as an officer in the Mexican war, rising to the rank of lieutenant-colonel. He joined the Confederacy at the outbreak of the Civil War, became a major-general, and suffered defeat at Mill Spring, Ky., in 1862. He was kept under arrest in consequence, and resigned his commission the following year.

Crittenden, John Jordan, American legislator: b. Woodford County, Ky., 10 Sept. 1787; d. near Frankfort, Ky., 26 July 1863. He was graduated at William and Mary College in 1807; in 1816 became a member of the State legislature, and in 1817 was elected to the United States Senate. He resigned three years later, but subsequently was re-elected twice. In 1848 he became governor of Kentucky. Through his influence the State remained loyal to the Union in the Civil War.

Crittenden, Thomas Leonidas, American military officer: b. Russellville, Ky., 15 May 1819; d. Annandale, N. Y., 23 Oct. 1893. He was a son of J. J. Crittenden (q.v.), and was educated for the law. In 1842 he became State attorney for Kentucky; served as an officer in the Mexican war, and in 1849 was appointed consul at Liverpool. On the outbreak of the Civil War he became brigadier-general of volunteers, and in 1862 was promoted to major-general. He distinguished himself at Shiloh, Stone River, and Chickamauga. He was placed on the retired list in 1881.

Crittenden, Thomas Theodore, American lawyer: b. Shelby County, Ky., 2 Jan. 1832. He was graduated at Centre College, Danville, Ky., in 1855; served through the Civil War as lieutenant-colonel of the 7th Missouri cavalry; practised law after the close of the War; and filled an unexpired term as attorney-general of Missouri. He was a member of Congress 1877–81; governor of Missouri in 1881–5; United States consul-general at the city of Mexico 1893–7; and has since resumed the practice of law.

Crittenden Compromise, 1860–1: the last desperate effort of the Southern Union party to avert secession and war, by permanently crystallizing the free and slave communities as they stood; dividing the boundaries on the line of the Missouri Compromise, and engaging the Federal power to uphold slavery to the full, where it existed. In the session of Congress after Lincoln's election, the Constitutional Union party (q.v.) having broken down, John J. Crittenden of Kentucky, a leading Unionist senator, introduced a proposition for a constitutional amendment, in substance as follows: (1) Slavery to be abolished in all national territory north of 36° 30′, and recognized and protected south of it, the people to decide the status on its becoming a State; (2) not to be abolished in forts or other Federal territory in slave States; (3) nor in the District of Columbia while it existed in Maryland and Virginia, nor at all without consent of the inhabitants, and compensation, nor slaveholders forbidden to bring their slaves thither; (4) the interstate slave-trade never to be prohibited; (5) the United States to pay for all fugitive slaves rescued by violence, and sue the county of rescue, which could sue the individuals; (6) no future amendment ever to affect these provisions, nor Art. I., § 2, ¶ 3, nor Art. IV., § 2, ¶ 3 of the Constitution; nor to give Congress power to abolish slavery in a slave State. Four resolutions were appended, declaring the Fugitive Slave Act constitutional, urging the repeal of the State personal-liberty laws, promising the modification of two specially obnoxious features of the Fugitive Slave Law, and the rigorous suppression of the outside slave-trade. The legislatures of Virginia, Kentucky, Tennessee, and New Jersey instructed their delegates to the Peace Conference (q.v.) of 1861 to support it. In Congress, Crittenden continued to press it during the session. It was lost in the House 14 Jan. 1861, 113 to 80; in the Senate 2 March, 20 to 19.

Croatan, or **Croatoan,** "The Lost Colony." For Raleigh's attempt to colonize Roanoke Island, see ROANOKE COLONY. In 1587 he abandoned the effort, and incorporated a company to settle on Chesapeake Bay, entitled "The Governor and Assistants of the City of Raleigh in Virginia." John White was chosen governor, and sailed with 133 men and 17 women. They were to pick up the 15 men left on Roanoke by Grenville, and go on to the bay, but on arriving 22 July, the captain, a Spaniard, and not impossibly treacherous, refused to take them from the island, where the 15 had all been murdered by Indians. On 16 August was born there the first white American child, Virginia Dare, daughter of the governor's daughter. A few days afterward, White reluctantly yielded to the stranded colonists' petition to return to England for help; but they had agreed to remove 50 miles farther inland, cutting on trees or doorposts at Roanoke the name of the new place when found, and if in distress, carving a cross under it. White had Raleigh fit out a relief expedition for the next spring, but it was impressed by the government for service against the Spanish Armada; White, however, managed to sail 22 April, but was driven back by Spanish ships, and was unable to venture again till March 1591, and then only as a passenger on a West India trader. On 15 August, near his granddaughter's fourth birthday, he arrived, but found the island deserted, his houses pulled down, and a blockhouse with grass growing in it; five buried chests had been dug up and the contents destroyed, the relics, including fragments of his own books, maps, and pictures; and on a large tree from which the bark had been cut was carved: "Croatan" or "Croatoan" in capitals (Strachey says "Cro" only), but no cross. Croatan was an island near by, and White urged the captain to take him there at once. Had it been done the colony would have been rescued, as they were in fact living there peacefully waiting English succor; but a storm came up, and after a few days' beating around the captain insisted on making sail for England. White was broken-hearted and gave up all hope. Raleigh in 1602 sent another expedition to seek them, perhaps still not too late; but the captain was more interested prospecting than

hunting for strays among Indians, and made no effort to find them. Raleigh was never able to send another; and the fate of the colonists was unknown till Indians told the settlers at Jamestown. They had accepted the friendly invitation of the Croatan Indians to live among them, and remained there probably till not long before the Jamestown settlement in 1607, doubtless intermarrying considerably; then the priests or medicine-men had urged "Powhatan" to kill them — probably from jealousy of the influence their superior intelligence gave them — and all had been murdered except four men and two boys saved by one of the chiefs to work his copper-mines, and a "young maid" saved probably for a wife, who may have been Virginia Dare. The latter escaped up the Chowan, and her ultimate fate is unknown; the boys seem to have died or been killed; but the men were taken westward with the small tribe to somewhere around the Neuse or the Cape Fear River in North Carolina. They or their predecessors taught the natives to build two-story stone houses, make roads, use improved agricultural methods, etc. The Huguenots found these Indians there in 1709, and noted their farms and roads, and their gray eyes, different from those of any other Indians; and the protest of a chief of some mixed-blood Indians from Robeson County, N. C., over a murder in 1864, led to an investigation which has instilled a belief that they are the descendants of the Croatan tribe and the colonists. The State has officially recognized them as "Croatan Indians," and their language is said to contain many English words. However this may be, the actual fate of the "lost colony" rests on evidence it is absurd to discredit, and on which in fact we base unquestioned conclusions as to all other early Virginian history. Consult: William Strachey, 'Travaille into Virginia' (Hakluyt Soc., Vol. VI.); Hamilton McMillan, 'Raleigh's Lost Colony' (1888); chart reprinted in Brown's 'Genesis of the United States,' where on the Neuse (apparently) is marked a place at which remained "four men clothed," who had "come from Roanoke."

Croatia, krō-ā'shē-ą, a country in the south of Europe, belonging partly to Turkey, but chiefly to Austria-Hungary. Turkish Croatia, forming the northwest extremity of Turkey in Europe, is properly included in Bosnia (q.v.), its leading features being similar. Austrian Croatia forms, with Slavonia, a crownland of Hungary. It is bounded north by Styria and Hungary; east by Hungary; south by Servia, Bosnia, and Dalmatia; and west by the Adriatic, the district of Fiume, Carniola, and Styria; total area, 16,423 square miles. A great part of Croatia is covered with mountains, forming a continuation of the Julian Alps. In the north a small branch of the Carnic Alps forms the watershed between the principal rivers, the Drave and the Save. The vine, olive, mulberry, and fig are cultivated. The south is generally infertile. The principal crops are barley and oats; and, owing to the ruggedness of the surface, the whole country is more pastoral than arable. The inhabitants are Croats, and Raitzes or Serbs, with a small admixture of other races. The chief towns are Agram (the capital), Warasdin, and Karlstadt.

Croatia was anciently inhabited by the Pannonians, who were subdued by the Romans under Augustus. In 489 A.D. it was taken possession of by the Goths, and in 640 A.D. the Croats, a tribe from Bohemia, settled in it, and gave their name to the country. About the end of the 12th century it was incorporated with Hungary, and thenceforth sent representatives to the diet; but retained, and still retains, many of its peculiar political rights and privileges. Pop. (1900), including Slavonia, 2,400,766.

Crochet, krō-shā', a species of knitting performed with a small hook of ivory, steel, or wood, the material used being woolen, cotton, or silk thread.

Crocidolite, krō-sĭd'ō-līt (Gr. "thread-stone"), a mineral composed of long, delicate fibres, and also occurring massive and earthy, and then called abriachanite. It has the formula $NaFe(SiO_3)_2.FeSiO_3$, part of the iron being frequently replaced by magnesium and calcium, and part of the sodium by hydrogen. The mineral has a hardness of 4 and a specific gravity of about 3.25. The fibrous varieties have a silky luster, and vary from blue to green. Crocidolite occurs in Griqualand West, Africa, in the Vosges Mountains of France and Germany, in Greenland, in Ontario, and in Rhode Island. The South African varieties are often altered by oxidation of the iron, and by infiltration of silica, until they are of a brown or yellow color and exhibit a chatoyant luster. Specimens of this kind are known as "tiger-eye," and, when polished, are used in the manufacture of umbrella handles and other ornamental articles.

Crocin, a coloring matter obtained from the fruit of *Gardenia grandiflora,* Chinese yellow pods, *hoang-tchy,* which is largely used in China for dyeing silk, wool, and other fabrics yellow. The color is extracted from the pods by a complex process, and forms a red powder, which is soluble in water and in spirit. By dilute acids it is decomposed into *crocetin,* which dyes a fine yellow. Crocin has been identified with an analogous body obtained from saffron.

Crocker, Charles, American capitalist: b. Troy, N. Y., 16 Sept. 1822; d. Monterey, Cal., 14 Aug. 1888. He received a common school education and went to California in 1849, where he opened a store. In 1860 he was elected to the State legislature. With Leland Stanford, Mark Hopkins, and Collis P. Huntington, he projected and completed the Union Pacific R.R. system.

Crocker, Francis Bacon, American electrician: b. New York 4 July 1861. He was graduated at Columbia University in 1882; was employed as electrical engineer in 1882–9; became vice-president of the Crocker-Wheeler Electric Company in 1888, and professor of electrical engineering in Columbia University in 1889. He was president of the American Institute of Electrical Engineers in 1897–8, of the New York Electrical Society in 1892–5; and is author of 'Practical Management of Dynamos and Motors'; 'Electric Lighting'; etc.

Crockery. See POTTERY.

Crocket, a Gothic architectural ornament, usually in imitation of curved and bent foliage, but sometimes of animals, placed on the angles or the sides of the pinnacles, canopies, gables, etc. The name is also given to one of the terminal snags on a stag's horn.

Crockett, David, American pioneer, hunter, politician, and humorist: b. Limestone, Tenn., 17 Aug. 1786; d. San Antonio, Texas, 16 March 1836. He was member of Congress from Tennessee; served in the Texan war; and was one of the eccentric characters of the southwest, about whom numerous stories are still told — notably of the coon who voluntarily agreed to "come down." He wrote his 'Autobiography' (1834); 'Tour to the North and Down East' (1835); 'Sketches and Eccentricities' (1847); etc. He was killed while defending Fort Alamo, San Antonio, against the troops of Santa Anna.

Crockett, Samuel Rutherford, Scottish novelist: b. Little Duchrae, Galloway, 24 Sept. 1862. He was educated at Edinburgh and Oxford, and entering the ministry of the Free Church of Scotland in 1886 was for several years pastor of Penicuik. A volume of verse, 'Dulce Cor,' and 'The Stickit Minister,' a volume of prose stories (1893), showed literature to be his vocation. He accordingly left the ministry and has since devoted himself to literature. His later works include: 'The Raiders' (1894); 'The Lilac Sunbonnet' (1894); 'Mad Sir Uchtred' (1894); 'The Playactress' (1894); 'Bog Myrtle and Peat' (1895); 'The Men of the Moss Hags' (1895); 'Sweetheart Travelers' (1896); 'Cleg Kelly' (1896); 'The Grey Man' (1896); 'Lad's Love' (1897); 'Lochinvar' (1897); 'Sir Toady Lion' (1897); 'The Standard Bearer' (1898); 'The Red Axe' (1898); 'The Black Douglas' (1899); 'Ione March' (1899); 'Kit Kennedy' (1899); 'Joan of the Sword Hand'; 'Little Anna Mark' (1900); 'The Stickit Minister's Wooing' (1900); 'The Silver Skull' (1900); 'Cinderella' (1901); 'Love Idylls' (1901); 'The Firebrand' (1901); 'The Dark o' the Moon' (1902).

Crockett, William Shillinglaw, Scottish clergyman and writer: b. Earlston, Berwickshire, 24 June 1866. He was educated at Edinburgh University and entering the ministry of the Kirk of Scotland has been minister of Tweedsmuir from 1894. He has published: 'Minstrelsy of the Merse'; 'The Poets and Poetry of Berwickshire' (1893); 'A Berwickshire Bard' (1897); 'In Praise of Tweed' (1899); 'Biggar: Historical, Traditional, and Descriptive' (1900); 'The Scott Country' (1902).

Crocodile, a huge reptile of the genus *Crocodilus* and order *Crocodilia*, distinguished from the other genera of the family by having the enlarged fourth lower tooth fitted into an emargination, and not a pit, in the upper jaw, the dorsal head and trunk plates not united and the nasal bones not entering the nasal canal as a septum. The bones of the head have a peculiar corroded and pitted appearance, the skin is marked into transverse rows of hard quadrate areas and in addition protected dorsally by large keeled bony scutes, and the tail is provided with a partly double crest. Although fitted for terrestrial locomotion the feet are as well adapted for aquatic life by being webbed. More remarkable adaptations for life beneath the waters are valves on the tip of the snout for closing the nostrils, external ear openings, and especially the arrangement by which the glottis fits into the internal nares, enabling the crocodile to breathe while the mouth is open and to hold a struggling animal beneath the surface until it drowns. A crocodile's stomach is constructed much like a bird's gizzard and is a receptacle for stones and other hard substances by which the food is ground. About 10 living species are known, all of which are strictly aquatic animals; three are American, an equal number African, and the remainder distributed through the Indo-Malayan and North Australian regions.

The only species which enters the United States is *C. americanus*, which is of rare occurrence in southern Florida, where it has been known to exist since 1875, but more common in the West Indies, Central and South America. Little has been written of its habits. It may be readily distinguished from the very much more abundant alligator by the longer, more slender snout with a median ridge, besides the generic characters mentioned above. The extreme length appears to be about 14 feet. Unlike the alligator it enters brackish and salt water. The African crocodile (*C. vulgaris*) is the longest and best known. It ranges throughout the continent and swarms in the waters of Madagascar and of the upper Nile, but has been exterminated in lower Egypt. Like the alligator, the crocodile is essentially a scavenger, but attacks, drowns, and devours various animals which enter the water in which it lives, not excepting full grown cattle, or even man, especially after nightfall. It is said that, like the tiger, the crocodile acquires a taste for and prefers human flesh, a fact which is well brought out in Kipling's tale of the Indian Mugger. Crocodiles construct dens in the river banks above the water level, which they enter by means of long burrows opening beneath the water; they are used as retreats in case of danger, and in which to devour their prey. Numerous eggs are deposited in a hole or nest in dry earth, the mother remaining near to guard them, a point in which as, indeed, in most of its habits the crocodile resembles our well-known alligator (q.v.). In one of its associates, however, it is unique. A species of leech (*Timnatis nilotica*) infests the great saurian's mouth, which is said to be habitually entered by a plover-like bird for the purpose of feeding upon the parasites. It is not clear to just what species of bird this habit is to be attributed, but most ornithologists consider it to be *Pluvianus ægyptius*. The Egyptian crocodile was anciently the object of elaborate worship, possibly, as was suggested by Eusebius, because it appeared in greatest numbers at the time of the flooding of the Nile; hence it was connected with the fertility of the soil, was cared for by the priests, and in many cases embalmed after death. Curiously enough other inhabitants of the same country at the same period were mortal enemies of the crocodiles, in the section where they were a pest and did not merely appear at the time of the floods. Now they figure as divinities of the crops and again as malign spirits, typical of death and darkness, slain by Horus.

Crocodile-bird, or **Nile-bird,** the *Pluvianus ægyptius*, a black-headed plover that takes its name from its habit of devouring the insect parasites found upon the Egyptian crocodile. It answers to the description of the trochilos mentioned by ancient writers.

Crocodiles, Fossil. Crocodiles are a very ancient group of reptiles, and were much more

abundant and widespread in former geological periods, when the climate was more tropical than it is to-day. They have changed comparatively little in external appearance from the beginning of the Age of Reptiles until now, and the bony plates over the head and back were from the first characteristic of them. The most ancient crocodilian animals were the *Belodontia* (see BELODON) of the Triassic Period, partly intermediate between crocodiles and dinosaurs and with many archaic characters. In the succeeding Jurassic Period flourish primitive marine and fresh-water crocodiles (*Teleosaurus, Bemissartia, Goniopholis*), in which the vertibræ were bi-concave instead of convexo-concave, as in true crocodiles. In the later Cretaceous and Tertiary Periods true crocodiles were abundant, their range extending much farther north than it does now. They are found in the New Jersey greensands, in the Bad Lands of western United States and Canada, and in various parts of northern and central Europe, and their distribution was probably world-wide and not restricted, as now, to tropical or sub-tropical regions. W. D. MATTHEW.

Crocoite, native chromate of lead, $PbCrO_4$. Crocoite crystallizes in prismatic forms belonging to the monoclinic system, and also occurs in granular and columnar forms. It is scarlet red in color, and translucent, with an adamantine luster. It has a hardness of from 2.5 to 3, and a specific gravity of about 6. It was in this mineral that Vauqelin discovered the element chromium in 1797. Crocoite occurs in the Ural Mountains, also in Brazil and in small quantities in Hungary, the island of Luzon, and in Maricopa County, Arizona. Tasmania is by far the most important locality, having produced many specimens which rank among the finest mineral specimens known.

Crocus, in mythology, a youth who was enamored of the nymph Smilax, and changed into the flower of the name of crocus.

Crocus, a genus of perennial herbs of the natural order *Iridaceæ*. It includes about 70 species characterized by corms, showy, long, funnel-shaped, erect, sometimes fragrant flowers of six nearly equal segments, three stamens, and a subterranean three-celled ovary containing numerous nearly globular seeds. They blossom in autumn or early spring, the spring species being most widely known, and valued for their diversely colored flowers, the ease with which they are cultivated and the cheapness of the corms, commonly called bulbs. The corms are planted about three inches deep in any good garden soil in autumn, and allowed to remain for several years, when, owing to the formation of the new corms above the old ones, the plants are in danger of becoming uncovered. The little corms which have been developed by the old ones are separated, stored in a dry place until autumn, and replanted. They are often planted in lawns, but must there be frequently renewed, because in two or three years the grass chokes them. *C. sativus* yields the formerly well-known dye, saffron, which was prepared from the dried stamens. This coloring-matter has been largely replaced by aniline dyes. About 30 species are cultivated in American gardens and greenhouses. Consult: Bailey, 'Cyclopedia of American Horticulture' (New York 1900–2).

Cro'cus, a polishing powder composed of oxide of iron and prepared by calcining ferrous sulphate. Crocus is purplish in color, and differs from rouge chiefly in its comparative coarseness. (Formerly called "crocus of Mars," or "crocus Martis astringens.")

Croes, John, American Protestant Episcopal bishop: b. Elizabethtown, N. J., 1 July 1762; d. New Brunswick, N. J., 30 July 1830. He served in the American army throughout the Revolutionary War; was ordained in the Protestant Episcopal Church in 1790; and held charges in New Jersey. He conducted a classical school for a number of years; was elected bishop of Connecticut in June 1815, and of New Jersey in August of the same year, and accepting the latter election was consecrated in November following.

Croes, John James Robertson, American civil engineer: b. Richmond, Va., 5 Nov. 1834. He was graduated at the College of St. James, Maryland, in 1854; and was engaged as civil engineer, principally in hydraulic and sanitary work, after 1856. He was engaged in the waterwork construction in New York, Brooklyn, and Washington; became an expert on the problem of water-supply, sewerage, waterworks, and water power valuation, irrigation, and rapid transit in cities; and has written numerous articles on engineering subjects.

Crœsus, king of Lydia. He succeeded his father, Alyattes, 560 B.C. The territory governed by him included nearly all of Asia Minor. His riches, obtained chiefly from mines and the gold dust of the river Pactolus, were greater than those of any king before him, so that his wealth became proverbial. Proud of his treasures, he carried his love of splendor to extravagance, and thought himself the happiest of men. The legend says that, vain of his wealth, he asked the philosoper Solon what he thought of his good fortune: "I pronounce no man fortunate until his death," was the sage's reply. Subsequently Crœsus was made prisoner by Cyrus, king of Persia. When bound to the stake and about to be burned to death, he recalled the words of Solon, and thrice repeated his name. Cyrus demanded an explanation. Crœsus gave it, and Cyrus not only spared his life, but also took him into his favor and protection. At the death of Cyrus he recommended Crœsus to the favor of Cambyses.

Crof'fut, William Augustus, American prose writer and poet: b. Redding, Conn., 29 Jan. 1835. He has been connected with various leading newspapers, and has published: 'A Helping Hand' (1861); 'A Midsummer Lark' (1882); 'Bourbon Ballads' (1880); 'The Folks Next Door' (1892); 'The Vanderbilts' (1886); 'The Prophecy and Other Poems' (1893); etc. He has long been connected with the United States Geological Survey.

Crof'ters, a term applied in Scotland to a species of small farmers, the occupiers of small pieces of land, from which they derive their livelihood, or great part of it, by cultivation or rearing and grazing cattle. Crofters are numerous in the Highlands and Western Islands of Scotland, and they live for the most part in townships, each with his own piece of arable land, but with a joint tenancy in mountain pas-

ture. From some districts, in recent times, they have been summarily removed to make room for sheep farms and deer forests, so that they are now chiefly congregated on the seashore, where they are able to maintain themselves in part by fishing, and generally eke out a precarious existence. They have often complained of many grievances, such as high rents, want of compensation for disturbance, small holdings, excessive local rates, and want of harbors and railways. Under the Crofters Act (1886) some of these hardships have been removed, and great reductions of rent granted. This act is applicable only to the counties of Argyle, Sutherland, Inverness, Caithness, Ross and Cromarty, and Orkney and Shetland, where there are estimated to be 40,000 families of the crofter class. There are crofters to some extent also in other counties, but generally these seem to be in more favorable circumstances.

Croghan, George, American military officer: b. near Louisville, Ky., 15 Nov. 1791; d. New Orleans 8 Jan. 1849. He was graduated at William and Mary College in 1810, and greatly distinguished himself at the defense of Fort Meigs and Fort Stephenson in 1813, receiving a gold medal from Congress.

Croker, B. M. (SHEPPARD), English novelist. She married Lieut.-Col. John Croker of the Royal Munster Fusiliers, and spent 14 years in India and Burma. Her writings include 'Proper Pride' (1882); 'Pretty Miss Neville' (1883); 'Some One Else' (1884); 'A Bird of Passage' (1886); 'Diana Barrington' (1888); 'Two Masters' (1890); 'Interference' (1891); 'A Family Likeness' (1892); 'Mr. Jervis' (1894); 'Village Tales and Jungle Tragedies' (1894); 'Married or Single' (1895); 'The Real Lady Hilda' (1895); 'In the Kingdom of Kerry' (1896); 'Beyond the Pale' (1897); 'Miss Balmaine's Past' (1898); 'Terence' (1899); 'A State Secret' (1901); and 'Angel' (1901).

Croker, John Wilson, Irish miscellaneous writer: b. Galway 20 Dec. 1780; d. Hampton 10 Aug. 1857. His capacity for satire revealed itself in 'An Intercepted Letter from Canton,' and his 'Songs of Trafalgar' spread his fame as a poet. Macaulay's review of his edition of Boswell's 'Life of Johnson,' and his counterblast upon Macaulay's 'History of England,' are among the celebrities of literary duels. He was a Tory politician of intense fervor, permanently resigning his seat in Parliament because of the passage of the Reform Bill of 1832.

Croker, Richard, American politician: b. Black Rock, Ireland, 24 Nov. 1843. He came to the United States in early life, was alderman of New York three times, and in 1889–90 was city chamberlain. He became prominent in politics during the scandal of the Tweed ring, whose schemes he vigorously opposed; was for several years at the head of Tammany Hall; and was long the Democratic dictator of New York State and city. In 1902 he took up permanent residence at Wantage, England.

Croll, krōl, **James,** Scottish geologist: b. Little Whitefield, Perthshire, 1821; d. Perth 15 Dec. 1890. In 1859 he was appointed keeper of the museum in the institution known as Anderson's University, Glasgow, a position which he occupied till his appointment to a minor post in the Geological Survey of Scotland in 1867. His writings include 'The Philosophy of Theism' (1857); 'Climate and Time in their Geological Relations' (1875), perhaps his ablest work; 'Discussions on Climate and Cosmology' (1886); 'Stellar Evolution' (1889); 'The Philosophical Basis of Evolution' (1890).

Crollius, Oswald, German chemist: b. Wetter, Oberhessen, about 1580; d. 1609. He is now remembered as the author of a work entitled, 'Basilica Chymica,' which appeared at Frankfort in 1609, and went through 18 editions, was translated into French, into German, and by Richard Russell into English, under the title of 'Royal and Practical Chymistry' (London 1670). This is a remarkable mixture of speculative ideas about the action of chemical substances in different diseases, and practical skill in the preparation of the substances themselves. Crollius was obviously quite familiar with the details of the processes he describes, although they sometimes would, sometimes would not yield the bodies he intended, and although he was of course ignorant of the true composition of many of them. By his manipulative skill he discovered new preparations, which he introduced into medicine, and which still remain, and this practical ability seems to have given weight to his therapeutic theories.

Croly, krō'lĭ, **David Goodman,** American journalist: b. New York 3 Nov. 1829; d. New York 29 April 1889. He was educated at the University of New York; was reporter on New York papers in 1855–8; city and managing editor of the New York *World* in 1860–72, and editor of the New York *Daily Graphic* until 1878. He foretold the financial panic of 1873, naming the firm of Jay Cooke & Company as the first to fail. His publications include a 'History of Reconstruction' (1868); 'Primer of Positivism' (1876); etc.

Croly, George, Irish author and clergyman: b. Dublin August 1780; d. London 24 Nov. 1860. He was educated at Trinity College, in his native city, took orders in 1804, and in 1810 went to London, where in 1834 he became rector of St. Stephen's, Walbrook. Between 1817 and 1858 Croly published some 40 works — the best known being the romance of 'Salathiel,' reprinted in New York in 1901 under the title 'Tarry Thou Till I Come' and obtaining a new lease of popularity. He was a poet of some note, two volumes of his verse appearing in 1830.

Croly, Jane Cunningham ("JENNIE JUNE"), American writer: b. Market Harborough, England, 19 Dec. 1831; d. New York 23 Dec. 1901. She removed to New York in 1841, and in 1856 married D. G. Croly (q.v.). She was editor of 'Demorest's Magazine' 1860–87, and of other periodicals. She was one of the founders of "Sorosis" and its president for 14 years, and one of the most active promoters of the Federation of Women's Clubs. She published: 'Talks on Women's Topics' (1863); 'For Better or Worse' (1875); 'Three Manuals for Work' (1885–9); 'History of the Woman's Club Movement in America' (1900), etc.

Cromarty, Scotland, a small county in the north, formerly consisting of 14 detached portions scattered over the county of Ross, with

which county it is now entirely incorporated. The total area was about 220,800 acres. This singularly awkward county was formed at the request of an Earl of Cromarty, who desired that one county might contain all his lands wherever situated.

Cromarty Firth, a long, narrow inlet of the sea running into the united county of Ross and Cromarty in a southwesterly direction, and having a length of about 18 miles, and an average breadth of two to five miles. Its entrance from the Moray Firth, between two bluff-wooded headlands called the Sutors of Cromarty, is about a mile wide, with 30 to 40 fathoms water. Being completely landlocked it affords excellent shelter for shipping, and is often crowded in stormy weather. At its upper end it receives the river Conan, and this portion of the firth is shallow, several square miles of mud-flats being laid bare at low-water. On its shores are the towns of Cromarty, Invergordon, and Dingwall.

Cromcruach, or **Cromchruach,** the name of an idol worshipped by the people of Ireland before the introduction of Christianity. It was a gold or silver image surrounded by 12 small images.

Crome, John, English landscape painter: b. Norwich 22 Dec. 1768; d. there 22 April 1821. His school education was very scanty, but after some struggle he succeeded in getting established as a drawing-master. In 1805 he founded the Norwich Society of Artists, of which he became president as well as chief contributor to its annual exhibitions. Some of his pictures are: 'Mousehold Heath'; 'View of Chapel Fields, Norwich'; 'Carrow Abbey'; and 'Clump of Trees.' He excelled in depicting the scenery of his native county, and especially in his handling of trees; and his high place among British landscape painters is now universally acknowledged. He also practised etching with great success. He is sometimes called "Old Crome," to distinguish him from his son, Bernay Crome, also an artist.

Cromer, Viscount. See BARING, SIR EVELYN.

Cromlech, krŏm'lĕk, the name given to a kind of ancient sepulchral monument, numbers of which have been found in all parts of the British Islands, as well as on the continent of Europe, in Asia, and in America. A cromlech consists of three or more columns of unhewn stone supporting a large tabular block so as to form with it a rectangular chamber, beneath the floor of which is generally found a sepulchral chamber or cist enclosing a skeleton, with arms, stone implements, and other ancient relics. Sometimes the cromlech was encircled by a ring of standing stones, as is seen in the case of the Standing-stones of Stennis, in Orkney; and sometimes it was itself buried beneath a large mound of earth. Among the most remarkable cromlechs in England are those known as Kit's Coty House, near Aylesford, in Kent, consisting of three upright stones with a very large flat one above them; the cromlech of Chun Quoit, in Cornwall, the capstone of which is calculated to weigh 20 tons; and two cromlechs standing beside each other at Plas Newydd in Anglesey. Among cromlechs in Scotland we may mention one near Craigmaddie House, Stirlingshire, known as the Auld Wives' Lifts, remarkable for being a complete cromlech consisting of three stones only; and a partially ruined one at Bonnington Mains, near Edinburgh, called the Witch's Stone, the capstone of which measures 11½ feet long, and 10½ feet in greatest breadth. The term cromlech is supposed by Prof. Daniel Wilson to be derived from *cromadh* (Gaelic) or *cromen* (Welsh), signifying a roof or vault, and *clach* or *lech,* a stone, and would therefore mean the suspended or vaulted stone. See DOLMEN.

Crommelin, krŏm-mĕ-lăn, **May de la Cherois,** shā-rwä, Irish novelist: b. in Ireland, the descendant of a Huguenot founder of the Ulster linen trade. She has traveled very extensively, and is the author of: 'Queenie'; 'My Love, She's But a Lassie'; 'A Jewel of a Girl'; 'Black Abbey'; 'Miss Daisy Dimity'; 'Orange Lily'; 'Joy'; 'In the West Country'; 'Brown Eyes'; 'Goblin Gold'; 'Violet Vivian, M. F. H.'; 'For the Sake of the Family'; 'Love Knots'; 'Dead Men's Dollars'; 'Bay Ronald'; 'Dust Before the Wind'; 'Over the Andes,' a volume of travel; 'Half Round the World for a Husband'; 'Divil-May-Care'; 'Kinsah, a daughter of Tangier'; 'Bettina'; 'The Luck of a Lowland Laddie'; 'A Woman Derelict.' Her novels have circulated extensively in the United States.

Crompton, Samuel, English inventor: b. Firwood, near Bolton, 3 Dec. 1753; d. Bolton 26 June 1827. He early displayed a turn for mechanics, and when only 21 years of age invented the machine for spinning cotton which is now constantly associated with his name, and was called a mule, from its combining the principles of Hargreave's spinning jenny and Arkwright's roller-frame, both of which had been invented a few years previously. The mule shared in the odium excited among the Lancashire hand weavers against these machines, and for a time Crompton was obliged to take his invention to pieces and conceal it from view. He afterward refitted it and brought it again into work; but was unfortunately unable to prevent others from appropriating the fruits of his labors, and thus, as in many similar cases, the real inventor derived little or no benefit. Various improvements were introduced from time to time on the mule, but the original principle, as devised by Crompton, remained the same. In 1812 the sum of £5,000 was voted to him by Parliament. This was almost all the remuneration which he ever received for an invention which contributed so essentially to the development of the greatness of Great Britain as a manufacturing nation. See French, 'Life and Times of Crompton' (1860).

Cromwell, Bartlett Jefferson, American naval officer: b. Georgia, 2 Feb. 1840. He was at the Naval Academy 1857–60, and is said to have been the first naval cadet appointed from Nebraska. He served on the St. Lawrence, Quaker City, and Conemaugh with the South Atlantic blockading squadron 1861–3; and with the East Gulf squadron 1863–5. He was commissioned commander 24 Oct. 1874; was inspector of ordnance 1878; on duty at Portsmouth navy yard 1882–5; League Island navy yard 1886–9; and promoted captain in March 1889. At the conclusion of the Spanish-American war he was ordered to Havana to receive the surrender of the naval station there. He became

a rear admiral 3 March 1899. Up to January 1901 he had had 16 years of sea service, and 24 of shore or other duty.

Cromwell, Henry, English soldier: b. Huntingdon, Eng., 20 Jan. 1628; d. Soham, Cambridgeshire, 23 March 1674. He was the fourth son of Oliver Cromwell, under whom he served as colonel in Ireland in 1649. He sat in Parliament in 1653 and was lord deputy of Ireland 1655–7, and lord-lieutenant 1657–9, his rule being conservative and popular. After 1659 he lived in retirement in England.

Cromwell, Oliver, lord-protector of England: b. Huntingdon 25 April 1599; d. London 3 Sept. 1658. His father was Robert Cromwell, a younger son of Sir Henry Cromwell, knighted by Queen Elizabeth; and Sir Henry again was a son of Sir Richard Williams, a nephew of Thomas Cromwell, Earl of Essex, whose name he took. Oliver's mother could trace her descent back to Alexander, lord-steward of Scotland, the founder of the house of Stuart. He entered Sidney-Sussex College, Cambridge, 23 April 1616, but left on the death of his father in 1617. In 1620, at the age of 21, he married Elizabeth, daughter of Sir James Bourchier, and settled on his estate at Huntingdon. In 1628 he was a member of Parliament for Huntingdon, and distinguished himself by his zeal against popery. On the dissolution, in 1629, he returned to Huntingdon; in 1631 he went with his family to a grazing-farm he had taken at St. Ives; and four years after, to Ely, where he had inherited a property. While in this place he successfully opposed some unjust schemes for the draining of the fens, and thereby made himself so popular with the people of the place that they gave him the title of "lord of the fens."

The storm was already at hand which was to shake the repose of England. Several of the opponents of the arbitrary measures of the government were making arrangements to embark with their families for New England. Among those already engaged in this scheme were Cromwell, Hampden, Pym, Hazelrig, and other men afterward so formidable in the Revolution; but the government forbade their emigration. At length the king was compelled, by the state of affairs in Scotland, to summon a Parliament. Cromwell, now a member for Cambridge and others were so loud in their complaints of abuses in Church and state that Charles prorogued the Parliament, but six months after, was obliged to reassemble it. In this Parliament, called the Long Parliament (from Nov. 1640 to April 1653), Cromwell attracted notice chiefly by his rustic and slovenly dress, and by the vehemence of his oratory.

On the breaking out of the war in 1642, being appointed captain, and afterward colonel, he raised a troop of horse (the "Ironsides") composed of zealous Puritans. His first military exploit was to capture the magazine of Cambridge along with the university plate. He then routed the Royalists, and made himself master of their supplies. He laid the foundation of his military fame by the relief of Gainsborough, and in October 1643, he was assailed by a greatly superior Royalist force at Winceby, but defeated it. In this action he had a horse killed under him, and was himself struck down while in the act of rising. On 3 July 1644 the battle of Marston Moor was gained by the parliamentary army, a result mainly brought about by Cromwell and his Ironsides. Cromwell also bore a distinguished part in the second battle of Newbury (27 Oct. 1644) under the Earl of Manchester. The independent party, led by Cromwell and his friends, were for pursuing the war with the utmost vigor, and in order that they might have their way determined to get the entire control of the army. In order to accomplish this, they procured the passing of the Self-denying Ordinance, prohibiting members of either house of Parliament from holding any military command, on the ground that vices and corruptions had crept into the army, that it required to be remodeled and a stricter discipline maintained. Thomas Fairfax was made lord-general in place of Essex, while Cromwell was again placed under him, with the rank of lieutenant-general. Cromwell now introduced into the whole army the excellent discipline in which he had already trained a part of it, and gained the decisive battle of Naseby (14 June 1645), in which the king was routed with great loss. The spirit in the army, which the officers, and especially Cromwell, excited by their sermons and prayers, had now risen to fanaticism; though at the same time good order and morality were so well maintained that profanity, drunkenness, robbery, and the like offenses, hardly ever occurred. After Naseby no time was lost by the parliamentary leaders in following up their success. Leicester was retaken, Taunton relieved, Bridgewater stormed, Bristol, held by Prince Rupert, was besieged and surrendered, Devizes was stormed, Winchester surrendered, Dartmouth was stormed, and finally Sir Jacob Astley, at the head of 3,000 horse, was defeated at Stow-on-the-Wold, 21 March 1646.

The Royal party was completely crushed, and Charles took refuge with the Scottish army (5 May 1646), but was soon given up by them to the Parliament, on which occasion Cromwell was one of the commissioners. When Parliament, in which the Presbyterian element predominated, wished to disband the army, headed by the Independents, the soldiers appointed a council of officers and a body of subalterns and privates called Adjutators (misspelt agitators), who declared to the Parliament that they would not lay down their arms till the freedom of the nation was established. Some of the soldiers conducted themselves so boldly that the Parliament ordered their arrest; on which occasion Cromwell not only supported the house, but deplored the seditious temper of the troops, which, he said, had even put his own life in danger. Cromwell seems at this time to have contemplated the restoration of the king, and, supported by Fairfax and others, even entered into a treaty with him, but soon discovered that Charles was not to be trusted, and that the king's success would be his destruction. Fighting now took place with the Royalist party in Wales, but Cromwell soon finished the struggle in this quarter; after which he proceeded against the Scotch, who had raised a strong army "to deliver the king from sectaries." As Fairfax, from Presbyterian scruples, declined the command of the expedition against Scotland, Cromwell undertook it. With a much inferior force he defeated them at Preston (17 Aug.

1648), and was received in Edinburgh as a deliverer. Now followed the tragedy of the king's execution, 29 Jan. 1649. Cromwell's name stood third in order in the death-warrant, and though he may have been impelled to the step by the force of circumstances and by his knowledge of the king's faithlessness, there is no reason to suppose that he regretted the share he took in the death of the king, or thought that he was unjustly punished. Affairs in Ireland now demanded his presence, and having been appointed lord-lieutenant and commander-in-chief, he joined the troops there in August 1649. He took Drogheda by storm (September 1649), where he gave orders that nothing should be spared. Most of the cities opened their gates without resistance, and within six months the Royalist party in Ireland was wholly crushed.

Resigning the command to Ireton, he now undertook, at the request of the Parliament, a similar expedition against Scotland, where Prince Charles, afterward Charles II., had been proclaimed king. The victory at Dunbar, 3 Sept. 1650, rid the fortunate general of his enemies, the Presbyterians. Meanwhile Prince Charles had collected new forces; but Cromwell, by skilful marches near Stirling, cut him off from his points of support, when, contrary to his expectation, the prince entered England, and threatened the metropolis itself. Cromwell hastened after the Scottish troops into England. Charles was totally defeated at Worcester 3 Sept. 1651, and this victory, which Cromwell called the crowning mercy of God, gave the commonwealth party full power over three kingdoms. Cromwell already exerted a weighty influence on the supreme direction of public affairs. He succeeded in restoring the continental relations of England, which had been almost entirely dissolved, and regulated them so as to promote the interests of commerce. The Navigation Act, from which may be dated the rise of the naval power of England, was framed upon his suggestion, and passed in 1651. Meantime the Long Parliament, aiming to establish its own power, was growing more and more unpopular, in consequence of its undisguised tyranny, the war which it had provoked with the Dutch, and its treatment of the prisoners taken at Worcester, some of whom were put to death in prison, and others sold for slaves in the colonies. Cromwell now spoke openly to his friends of the ambition, the godlessness, and injustice of the Parliament. Encouraged by their support he, with 300 soldiers, dispersed that body 20 April 1653. He then summoned a council of state consisting mainly of his principal officers, which finally chose a parliament of persons selected from the three kingdoms, which, from Praise-God Barebone or Barbone, one of the principal characters in it, by trade a leather seller, was nicknamed Praise-God Barebone's Parliament, another name being the Little Parliament. Cromwell opened the session with a speech, in which he said that the day was come on which the saints were to commence their reign upon earth. Fifteen months after, a new annual parliament was chosen; but after five months Cromwell prevailed on this body to place the charge of the commonwealth in his hands. The chief power now devolving again upon the council of officers (12 Dec. 1653), they declared Oliver Cromwell sole governor of the commonwealth, under the name lord-protector. The new protector behaved with dignity and firmness. With the aid of Gen. Lambert he formed a constitution called the Instrument of Government, by which the protector with his council was invested with the power of peace and war, and was to summon a parliament once every three years, the supreme legislative authority was declared to be and to reside in the lord-protector and Parliament; all commissions, patents, writs, processes, etc., were to run in the name of the lord-protector; all the forces of the kingdom were to be under the protector and Parliament during the sitting of the latter, but in the intervals of Parliament, under him and his council alone. In case of his death the council were immediately to choose a new protector; but no protector after him was to command the army. The nobles feared, the clergy hated the protector; while the people, whom he treated with equity and kindness, loved him, because they enjoyed much more liberty under him than before. The protector treated Ireland with great severity. Here, however, as in Scotland, he established an equitable form of government, which, in the course of a few generations, would have much improved the state of the island. On the whole his political administration was masterly, and adapted to the circumstances of his situation. He established large magazines of provisions; the pay of the soldiers was regularly delivered to them a month in advance; yet the public revenues were strictly and economically managed, without any additional imposts. He appointed for judges the most upright and distinguished men. He never interfered with the proceedings of the courts of justice. In religion he acted on the principle of toleration. Every man had liberty of conscience. In other things, too, Cromwell, as his own correct judgment prompted, would have governed with mildness and justice, and promoted the arts and sciences, but was obliged to maintain his power, as he had acquired it, by a severity often amounting to tyranny. The skilful and fortunate conduct of the war with Spain, from 1655 to 1658, in which Jamaica and Dunkirk were taken, made the new Parliament, from which Cromwell had carefully excluded all Republicans, so obsequious, that they at last offered him the title of king. Some individuals opposed the measure so resolutely that Cromwell, fearing the fate of Cæsar, declined the title. Parliament by an act entitled Humble Petition and Advice, gave him the title of "Highness," and the right of appointing his successor; and he was a second time solemnly invested by the speaker with the ensigns of his office. He died at Whitehall, whither he had been brought from his favorite residence, Hampton Court, and was buried in King Henry VII.'s Chapel, in Westminster Abbey. Most of the European courts went into mourning for him, even that of Versailles. After the Restoration his body was taken up and hanged at Tyburn, the head being fixed on a pole at Westminster Abbey, and the rest of the remains buried under the gallows. Great as a general, Cromwell was still greater as a civil ruler. He was abstemious, temperate, indefatigably industrious, and exact in his official duties. His exterior inspired neither love nor confidence; his figure had neither dignity nor grace: his voice was harsh; in his public speeches he

expressed himself with force and fire, but without method or taste. On the other hand, he possessed extraordinary penetration and knowledge of human nature; no one knew so well as he the art of winning men and using them to his purposes. He devised the boldest plans with a quickness equaled only by the decision and intrepidity with which he executed them. No obstacle deterred him; and he was never at a loss for expedients. Cool and reserved, but full of great projects, he patiently waited for the favorable moment, and failed not to make use of it. In his religious views he was an upright and tolerant Calvinist.

Bibliography.—Carlyle, 'Letters and Speeches of Oliver Cromwell' (1845); Foster, 'Statesmen of the Commonwealth' (1840); Guizot, 'Life of Cromwell' (1851); Gardiner, 'The Great Civil War' (1893); 'History of the Commonwealth and Protectorate' (1894–1901); 'Cromwell's Place in History' (1897), and 'Oliver Cromwell' (1901); Harrison, 'Oliver Cromwell' (1888); Firth, 'Oliver Cromwell and the Rule of the Puritans in England' (1900); Morley, 'Oliver Cromwell' (1900); Roosevelt, 'Oliver Cromwell' (1900).

Cromwell, Oliver, English solicitor: b. 1742; d. Cheshunt, Hertfordshire, 31 May 1821. He was the great-grandson of Henry Cromwell, son of the protector, and the last of his known descendants. He succeeded to the estate of Theobalds, which descended to him through the children of Richard Cromwell, eldest son of the protector. He wrote the 'Memoirs of the Protector, Oliver Cromwell, and his Sons, Richard and Henry, illustrated by Original Letters and other Family Papers' (1820).

Cromwell, Richard, lord-protector of England: b. Huntingdon 4 Oct. 1626; d. Cheshunt, Hertfordshire, 12 July 1712. He was the third son of Oliver Cromwell, and by the deaths of his two elder brothers, Robert and Oliver, became his father's heir. He was an amiable and popular but weak man, devoted to field sports and fond of pleasure. He lived for some time in comparative privacy, succeeding his father in the protectorate in September 1658. Scarcely had he entered on his office, when the forces of anarchy, both parliamentary and military, broke loose, and he found himself utterly unable to restrain them. It was probably with little reluctance that he quitted Whitehall in April 1659, and retired into private life. After the Restoration he lived for a time abroad under the name of Clark, but he returned to England about 1680, and passed the remainder of his life at Cheshunt, and was buried in the church at Hursley, Hampshire.

Cromwell, Thomas, Earl of Essex, English statesman: b. Putney, Surrey, about 1485; d. London 28 July 1540. In 1514 Wolsey made him collector of the revenues of his see of York, and nine years later he entered Parliament, where his ability soon attracted attention. In 1524 he became a member of Gray's Inn, and Wolsey now employed him in the work of suppressing the smaller monasteries. On his master's disgrace in 1529 Cromwell defended him with great spirit in the House of Commons, and effectually opposed the articles of treason brought against Wolsey. After the cardinal's death he was taken into the king's service, into which he entered with zeal, but with little consideration or regard for others. He was knighted and made a privy councilor; in 1533 was appointed chancellor of the exchequer, and in 1534 king's secretary and master of the rolls. On the abolition of the Pope's supremacy in 1534 he was created king's vicar-general, and used all his influence to promote the reformation. In 1535 he was commissioned to hold a general visitation of all the monasteries in England, in order to suppress them. In this office he acted with great severity and injustice. His services were rewarded by the situation of lord-keeper of the privy seal, and a seat in the House of Peers, with the title of Baron Cromwell of Oakham. In 1539 he became lord high chamberlain, and the following year Earl of Essex. He at length fell into disgrace with the king for the part he took in promoting his marriage with Anne of Cleves. Her person proved disagreeable to Henry, who fell in love with Catharine Howard, and partly in consequence Cromwell was arrested at the council table on a charge of treason, committed to the Tower, and a bill of attainder was passed against him. After appeals for mercy, which were disregarded by the king, he was beheaded on Tower Hill, declaring that he died in the faith of the Catholic Church. Protestantism owed much to Cromwell, as did also the English Bible (an edition of which was known by his name), yet he seems to have been never influenced by religious or moral principle, but by desire to retain the king's favor as a means of his own aggrandizement. Consult Drayton, 'Historie of the Life and Death of Lord Cromwell' (1609); Merriman, 'Life and Letters of Thomas Cromwell' (1902).

Cronje, krōn'yĕ, **Pietrus Arnoldus,** Boer military commander: b. near Pretoria 1835. He has been prominent in all the history of the South African republic. Bred to farm life, he entered politics, refused office under British annexation in 1877, commanded a brigade in the war of 1880–81, because a member of the Transvaal executive government, and captured Sir John Willoughby and his force after the Jameson raid in 1896. During the war with England in 1899–1900, Cronje rose to the military leadership of the Boers, and held out heroically with an inferior force till forced to surrender to Lord Roberts at Klip River, near Paardeberg, Orange Free State, 27 Feb. 1900, the anniversary of the battle of Majuba Hill in 1881. He was exiled to Saint Helena in May 1900.

Cronstadt. See KRONSTADT.

Cronstedt, krōn'stĕt, **Axel Frederic,** Swedish scientist: b. Stropsta Nyköping, Sweden, 23 Dec. 1702 (others say 1722); d. Stockholm 19 Aug. 1765. He was a baron, councilor of mines, and member of the Academy of Sciences at Stockholm. In 1758 he published anonymously an important work on mineralogy. He first distinguished between minerals and rocks, and made chemical composition the basis of classification in minerals, and was the first to isolate nickel. The mineral *Cronstedtite,* a silicate of iron and manganese, forming highly lustrous jet-black crystals, and found in Cornwall and elsewhere, has been named in honor of him.

Cronus, in ancient Greek mythology, a son of Uranus and Ge (Heaven and Earth), and youngest of the Titans. He received the government of the world after Uranus was de-

prived of it, and was in turn deposed by Zeus. Cronus was considered by the Romans as identical with their Saturnus. See SATURN.

Crook, George, American military officer: b. near Dayton, Ohio, 8 Sept. 1828; d. Chicago, Ill., 1 March 1890. He was graduated at the United States Military Academy in 1852, and rose to the rank of major-general. In the Civil War he greatly distinguished himself at South Mountain, Antietam, Chickamauga, and Appomattox, and after the War achieved celebrity in campaigns against the Indians as commander of the districts of Idaho and Arizona. From 1888 until his death, he commanded the military division of the Missouri.

Crooked Island, one of the Bahamas, in lat. 22° 15′ N., lon. 74° W. Area about 160 square miles. The chief product is salt.

Crooked Lake. See KEUKA LAKE.

Crooker, Joseph Henry, American Unitarian clergyman: b. Foxcroft, Maine, 8 Dec. 1850. He was graduated at Ypsilanti (Mich.) Union Seminary in 1870, and was a Baptist pastor for five years, when he entered the Unitarian ministry. He has been very successful as a pastor at Madison, Wis., 1881–91; Helena, Mont., 1891–7; and Ann Arbor, Mich., 1897. Among his publications are: 'Jesus Brought Back' (1889); 'Different New Testament Views of Jesus' (1890); 'The New Bible and Its New Uses' (1893); 'Growth of Christianity' (1897); 'Plea for Sincerity' (1898); 'Problems in American Society' (1899); 'The Supremacy of Kindness' (1899); 'The Menace to America' (1900).

Crookes, SIR William, English electrician and chemist: b. London 1832. In 1854 he became superintendent of the Meteorological Section of the Radcliffe Observatory, Oxford, and in the following year was chosen professor of chemistry at the Chester Training College. In 1863 the Royal Society elected him a Fellow, and since then many scientific bodies have conferred distinctions on him. He was knighted in 1897, and presided over the 1898 meeting of the British Association at Bristol. Prof. Crookes has made his name famous by his important researches and inventions in connection with molecular physics, radiant matter, and high vacua. One of his earliest works was 'Select Methods of Chemical Analysis' (1871). His later ones consist mainly of practical manuals, or of translations and adaptations. Among the former are 'Manufacture of Beetroot Sugar in England' (1870); 'Handbook of Dyeing and Calico-printing' (1874); and 'Dyeing and Tissue-printing' (1882). The latter include Kerl's 'Metallurgy'; Wagner's 'Chemical Technology'; Auerbach's 'Anthracen and Its Derivatives'; and Ville's 'Artificial Manures.' He is an authority on sanitation, and in this connection has written pamphlets entitled 'A Solution of the Sewage Question,' and 'The Profitable Disposal of Sewage.' In 1874 he published his 'Researches in Modern Spiritualism,' and in the following year 'Psychic Force and Modern Spiritualism,' the latter being a reply to those critics who had attacked the defense of spiritualistic beliefs contained in the earlier work.

Crookes' Tubes, sealed glass tubes or vessels, of various shapes, highly exhausted by means of efficient mercurial air-pumps, so that the residual gas that they contain is exceedingly attenuated. Such tubes manifest singular properties when the gas within them is submitted to the action of the electric discharge, by means of electrodes sealed into the glass. (See GASES, KINETIC THEORY OF; MOLECULAR THEORY; RADIATION; VACUUM.) The name refers to Sir William Crookes, the noted English physicist and chemist, who discovered many of the phenomena that high vacua exhibit.

Crookston, Minn., city and county-seat of Polk County, on Red Lake River, and on the Great Northern and Northern Pacific railroads, 300 miles northwest of Saint Paul. Crookston was first settled in 1877 by Col. Crooks, became a borough in 1880, and a city in 1882. It is a commercial centre of a fertile agricultural region, and carries on a large business in lumber, wheat, and live stock. It has four banks, with a combined capital of $225,000, and an annual business of $10,000,000. The city has a fine court-house and municipal buildings, two Roman Catholic and 12 Protestant churches, a fine High School, two large business colleges, a gymnasium, and a public library. The city government is administered under a charter which provides for a mayor and a council of 11 members, elected annually. Pop. (1903) 7,000.

Crop'sey, Jasper Francis, American artist: b. Westfield, Richmond County, N. Y., 18 Feb. 1823; d. Hastings, N. Y., 22 June 1900. Having received a few lessons in water colors, he devoted himself to landscape painting, and his third picture, a view of Greenwood Lake in New Jersey, procured his election as an associate of the American Academy of Design, of which in 1850 he became a full member. In 1847 ill health compelled him to visit Europe, where he spent three years in close study of his art. Among his most successful productions after his return to America were the 'Sibyl's Temple'; 'American Harvesting'; 'Peace'; 'War'; and 'Niagara Falls.'

Croquet, to the most scientific form of which the name ROQUE is given in America, an open-air game played with balls, mallets, and arches, either upon a closely mowed lawn or a specially prepared court. The game is substantially a revival of the old game of pall mall, which gave its name to the well-known London street. France introduced this game into Ireland and thence into England early in the 17th century, and during the 18th century it was largely neglected, but came again into favor about 1850 and was later superseded in popularity by tennis. When first introduced into the United States croquet was a simple game destitute of all opportunity for skill, but it has so developed that it is now considered by experts to be as scientific as billiards. The court upon which the most improved form of this game is now played has a hard rolled and lightly sanded surface composed of either loam or clay, the nature of this material being determined by the character of the native soil upon which the ground is built. The regulation size for the court is 36 feet by 72 feet, the angles of the rectangle being cut off by 8 foot corner pieces. This space is enclosed by heavy timbers 4 x 6 inches, which are securely spiked together about the ground and which not only serve to confine the balls to the court, but are invaluable in driv-

ing balls to some desired position in another part of the ground, and are of even more value in making carom shots as on a billiard table. A player frequently finds his ball in such a position upon commencing his turn of play that he has not a straight shot for either a ball or his arch, and at such times a carom shot is resorted to to strike or capture one of the wired balls. In order to facilitate carom or bank shots and to ensure as great accuracy as possible, use is made of rubber cushions similar to those used upon billiard tables, fitted to the inside of the border timbers, so that surprising accuracy in making caroms is attained. The balls used upon these courts are made of the finest quality of vulcanized rubber and are somewhat expensive. These are very carefully made and must conform to a regulation size of 3¼ inches. The wickets, 10 in number, are made of ⅜ or 7-16 inch finest steel rod and are arched at the top, so as to leave, when bent, a distance between wires of 3½ inches in all of the arches except the centre or "cage," as it is called, where only 3⅜ inches is left. It can readily be seen that a ball having a diameter of 3¼ inches must be almost directly in front of, and in close proximity to, a wicket of 3½ or 3⅜ inches in width in order to successfully pass through. To ensure rigidity and to prevent spreading, the wickets after they are bent are driven into heavy wooden blocks 4 x 8 x 18 inches, across the top of which steel plates, properly drilled to fit the arches, have been bolted. The blocks are then buried under the ground, so that the arch stands between 8 and 9 inches above the surface. The stakes, which are located at the starting and turning points in the game, are 1½ inches high and 1 inch in diameter. The mallets, which range in price from $5 to $20, are very carefully made, usually to order. Their dimensions and weights vary according to individual taste, but the average sizes are: Length of handle, 10 inches; length of head, 7½ inches; diameter of head, 2 or 2¼ inches. The average weight is about two pounds. The ends or faces of the mallet heads are protected by heavy steel or brass ferules, and the faces themselves are made of either ivory or vulcanized rubber, in the one end, and soft rubber in the other, the latter being used for making certain shots which are impossible with the hard end.

While the old game croquet was, and, in fact, is still played by any number of persons up to eight, roque as played to-day contemplates the participation of but two players in a game, each of whom uses two balls, playing them as partners against the opposing two of the adversary. The object of the game is to play by stroke of the mallet through all of the arches, with both balls in order, by any number of turns or plays, and finally putting both partner balls out by making them strike successively the home stake. The player who succeeds in doing this first is the winner. While advancement of one's own balls is of course of primary importance, hardly less important is the ability to retard the progress of one's opponent. This is often done by shooting the next playing ball into or behind an arch, so that upon the opponent's beginning his turn, but little chance for him to advance presents itself.

Croquet tournaments are held at stated intervals at Wimbledon, England, and attract considerable attention in that country, but although challenges have been sent to the United States by some of the representative players of England, international matches have never been arranged, owing largely to the difficulty of unifying certain differences in play. The greatest of these is possibly the fact that the Englishmen play upon grass, while in the United States all championships are contested for upon dirt or clay courts.

The principal clubs of the United States are federated into the National Roque Association of America, which was organized in New York in 1882, under the name of the National American Croquet Association, which name was subsequently changed to the present one. The headquarters of the association are at Norwich, Conn., where there are eight first-class courts and a spacious and attractive club-house, in which on the Tuesday following the third Monday in August the association holds its annual meetings. During the remainder of the week the annual championship contests are held to determine the champion for the next year. There are more than two dozen clubs comprising the National Association, the more prominent being located in the following cities: Washington, Philadelphia, New Brunswick, Troy, Norwich, Middletown, New London, Chicago, Cleveland, Providence, Springfield, Asbury Grove, and Martha's Vineyard.

W. H. WAHLEY.

Crosby, Alpheus, American educator: b. Sandwich, N. H., 13 Oct. 1810; d. Salem, Mass., 17 April 1874. He was graduated at Dartmouth College 1827; was professor of Latin and Greek there 1833–7, and of Greek alone for nearly 20 years thereafter. In 1854 he was appointed agent of the Massachusetts Board of Education, and in 1857 became principal of the Salem Normal School, remaining such until 1865. He published several Greek and other text-books, the best of which by far were the 'Greek Grammar' (1858); and 'A Compendious Grammar of the Greek Language' (1871).

Crosby, Ernest Howard, American social reformer: b. New York 4 Nov. 1856. He is a son of Howard Crosby (q.v.) and was educated at the University of New York. He practised law in his native city 1878–89, and has since given his attention mainly to matters connected with social reform. He is the author of 'Plain Talk in Psalm and Parable' (1899); 'War Echoes'; 'Captain Jinks: Hero' (1902).

Crosby, Frances Jane Van Alstyne, American hymn writer: b. Southeast, N. Y., 24 March 1820. She became blind at the age of six months; entered the New York Institute for the Blind 1839, and was a teacher of English and history there 1847–58, when she married Alexander Van Alstyne, a blind music teacher. She has written more than 3,000 hymns, many of which have become perennially popular, and powerful aids in evangelistic work. Publications: 'The Blind Girl, and Other Poems' (1844); 'Monterey and Other Poems' (1849); 'A Wreath of Columbia's Flowers' (1858); 'Bells at Evening, and Other Poems' (1898). Of her hymns perhaps the best known are: 'Safe in the Arms of Jesus,' and 'Jesus the Water of Life Will Give.' Most of the popular ones are included in Moody and Sankey's 'Gospel Hymns,' and Sankey's 'Sacred Songs

and Solos.' Among her songs may be mentioned 'There's Music in the Air' and 'Hazel Dell.'

Crosby, Howard, American Presbyterian clergyman and scholar: b. New York 27 Feb. 1826; d. there 29 March 1891. He was graduated at the University of the City of New York in 1844, and six years later became professor of Greek there. In 1863 he was made pastor of the Fourth Avenue Presbyterian Church in New York, and thereafter was frequently a delegate to the Presbyterian General Assembly and was once its moderator. He was chancellor of the University of New York 1870–81, and a member of the American committee of revisers of the New Testament. He published: 'Lands of the Moslem' (1850); an edition of the 'Œdipus Tyrannus' (1851); 'Life of Jesus' (1871); 'Commentary on the New Testament' (1885); 'Bible View of the Jewish Church' (1888); 'The Seven Churches of Asia' (1890); etc.

Crosby, John Schuyler, American soldier: b. Watervliet, Albany County, N. Y., 19 Sept. 1839. He is a lineal descendant of the Floyds and Schuylers of the Revolutionary period. He was personal aide-de-camp to Gen. Phil Sheridan for five years during and following the Civil War, and was brevetted several times for gallantry in getting despatches through to Admiral Farragut and others, retiring from the army in 1871 as colonel. As adjutant-general of the expeditions against hostile Indians by Gens. Sheridan, Custer, and others, he did much for peace in the disturbed West, representing the government in many conferences with Indians. In 1876 he was awarded a gold medal by Congress for saving life at sea. He was appointed consul to Florence, Italy, that same year, was territorial governor of Montana 1882-4, and first assistant postmaster-general of the United States 1883–6. Since then he has served as school commissioner of the city of New York, etc., and continues prominent in Republican politics. He is a popular orator and after-dinner speaker.

Crosby, Peirce, American naval officer: b. near Chester, Pa., 16 Jan. 1823; d. Washington, D. C., 15 June 1899. He entered the navy as midshipman in 1838, and during the Mexican war served on the Decatur and Petrel. In the spring and summer of 1861 he served in Chesapeake Bay, performing important service, and before the naval attack on forts Hatteras and Clark he superintended the landing of troops. The next year he commanded the gunboat Pinola and joining Farragut's gulf squadron, cooperated with the Itasca in breaking through the chain barrier across the Mississippi at forts Jackson and St. Philip; participated in the capture of New Orleans, and in the bombardment, passage, and repassage of the Vicksburg batteries; commanded the Metacomet (1864–5), blockading Galveston, Texas, and participated in the attack on Mobile. After the war he was commandant at various navy yards; became commodore in 1874, and rear-admiral in 1882. He commanded the South Atlantic station 1882, and Asiatic station 1883, and was retired at his own request in October 1883.

Crosby, William Otis, American geologist: b. Washington County, Ohio, 14 Jan. 1850. He was graduated at the Massachusetts Institute of Technology 1876, and has been a member of its faculty since 1883, his present position (1903) being associate professor of geology. His publications include: 'Report on the Geological Map of Massachusetts' (1876); 'Native Bitumens, and the Pitch Lake of Trinidad' (1879); 'Contributions to the Geology of Eastern Massachusetts' (1880); 'Common Minerals and Rocks' (1881; new ed. 1886); 'Dynamical and Structural Geology'; and many papers relating to his specialty.

Crosier, the pastoral staff of a bishop, symbol of his authority over his flock and of his guard over them to save them from ravage by the wolves. It is curved or crooked at the top and pointed at the lower end; and a mediæval hexameter verse indicates the significations of the staff, its crook and its sharpened lower end: *Curva trahit quos dextra regit, pars ultima pungit* — the crooked end gathers in (the lambs or sheep) that the right hand with the staff guides, the lowest part pierces — kills the wolf. The bishop of Rome alone of all bishops bears no crosier.

Crosman, Henrietta, American actress: b. Wheeling, W. Va., 2 Sept. 1870. In 1897 she was married to Maurice Campbell. She went on the stage in 1889, in Bartley Campbell's 'White Slave' Company, and in 1892–4 was Charles Frohman's leading woman. Her career as a star began under the management of her husband, Maurice Campbell, in Bronson Howard's 'One of Our Girls'; and on 9 Oct. 1900 she produced Hazleton's 'Mistress Nell' at the New York Bijou Theatre.

Cross, Charles Robert, American physicist: b. Troy, N. Y., 29 March 1848. He graduated at the Massachusetts Institute of Technology 1870, and has taught in its physical department ever since, being at the present time (1903) Thayer professor of physics, and director of the Rogers laboratory. In 1882 he established one of the first courses of electrical engineering ever given in this country, and has been in charge of it ever since. Most of his scientific papers have been published in the 'Proceedings' of the American Academy of Arts and Sciences. He is the author of the text-books: 'Course in Elementary Physics' (1873); and 'Lecture Notes on Mechanics and Optics' (1884).

Cross, Mrs. George Frederick. See CAMBRIDGE, ADA.

Cross, Mary Ann Evans. See ELIOT, GEORGE.

Cross, Wilbur Lucius, American educator: b. Mansfield, Conn., 10 April 1862. He was graduated at Yale 1885; was instructor in English in the Sheffield Scientific School 1894–7; and has been professor there from 1897. He has published: 'Development of the English Novel' (1899); and an annotated edition of 'Macbeth' (1900).

Cross, the gibbet on which Christ died; the cross was from the early days of the Church a usual emblem of Christian faith and hope, and the first Christians were wont to show great respect to its representations, with St. Paul "glorying in the cross of our Lord Jesus Christ." The gestural sign of the cross was in general use among them, so that in the 2d century Tertullian writes: "At every step

and movement, when we go in or out, when we dress or put on our shoes, at the bath, at the table, when the lights are brought, when we go to bed, when we sit down, whatever it is that occupies us, we mark the forehead with the sign of the cross.» He tells us that the Christians were reproached with worshipping the cross. In the Catholic Church blessings and benedictions are always accompanied with the sign of the cross. The Church has an annual festival commemorative of the finding by St. Helena, mother of Constantine, of the cross upon which Christ died. Another festival is that of the Exaltation of the Cross, to commemorate a miraculous appearance of a cross in the heavens in 317 at the moment when Constantine was ordering his army for an attack on that of his rival, the emperor Maxentius. On Good Friday is practised the usage of the «Adoration of the Cross,» when the faithful humbly and reverently by kissing the crucifix express their devotion and gratitude to the author of their redemption. In church processions the cross or the crucifix is always borne in the forefront, its bearer, the crucifer, having on his right and left an acolyte bearing a lighted torch or candles.

There are many different kinds or forms of crosses, as the common or Latin cross, or *crux capitata,* ✝; St. Andrew's cross, or *crux decussata,* X; the Tau cross, or cross of St. Anthony, like the letter T; the Greek cross, or cross of St. George, ✚; the Maltese cross, formed of four arrowheads meeting at the points. Two sorts of crosses are used for the forms of churches, the Greek and the Latin. Bramante originally designed St. Peter's at Rome for a Latin cross; Michael Angelo reduced it to the proportions of the Greek cross; but Carlo Maderno again elongated it to the original dimensions of Bramante. The cathedral of St. Paul's London, is a Latin cross, with its base spread by a sort of second transept, which increases the breadth of the western front.

Market crosses are crosses which were erected in the markets or trading place to remind people to so deal with their customers as to be Christ-like. Most market-towns in England and Scotland formerly had their crosses, and many of them are still in existence. Some of the chief are those of Bristol, Chichester, Cheddar, Edinburgh, Malmesbury, and Winchester.

Cross, in heraldry, the chief of the honorable ordinaries, occupying one fifth of the field when uncharged, but one third when charged. The cross may be engrailed, invested, couped, etc., like other ordinaries. Various modified crosses are also used in heraldry, such as the cross calvary, a Latin cross on three steps; cross bottonnée or trefflée, having each end terminating in a trefoil; cross crosslet, with the four ends crossed; cross fleury, having each end capped by a fleur-de-lis; cross fourchée, with each end forked; cross moline, with the ends curved out both ways; cross patée, widening from the centre to the ends.

Cross-bearer, in the Roman Catholic Church, a functionary who carries a cross in the more solemn processions; the cross-bearer is generally a sub-deacon. See CROSS.

Cross-bow, or **Arbalist,** formerly a very common weapon for shooting, but not long used in war after the invention of firearms. It was a strong wooden or steel bow fixed to a stock, having the bowstring stretched by lever power, and shot off by the trigger fixed to the stock. All kinds of weapons in which the bow was fastened to the stock were called cross-bows, some of which were attached to wheeled supports, and drawn by horses.

Cross-examination, the questioning of a witness by the party or the counsel of the party against whom he has been called to testify.

Cross-fertilization is a term used mainly by botanists and horticulturists; and in a strict sense, applies to the fertilization of the ovules of one seedling plant by pollen from another seedling plant. In a rather loose way, it is sometimes used to refer to the cross-pollination of a flower with pollen from a different flower on the same plant, but its use in this sense is erroneous, as the act of cross-pollination in this case does not give cross-fertilization, or cross-fecundation. «Cross-fertilization,» as used by Darwin in his classical work on this subject, to quote his words, «always means a cross between distinct plants which were raised from seed and not from cuttings or bulbs.» Plants raised from cuttings or bulbs may possibly have been derived from the same seedling, and flowers fecundated with pollen from different plants thus derived would not be cross-fertilized.

In animals and man cross-fertilization means the crossing of different races or miscegenation in opposition to inbreeding. Here close- or self-fertilization, such as occurs commonly in plants, is impossible in almost all cases, as only a few animals are hermaphrodite, having both male and female organs, while this phenomenon is common in plants. In animals and man, therefore, cross-fertilization has a somewhat different meaning than when used in reference to plants. In plants, however, as in animals, if individuals of different races or species are bred together, they are said to be cross-fertilized, in contradistinction to self-fertilized.

The indefinite way in which the terms self-fertilization and cross-fertilization have been used makes it desirable to recognize a clear limitation as to their meaning. Self-fertilization should be used to mean the fertilization of an ovule by pollen from the same or a different flower on the same seedling individual; while cross-fertilization should be restricted so as to mean the fertilization of an ovule by pollen from a different seedling individual of the same strain, race, or species, or of a different strain, race, or species.

CROSS-FERTILIZATION IN PLANTS.

Methods by which cross-fertilization is accomplished.—While a knowledge of the sex distinction of animals dates from the dawn of human history, the sexuality of plants remained unknown until about two centuries ago. Experimental proof of the sexuality of plants was published for the first time by Camerarius in 1691, and only after this discovery was the function of pollen known and its necessity in seed formation recognized. The first recorded hybrid was made by Thomas Fairchild about 1711, and very careful studies of plant hybrids were published by Koelreuter in 1760. With all this accumulating knowledge of the sexuality and

crossing of plants, it is surprising that the true meaning and significance of the flower and its various adaptations to secure cross-fertilization was not perceived until Christian Conrad Sprengel completed his researches and in 1793 published his now classical work entitled, 'The Secret of Nature Discovered in the Form and Fertilization of Flowers.' Sprengel discovered the principal facts connected with the cross-pollination of flowers by insects. He recognized the true significance of honey and of bright-colored flowers, that they were but means to attract insects to the flowers and that the insects carried pollen from one plant to another and aided in securing cross-fertilization. He, however, failed to recognize that the plant derived any benefit from the cross-fertilization. It was left for Charles Darwin, the great English naturalist, to point out that certain species of flowers are entirely dependent for fertilization on the transfer of the pollen from one plant to another and that self-fertilization is in the majority of cases actually injurious, resulting in loss of vigor in the progeny. The transfer of pollen in cross-fertilized plants is generally accomplished through the agency of the wind, water, insects, or birds, and the various devices that have been adopted by the plant to secure crossing, form an interesting and inexhaustible field for study and observation.

Wind fertilized, or anemophilous flowers are those so modified as to depend upon the wind to secure cross-fertilization by carrying the pollen of one plant to the stigmas of another. Anemophilous plants are characterized by having dry and powdery pollen, which is very abundant and light and easily carried by the wind. In most cases also the pistils are large and feathery, with large, sticky stigmas, presenting an abundant surface to catch the pollen floating in the air. In wind-fertilized plants there is a great opportunity for loss of pollen and it thus becomes necessary that an abundant supply should be formed. The various pine-trees, of which there are large forests in some parts of America, are wind-fertilized and form enormous masses of pollen. In this case, the pollen grains are provided with two lateral wing-like extensions which are supposed to be of service in making the pollen lighter and easier to blow about. Several instances are recorded where the decks of vessels at sea have been covered by a rain of pollen which, in some cases, must have been carried a distance of some 400 miles. Corn, or maize, forms a familiar example of a wind-fertilized plant. The pollen is produced in great abundance in the stamens of the tassel, which forms the upper part of the stalk. When the pollen is mature the stamens protrude from the flower and the slightest jarring of the plant by the wind causes the pollen to fall in a cloud, and as the plants are grown near together, some grains are almost certain to lodge on the pistils, or silks, of the ear of another plant. The silks are long and are covered with numerous stigmatic hairs so that the opportunity for plants to catch floating pollen and be cross-fertilized, in an ordinary field where numerous plants are grown, is very great. Experiments prove that cross-pollination is so universal that it is very difficult to keep varieties of corn pure. If different varieties are grown near each other cross-fertilization is certain to occur and impure seed results. Vilmorin found by careful experiments that plants of different varieties have to be separated by at least 1,000 feet to prevent cross-fertilization, and this distance is by no means sufficient if strong winds blow over one field of corn in such a direction as to carry the pollen from it toward another field of corn. Nevertheless it is well known that a number of plants must be planted near together to insure thorough pollination. Plants standing alone at a distance from other corn plants seldom produce well-filled ears. The flowers of wind-fertilized plants are usually green, or greenish, inconspicuous, and have no odor or nectar. The flowers are ordinarily regular in form and they frequently appear before the leaves, though this is by no means universal.

Water-fertilized, or hydrophilous, plants, are those in which the pollen is transferred through the agency of water, and are not very common. Following Delphino, they may be divided into two types: the first type includes *Zostera, Posidonia,* etc., and the *Florideæ,* where the pollen is of the same specific gravity as water, and is carried here and there by water currents; the second type includes such plants as *Ruppia* and *Vallisneria,* in which the pollen is lighter than water, or is borne on a floating raft formed by the loosened flower. The peduncles of the female flowers elongate and bring them to the surface of the water where their position allows the stigma to be pollinated by the floating pollen.

By far the greatest number of plants that require cross-fertilization depend upon insects as pollen carriers, and these plants have been termed entomophilous. Such plants are characterized by the large size, showy colors, and markings of their flowers and their odor, which serve to advertise the nectar and nourishing pollen that the flower contains and thus attract insects to the flower. The insects in passing from flower to flower in search of nectar and pollen become useful to the plant by incidentally transferring pollen from one flower to the stigmas of other flowers, thus causing cross-fertilization. Flowers have in many cases become adapted to certain insects and have stamens and pistils developed in the position best suited to insure pollination when these insects visit the flowers for nectar or pollen. Many insects depend wholly, or in large part, on the nectar and pollen of flowers as food, and such insects usually visit only one kind of flower during the day and therefore carry but one kind of pollen. They work systematically, passing from one flower to another, and clearly do an enormous amount of crossing and waste less pollen than the wind or water. Some insects, like certain beetles, have smooth bodies and carry but little pollen, but many beetles, and all bees, moths, butterflies, etc., have their bodies, wings, and limbs, roughened with hairs and scales, and these collect and retain a large quantity of pollen ready to be left on the sticky stigmatic surface of the pistil of the flower when the insect rubs against it. The nectar glands of the flower are usually located in such a position that the insect in getting to them to suck the nectar must enter the flower in the best way to insure cross-pollination. Insects are greatly attracted by odors, and the flowers of many plants have a strong scent which serves to make them more attractive. The evening primrose (*Œnothera*), which opens early in the evening and is fertilized by night-flying moths, has a very strong odor, and the

same is true of many night-fertilized flowers, such as the honeysuckle (*Lonicera caprifolium*), night-blooming Cereus, etc. Night-blooming flowers which are fertilized by insects are principally white and generally more sweet-scented than day-blooming flowers. Some flowers, such as the Stapelias, are purplish or brownish, resemble decayed flesh in appearance and are carrion-scented to attract carrion flies. Certain insects are attracted by certain colors more than others. The favorite color of the honey-bee, for instance, is deep bluish-violet, while pure blue and violet are pleasing. Yellow is less sought, but is not avoided, while red is disliked and shunned. Kerner states that in the Vienna Botanical Gardens the honey-bees in great numbers visit the bluish-violet flowers of *Monarda fistulosa*, and the blue flowers of the hyssop (*Hysopus officinalis*), but avoid the scarlet flowers of the *Monarda didyma*. In some plants the involucre, or whorl of leaves below the flower, is highly colored and takes the place of the colored parts of the flower. Such is the case in some *Euphorbias* such as snow-on-the-mountain, which is nearly white, and the poinsetta (*E. pulcherrima*), in which the involucre is red. In a large number of cases the petals of large flowered species show spots or lines on the main part of the flower of different color from the main ground color of the petals. These are usually known as nectar guides and are believed to be of service in aiding insects to find the nectar.

One of the most interesting and instructive modifications to secure cross-fertilization is the formation on different plants of flowers with different lengths of stamens and styles. Sprengel noted that some plants in *Hottonia* bear only flowers whose anthers are included in the tube, but whose style is exserted; while other plants bear only flowers having short styles and long stamens, longer than the flowing tube. He was, however, unable to suggest any reason for such variations. Some plants, such as *Lythrum*, regularly show these different lengths of stamen and style. Darwin subjected the peculiar sexual relations of these plants, which he called dimorphic and trimorphic, to most careful and extensive research, crossing the different forms back and forth in various ways. The results of these researches are summarized below.

In dimorphic plants, such as *Primula* and *Linum*, two forms exist in about equal number and usually growing together. In one form the plants have flowers with a long style extending considerably beyond the short stamens, while in the other form, the position is reversed, the style being short and the stamens long. In the long-styled form the stigma is rough and furnished with long papillæ, and the pollen grains are small, while in the short-styled form the papillæ of the stigma are short and the pollen grains are larger (Fig. 3). In the trimorphic heterostyled plants of *Lythrum salicaria* three lengths of styles are formed, long-styled, mid-styled, and short-styled (Fig. 1). In each form the stamens exist in groups of two lengths corresponding to the two other lengths in which the styles occur in other plants. The longest stamens produce the largest pollen grains, the shortest stamens produce the smallest grains. When insects visit the dimorphic and trimorphic flowers, their organs become dusted with the pollen at certain heights. When they later visit other plants with other lengths of styles, this pollen will be at the exact position and height to best cause cross-fertilization. In such crossing a pistil always receives pollen from stamens of corresponding heights and the size of the pollen grain is thus proportional to the length of the style which its tube must traverse. Such crossing Darwin called legitimate. When a pistil of a dimorphic or trimorphic flower is crossed with pollen from stamens of different heights he termed it illegitimate fertilization. By very careful experiments Darwin found that only seeds produced as a result of legitimate crossing give completely normal and fertile plants. Illegitimate crossing leads to the production of progeny with all degrees of diminished sterility or even complete barrenness and give offspring which have all the characters of hybrids produced by the union of different species.

Aside from the classes above mentioned a few plants are specially adapted to cross-fertilization by small birds and snails, but such plants

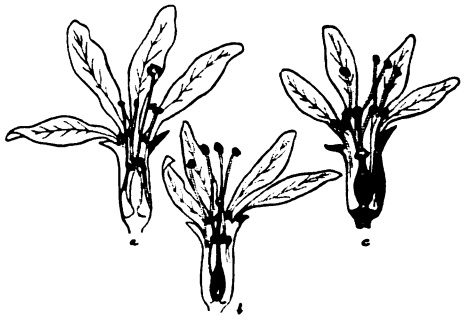

FIG. 1.— Trimorphic flower of *Lythrum salicaria* L; *a*, long-styled flower; *b*, mid-styled flower; *c*, short-styled flower; with one-third of calyx, corolla, and stamens removed in each case. (After Müller.)

are few in number and their modifications are similar to those adapted by plants which are fertilized by insects.

Prepotent Pollen.— The great majority of plants that have devices to secure cross-pollination also have some modification that insures self-fertilization. This in a way would seem to have been developed as a safeguard to insure seed development should cross-pollination fail to take place. In most cases the self-pollination takes place before or about the same time as the cross-pollination, and it would seem that in such cases where the plants are not self-sterile that a large majority of self-fertilized seeds would be formed. However, it has been found in many cases that the pollen of a different plant of the same race or species or in some cases of a different race will be prepotent over the plant's own pollen. In one instance, Darwin selected two flowers which had only recently opened on a plant of a variety of cabbage, known as "Ragged Jack," and abundantly pollinated them with pollen from the same plant. After an interval of two or three hours pollen of a different variety, known as "Early Barnes," was dusted on the stigmas of the same flowers. Under the circumstances it would seem that little effect could be expected from the pollen of the Barnes cabbage, yet 3 out of the 15 plants raised from the

seed formed by the above two flowers, showed plainly that they were hybrids.

A similar experiment was carried out by the writer with cotton. A bud of Sea Island cotton (*Gossypium barbadense*) was covered with a manila paper bag before it had opened. Early in the morning, when the flowers of cotton normally open and are pollinated, the bag was removed and the stigma abundantly dusted with pollen from the same flower, after which the bag was replaced. Cotton is abundantly self-fertile, only about 5 per cent of the flowers being normally cross-fertilized under the most favorable circumstances, so that this capsule should have set the normal number of seeds without further pollination. After four hours the bag was removed and the same stigma dusted with pollen of upland cotton (*G. herbaceum*), which belongs to a different but nearly related species. The seed of this Sea Island capsule gave five plants, of which three were clearly hybrids.

The prepotency of pollen can be easily observed where different races or varieties are concerned, but in cases where the pollen of a different plant of the same race or species is prepotent over the plant's own pollen, as is not infrequently the case, the fact is not so easy to prove. Darwin demonstrated prepotency in a number of cases of this kind, using as his guide the superiority of seedlings raised from cross-fertilized seed to those resulting from self-fertilization, which after a few experiments can be used as a fairly safe index.

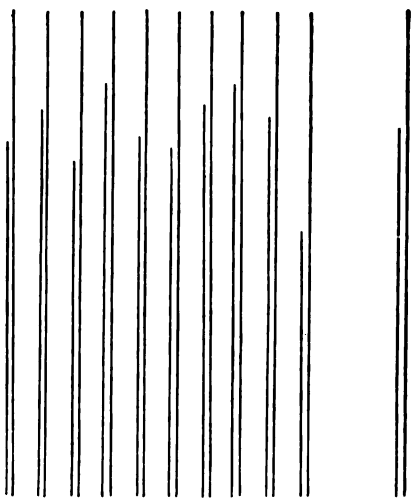

FIG. 2.— Diagram showing the mean heights of cross- and self-fertilized plants of *Ipomœa purpurea* in ten generations, the mean height of the crossed plants being taken as 100; on the right hand are shown the mean heights of the cross- and self-fertilized plants of the ten generations taken together. (After Darwin.)

Benefits of Cross-fertilization.— The benefit derived from cross-fertilization in the case of plants was first clearly brought forward through the classical treatise of Charles Darwin on "The Effects of Cross- and Self-fertilization in the Vegetable Kingdom." Sprengel at times apparently foresaw this law, but he seems never to have grasped its full significance. In one place he states "it appears that nature has not willed that one flower should be fertilized by its own pollen," yet he failed to realize that this carrying of pollen from one flower to another was of any service to the plants themselves. Knight, Koelreuter, and Herbert plainly had the main features of this law in mind, but did not recognize it as of sufficient importance to give it special attention. Darwin carried on extensive experiments to demonstrate the effect of cross- and self-fertilization in various plants and his conclusions are generally accepted to-day. His general plan of experimenting was to grow cross- and self-fertilized seed of the same plant in the same pot on opposite sides, with a partition between them. They were carefully watched and as often as one on each side germinated at the same time they were transplanted to another pot and again placed on opposite sides of a superficial partition.

The increased vigor and productiveness due to cross-fertilization may be illustrated by Darwin's experiments with the morning-glory (*Ipomœa purpurea*). The experiments were carried to the tenth generation and in each generation the height of the cross-fertilized plants greatly exceeded that of the self-fertilized plants (Fig. 2). The ratios between the average heights of cross- and self-fertilized plants in the different generations were as follows:

1st generation, as 100 to 76.
2nd generation, as 100 to 79.
3rd generation, as 100 to 68.
4th generation, as 100 to 86.
5th generation, as 100 to 75.
6th generation, as 100 to 72.
7th generation, as 100 to 81.
8th generation, as 100 to 85.
9th generation, as 100 to 79.
10th generation, as 100 to 54.

The average ratio of height during the 10 generations was 100 to 77. The same vigor and superiority of the cross-fertilized plants was also shown in all other features, such as the number of capsules and seed, constitutional vigor, etc., in fully as marked a proportion as was shown in increased height. Similar superiority of cross-fertilized over self-fertilized plants has been demonstrated to occur in *Mimulus, Digitalis, Verbascum, Papaver,* and many other plants, and the rule may be considered a general one.

Darwin's experiments with the common garden pea, however, forms an exception of some interest. Here the average height of the cross-fertilized plants was 34.62 inches and that of the self-fertilized plants 39.68 inches, or in the proportion of 100 to 115. The pea, however, is a plant which is normally self-fertilized, crossing rarely occurring. The plant has therefore become adapted to self-fertilization, and does not lose vigor as a result. The lack of vigor shown by the cross-fertilized progeny would indicate that such plants which are normally self-fertilized may have assumed this habit through some benefit derived from the self-fertilization and would thus be injured as a result of crossing. Wheat, barley, and oats, among the cereals, are almost wholly self-fertilized, crossing very seldom occurring. As a result of experiments conducted

by Professor Hays, of the Minnesota Agricultural Experiment Station, it has been shown that the artificial crossing in wheat of individuals of the same race, or of different races, almost invariably results in decreased fertility as a whole, although as a result of crossing distinct races, certain individuals with increased fertility can be selected.

It has been said by Nægeli that "the consequences of fertilization reach their optimum when a certain mean difference in the origin of the sexual cells is attained"; and by Fritz Müller, that "every plant requires, for the production of the strongest possible and most prolific progeny, a certain amount of difference between the male and female elements which unite. Fertility is diminished as well when this degree is too low (in relatives too closely related) as when it is too high (in those too little related)." Darwin says: "The offspring from the union of distinct individuals, especially if their progenitors have been subjected to very different conditions, have an immense advantage in height, weight, constitutional vigor, and fertility over the self-fertilized offspring from one of the same parents."

Attention has been called by Willis to three factors in the gain resulting from cross-fertilization, namely, *a*, fertility of mother plant; *b*, vigor of offspring; and *c*, fertility of offspring. The relative value of these factors varies with different plants. In the carnation, for instance, factor *a* of cross-fertilized plants was 9 per cent greater than in self-fertilized plants, *b* was 16 per cent greater, and *c* was 54 per cent greater; in tobacco, factor *a* was 33 per cent less than in self-fertilized plants, but factor *b* was 28 per cent greater, and factor *c* 3 per cent greater. Even when the fertility of the mother-plant is greatly reduced by hybridizing with a distinct species and the hybrids themselves are sterile or very infertile they nevertheless often show extraordinary vigor, that is, *b* is often greater in hybrids than in pure-bred plants, but factors *a* and *c* show usually less.

In plant breeding the importance of the increased vigor resulting from cross-fertilization is very great. In cases where there is no particular object in keeping the varieties pure, a marked increase in yield may be obtained by using crossed seed. The practical value of this fact is indicated by results obtained at the Illinois Experiment Station by Morrow and Gardner in crossing various races of corn. Of 15 cross-bred corns tested, 12 gave a decided increase in yield over that of the parent sorts, ranging from 2 to 86 per cent in individual cases. In three cases a decrease in yield of from 8 to 20 per cent resulted. In the 15 cases taken together an average increase in yield of about 16 per cent was secured. In some cases the cross-bred corns were grown to the second generation without crossing and showed a decidedly larger yield than the parent varieties. A number of crossing experiments of a similar nature had previously been made by McCluer with corn and practically the same results obtained. McCluer states that: "The corn grown from the crossed seed was in nearly all cases clearly increased in size as a result of crossing," and that "nearly all the corn grown a second year from the crosses is smaller than that grown the first year, though most of it is yet larger than the average size of the parent varieties."

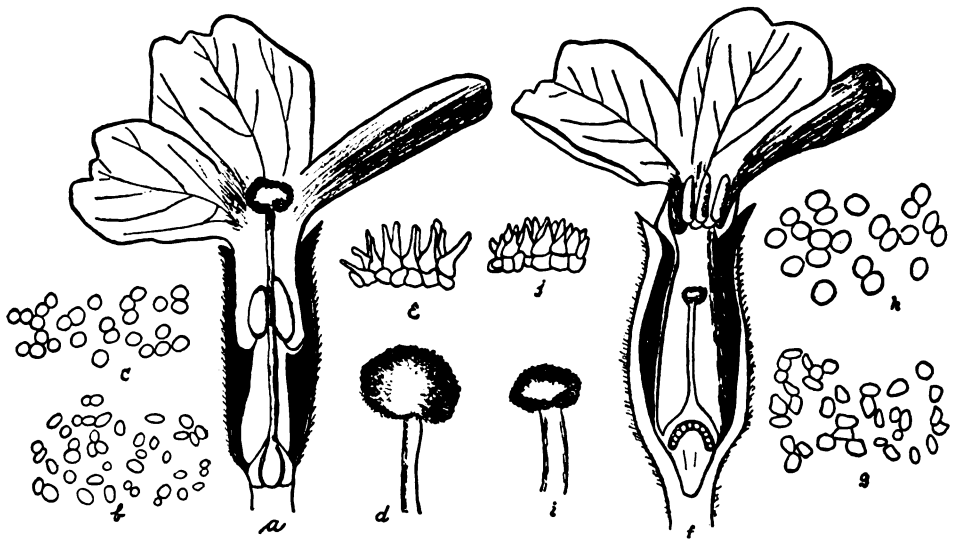

FIG. 3.— *Primula elatior*; *a–e*, long-styled flower; *f–j*, short-styled flower; *b* and *g*, pollen grains dry; *c* and *h*, pollen grains moist; *d* and *i*, stigmas; *e* and *j*, stigmatic papillæ. (After Müller.)

In maize, the loss of vigor caused by close in-breeding was found in experiments conducted by the writer, in conjunction with Mr. C. P. Hartley, to be very marked. Seeds of Hickory King, a race grown commonly in the Eastern States, produced by in-breeding with pollen of the same stalk, yielded the next year at the rate per 100 stalks of 46 ears, weighing 9⅓ pounds. Seeds of the same race, in every way comparable, but produced by crossing different seedlings, yielded under the same conditions at the rate per 100 stalks of 82 ears, weighing 27½ pounds. In

attempting to fix hybrids of Hickory King crossed with Cuzco or Peruvian corn, some ears were inbred with pollen from the stalks bearing them, while others were pollinated from other hybrid seedlings of the same parentage. The hybrids of the second generation, where the seed was inbred with pollen from the same stalk, showed great loss of vigor, being small in stature and almost totally sterile; while those produced from seed which was inbred with pollen from a different seedling were much more vigorous and productive, seeming to have lost but little by this process of inbreeding. In the majority of cases crossing distinct sorts improves the vigor and results in greatly increased yield. By selecting varieties which have increased yields uniformly when crossed and crossing these for seed corn, it seems certain that the average yield can be greatly increased. Securing seed corn from a cross of any two races desired is not a difficult or expensive process, being easily accomplished by planting the two desired sorts in alternate rows and removing the tassels, as soon as they appear, from the one to be used as the female parent. The ears that form on the rows from which the tassels have been removed will have been crossed with pollen from the variety from which the tassels have not been removed. The seed corn should therefore be selected from the ears produced on the detasseled rows. The field planted to the two varieties, as above described, to secure crossed seed should be somewhat isolated from other cornfields, and should be of sufficient size to produce the necessary quantity of seed. The only extra expense incurred in producing seed corn in this way is the cost of detasseling the alternate rows, as ears will form on both as usual.

The increased vigor and fruitfulness which almost invariably result from crossing closely related sorts or varieties is a principle of the utmost importance in our common agricultural practices, for there is a great need for more vigorous forage plants, timber and shade trees, vegetables, etc., and more prolific grains and fruits.

Self-sterile Plants.—Some plants have become so completely modified for cross-fertilization that they are sterile to their own poller and will not set seed unless cross-fertilized. Of our wild plants this has been found to be the case in a number of instances. Koelreuter and Gärtner long ago found that some plants, namely, *Verbascum phœniceum, V. nigrum,* and *Lobelia fulgens,* under certain conditions were sterile to their own pollen, but would set seed abundantly when crossed with pollen of other species. Fritz Müller proved by careful experiment that *Eschscholtzia californica, Abutilon Darwinii,* and a species of begonia were sterile to their own pollen, whether fertilized with pollen from the same flower or from different flowers on the same plant, but were perfectly fertile when cross-pollinated with pollen from other plants. Darwin found that these plants in England were also largely self-sterile, but that under certain conditions the degree of fertility with their own pollen could be greatly increased. The same phenomenon of self-sterility and necessity for cross-pollination is shown by some of our important cultivated plants. Mr. M. B. Waite has demonstrated that many of the varieties of pears, such as Bartlett, Anjou, etc., are largely self-sterile, producing few or no fruits when pollinated only with pollen of the same variety. In the case of varieties of pears and fruits of this kind that are propagated altogether by budding, as is well known, all of the various trees of the variety that exist are simply parts of the same individual, so that pollinating flowers on one Bartlett pear-tree with pollen from another Bartlett pear-tree is in effect the same as pollinating one flower on a plant with pollen from a different flower on the same plant and is what we recognize as self-fertilization. Mr. Waite and others have shown that when such sterile varieties are pollinated from a different horticultural variety, which in reality is simply a different individual of the same species, they are rendered perfectly fertile. This discovery has proved of great practical value, as many pear orchards were planted with trees of a single variety like the Bartlett and were found for some unknown cause to be very unfruitful. Waite's discovery showed the true cause of this lack of fruitfulness and at the same time pointed out the natural and simple remedy of cross-fertilization. All that remained to be done in such barren orchards was to bud some of the trees over with buds of varieties which had by experiment been found to produce a good percentage of fertility in crossing on the variety concerned. Since Waite's discovery of the reason for the barrenness of certain varieties of pears many experiments have been conducted by different investigators. It is now known as a result of experiments by Waite, Waugh, Beach, and others that many varieties of plum and apple are largely sterile to their own pollen and require cross-pollination for complete fruitfulness.

The pineapple, also, as shown by the writer's studies is an interesting example of a self-sterile plant. Ordinarily the pineapple is wholly seedless, yet the flowers are so arranged that they are abundantly fertilized with their own pollen. The self-sterility is so perfect that even under these circumstances, seeds set so rarely that few growers and consumers have ever seen seeds. In experiments in crossing various varieties it was found that when certain varieties were crossed seeds were formed in abundance, showing that cross-fertilization is necessary to insure the development of perfect seeds. The explanation for the setting of such few seeds in cultivation normally is probably to be found in the fact that the proper insect pollinators are not present, and the flowers are therefore not cross-fertilized.

CROSS-FERTILIZATION IN ANIMALS AND IN MAN.

In animals and man, as stated above, cross-fertilization means the crossing of individuals of different races or breeds in contradistinction to in-and-inbreeding in which different closely related individuals of the same race or breed are bred together. With animals as with plants, benefit results from occasional cross-fertilization, at least within certain limits. The evil effect from the closest possible inbreeding with animals, however, is not nearly so marked as in plants and in some cases its deleterious effect is hardly apparent. Inbreeding, interbreeding, or close breeding, which means the breeding together of closely related animals at rather distant or long intervals, and not every generation, seldom or never results in evil effect. It is the continuous

in-and-inbreeding of closely related individuals, generation after generation, without intermission, that is claimed by some to lead to evil effects. The opponents of in-and-inbreeding claim that it results in delicacy of constitution, predisposition to disease, lack of fecundity, etc. It must be admitted that those breeders who have used in-and-inbreeding the most, use the method as a means to an end and not because they believe primarily in any beneficial result of in-and-inbreeding in itself. As a result of long experience in the fixation of desirable characters it has been found that this is the surest and best way to render a character prepotent. It is used, therefore, as a means of strengthening the transmitting power or prepotency of a character, which otherwise in most instances would be lost. Miles states that "From a careful examination of the pedigrees . . . that may be found in the herd books and breeding-registers, representing the practice of breeders of acknowledged reputation, it will be found that in-and-inbreeding has only been resorted to in the case of some favorite animal or animals that were superior in certain respects to the average members of the herd or family which they represent, and the object has evidently been to secure in the offspring a predominance of their most highly valued characters." In most instances the older original character is more strongly hereditary and it is only by in-and-inbreeding that a new character can be rendered stable and prepotent and prevented from being swamped and lost. Such new characters in some cases have by this means been so strengthened that they dominate even the original and older characters. In regard to the belief that in-and-inbreeding leads to sterility and predisposition to disease, a careful consideration of the evidence at command leaves the student in doubt as to the conclusion to be drawn. Although in some instances there is a tendency to sterility, in other cases full fertility is maintained and the same conflicting statements may be made regarding weakness and tendency to disease. The facts seem to indicate that close breeding or in-and-inbreeding in itself is not injurious, but may be very detrimental in some cases, as it tends to perpetuate any constitutional defects which may have been produced by other agencies. In-and-inbreeding should always be accompanied by the closest selection of the best animals free from constitutional weakness or disease. The greatest objection to in-and-inbreeding lies first in the difficulty experienced in selecting breeding animals that are free from any constitutional weakness, as such defects frequently do not become distinguishable till after the breeding has progressed several years; and second in the danger that such defects may become dominant in the offspring. It must be admitted, however, that when used judiciously in-and-inbreeding forms an important means of securing improvements and is the only known means of fixing and rendering slight variations hereditary.

The majority of our various breeds of cattle have been brought up and improved as a result of very close inbreeding. As an illustration, the famous shorthorn bull, Favorite, was bred to his daughter, granddaughter, and great-granddaughter, and the product of the last union was matched with the bull Wellington, having 62.5 per cent of the blood of Favorite. Clarissa, the offspring of the last union was bred with the bull Lancaster, having 68.75 per cent of the blood of Favorite and gave very valuable offspring. The majority of our best breeds of animals have been very closely in-and-inbred without very noticeable deterioration in any direction except possibility in fecundity. It must be borne in mind, however, that this in-and-inbreeding has at every step been accompanied by the most rigorous selection, only the very best animals being retained for further breeding. Darwin says that "Although by careful selection of the best animals, close interbreeding may be long carried on with cattle, yet the good effects of a cross between almost any two breeds is at once shown by the greater size and vigor of the offspring; as Mr. Spooner writes to me 'Crossing distinct breeds certainly improves cattle for the butcher.' " The benefits of crossing are particularly visible when following extended in-and-inbreeding.

In the case of man, where families have interbred very closely, as has sometimes occurred, there is said to be a great gain in vigor as a result of intermarriage with a distinctly different family. The hardihood and general vigor of the Americans as a nation is commonly attributed to the great intermixture of peoples of many different nationalities. The mixture of European races has been going on from prehistoric times, and the population is of highly composite character. The results of mixtures of the various strains, breeds, or stocks of the white race are without doubt very beneficial, resulting in increased strength and vigor, and the same can be said of the intermixtures of the various strains or stocks of the yellow, brown, or black races. Here as in plants Nature abhors too close interbreeding. On the other hand, inter-racial marriage, or miscegenation, the marriage of individuals of distinct races, as a whole, results very disastrously both as to physical and mental characteristics. The result of such a union is a hybrid, frequently sterile, mainly intermediate in characters between the two races, and usually in large measure a social outcast. Such half-breeds or hybrids are in general inferior to the pure parental races, particularly in physical vigor, though mentally they may be equal or possibly superior. In crosses, for instance, of the negro and white races, the offspring commonly shows a tendency toward sterility and are in general weak in constitution.

In conclusion it may be stated that injury results on the one hand from too close inbreeding and on the other hand from crossing races too distinct, but that the crossing of slightly distinct strains and of individuals, reared under different conditions, is beneficial. See FERTILIZATION.

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Cross-fire, the combination of intersecting lines of fire from two or more parts of a work. It is frequently made use of to prevent an enemy's passing through a defile. The flanks as well as the faces of two adjoining bastions afford the means of cross-fire, as do also the faces of two adjoining redoubts.

Cross-fox, a peculiarly marked northern variety of the American red fox. It has a dark line along the back, and crossing this a stripe on the withers. This gives its name. Its rarity and beauty make its skin more valuable than is the pelt of the ordinary fox.

Cross Keys, Va., a place in Rockingham County, 20 miles northeast of Staunton, where a battle took place 8 June 1862, between the Union and Confederate forces. The former numbered about 18,000 under Gen. Fremont and lost 625 men; the latter had about 8,000 men under Gen. Ewell and lost 287.

Cross Keys, Battle of. On the morning of 8 June 1862 Gen. Frémont, with 10,500 men and 44 guns marched from Harrisonburg, Virginia, following Gen. "Stonewall" Jackson, who had been pursued up the Shenandoah valley, and who had now fallen back in the direction of Port Republic. Frémont's cavalry drove in Jackson's, and when eight miles beyond Harrisonburg Cluseret's brigade, in advance, came upon Gen. Ewell's division of about 5,000 men and 16 guns, at Cross Keys, and Frémont formed for attack. Cluseret's brigade, with artillery, was on and near the road, Stahel's and Bohlen's were sent on the left; Milroy's and Schenck's on the right. Eight batteries were put on the line and opened a spirited fire. Stahel was now ordered to attack Ewell's right and, going forward, met with some success, but when his two left regiments were ascending a gentle slope and had approached within a few feet of its summit, Ewell's men opened with an unexpected and severe fire, and the regiments were repulsed with great loss. Part of Ewell's line pursued, but was checked and driven back by Stahel's right regiment, which was concealed in the woods. Bohlen's brigade was now ordered forward, but under conflicting orders it was misdirected, and for the most part remained as support to the batteries. Re-enforcing his own right, Ewell advanced beyond Frémont's left, got an enfilading fire on his batteries, which, not properly supported, were withdrawn, the infantry following a full mile. Meanwhile on the right Milroy and Schenck had made some progress, and were preparing to make a determined attack on Ewell's left, when Frémont ordered them to fall back and re-enforce his left, but by this time his left had been forced back, and the entire line fell back at 6 P.M. to organize for a renewal of the battle in the morning. During the night and early in the morning Ewell withdrew, under Jackson's order, to join in an attack on Gen. Shields, who was nearing Port Republic by way of Luray Valley. Frémont followed Ewell to the south fork of the Shenandoah, to find that he had burned the bridge behind him and joined Jackson. He was an idle spectator of the battle of Port Republic, 9 June, in which his comrades were defeated, and the day following he returned to Harrisonburg. The Union loss at Cross Keys was 558 killed and wounded and 127 missing. The Confederate loss was 273 killed and wounded, and 15 missing. Consult: 'Official Records,' Vol. XII.

E. A. CARMAN.

Cross, The Southern. See SOUTHERN CROSS.

Cross, Victoria. See VICTORIA CROSS.

Cross Vine. See BIGNONIA.

Crossbar Shot, a projectile constructed in such a manner as to expand on leaving the gun into the form of a cross with one quarter of the ball at the end of each arm,— formerly used at sea for injuring the enemy's rigging, and doing general execution.

Crossbill, a bird of the genus *Loxia* belonging to the finch family (*Fringillidæ*) and unique from the character of the bill the two mandibles of which are twisted awry so that they cross. This peculiarity has given rise to a well-known and pretty legend to the effect that the crossed beaks is a mark of the bird's pity in having attempted to draw the nails which held Jesus' hands and feet to the cross, and that the red plumage of some species is the dye of his blood. This singular structure, having the appearance of a deformity, is in reality a wonderfully efficient mechanism for tearing asunder and extracting the seeds of pine cones on which these birds largely feed. Two species belong to the North American fauna, the red crossbill (*L. curvirostra*) and the white-winged crossbill (*L. leucoptera*). Both are birds of the northern pine and spruce forests, breeding within the United States, which they do in the very early spring, and only in the extreme northern States and the higher mountains. They are better known as irregular winter wanderers, which appear in flocks usually containing both species, remain in a neighborhood until they have devoured all of the seeds of conifers which are to be found, and then leave. Closely related species are found in Europe and Asia.

Crossbuns, small cakes specially prepared for Good Friday, and in many towns of England cried about the streets on the morning of that day as "hot crossbuns." Good Friday buns were appropriately marked with the cross, and hence the name. At Chelsea there were formerly two celebrated bun-houses, besieged on Good Friday from morning till night by hundreds of eager purchasers, but they have long since disappeared. In many of the cities of the United States, "hot crossbuns" are becoming quite common the last days of Lent.

Crosse, Andrew, English physician and scientist: b. Broomfield, Somerset, 17 June 1784; d. there 6 July 1855. He passed the greater part of his life experimenting in electricity. In 1816 he asserted that by electricity it was possible to communicate one's thoughts instantaneously to persons in the most distant parts of the earth, but he never appears to have attempted to demonstrate the fact by actual experiment. Among other things he applied electricity in the production of crystals, discovered

a process of purifying salt water by electricity, and also made some curious discoveries relative to the effects of positive and negative electricity on vegetation.

Croswell, Edwin, American journalist: b. Catskill, N. Y., 29 May 1797; d. Princeton, N. J., 13 June 1871. His able management of his father's paper, the 'Catskill Recorder,' led Martin Van Buren and other prominent Democrats to invite him to become editor of the Albany *Argus*, and also State printer 1824. During his 30 years' control he made it one of the most influential Democratic papers in America, and as a member of the political group known as the "Albany Regency," he preserved order in the party ranks through the columns of his paper. His articles were regarded as authoritative and were widely copied. Subsequently he found himself opposed to Van Buren and other early friends, and leaving journalism (1854) went into business in New York.

Croswell, Harry, American writer and clergyman: b. West Hartford, Conn., 16 June 1778; d. New Haven, Conn., 13 March 1858. He first came into notice as a Federalist editor of The Balance, a newspaper published in Hudson, N. Y. (1802), his bitter and sarcastic editorials involving him in numerous libel suits. Alexander Hamilton's last, and one of his finest, forensic efforts, was made in defense of Croswell in a suit caused by an article on Jefferson. He entered the Episcopal ministry in 1814, became rector of Trinity Church, New Haven, Conn., 1 Jan. 1815, and remained there until his death. He published: 'Young Churchman's Guide' (1838); 'Family Prayer' (1843); 'Memoir of Rev. W. Croswell' (1853); 'Guide to the Holy Sacraments' (1857).

Crotalaria, krō-ta-lā'rī-a, or **Rattle-box,** a genus of annual and perennial herbs and some shrubby plants of the natural order *Leguminosæ*. The numerous species are widely distributed in the tropical and temperate zones, in the former of which some of the tall growing straight-stemmed species yield a textile fibre. The most important of these species are *C. juncea*, which yields the Sunn hemp of India, and *C. tenuifolia*, by some botanists considered a variety of the preceding species, which yields Jubblepore hemp. These plants are grown thickly in order to produce attenuated stems with long strands of fibre. If sown thinly they branch freely. Several American species are reputed to cause trouble (crotalism) to horses which eat them too freely. A few species are cultivated for ornament both out of doors and in greenhouses. The most popular outdoor species is probably *C. retusa*, a hardy annual herb about one and a half feet tall and bearing racemes of yellow and purple rather fragrant flowers during summer.

Crotalidæ, krō-tăl'ī-dē (Gr. "rattle-like"), a family of venomous serpents of the group *Solenoglypha*, and considered by Prof. Cope to be the specialized in respect to their poison apparatus of all snakes. In the *Solenoglypha* the maxillary bone is very short, and so articulated that when the mouth is opened as the snake strikes, the venom fangs are erected; otherwise they are depressed. No other teeth than the functional and prospective poison fangs are borne on the maxillary bone. This family is distinguished from the *Viperidæ* (q.v.) to which it is most closely related by the presence of a deep sensory pit before each eye, on which account the name of pit-vipers is often given to them. With the exception of a couple of Indian and Malayan species closely related to the West Indian fer-de-lance, all of the 60 or 70 species are American. Besides the numerous South and Central American species of the genus *Lachesis* allied to the fer-de-lance the family includes the copperheads, water-moccasins and rattlesnakes of the United States (qq.v). Consult: Cope, 'Scaled Reptiles of North America,' Bull. U. S. Nat. Mus.

Crotch, William, English musical composer: b. Norwich 5 July 1775; d. Taunton, England, 29 Dec. 1847. As a child he showed astonishing precocity, and at the age of 22 was appointed professor of music at Oxford University, with the degree of doctor of music. In 1822 he became principal of the Royal Academy of Music. He left a large number of compositions, more especially for the organ, piano, and voice, and technical treatises. Among his works may be mentioned: 'Palestine,' an oratorio (1812); 'Elements of Musical Composition' (1812); 'Specimens of Various Styles of Music' (1813); and 'Captivity of Judah,' an oratorio (1834).

Cro'ton, the popular name of the genus *Codiæum* and the botanical name of another genus of the natural order *Euphorbiaceæ*. The former genus consists of about half a dozen shrubs or trees with monœcious flowers in long, slender axillary racemes, and thick leaves resembling those of the aucuba. These few species have given rise to a very large number of varieties of the most diversely colored foliage and of great variety of form. They are natives of the Malay peninsula, but are popular throughout the civilized world as ornamental plants grown out of doors in warm climates, and in greenhouses in cool countries, where they are planted in beds in parks and gardens during the summer. They must be removed to the greenhouse at the approach of frost. They are easily propogated from cuttings, easily cultivated in ordinarily good soil, and in rather high temperatures, but demand abundant light, and frequent syringing with insecticides to destroy the mealybug. More than a hundred varieties are cultivated in American greenhouses.

The genus *Croton* consists of about 500 species of widely distributed trees, shrubs, and herbs sometimes dicœcious but usually monœcious, the flowers generally being in terminal racemes or spikes. The few American species, which are nearly all annual herbs, have attracted little attention. Many of the species are very acrid, some are fragrant, aromatic, or balsamic. *C. gratissimus* furnishes a cosmetic and perfume which is popular in South Africa; *C. flavens*, a West Indian species, also yields a perfume. Several species have been used in medicine, among the best-known being *C. eleuteria*, which yields copalche bark, and *C. tiglium*, from the seeds of which croton oil is expressed, an oil which was formerly used as a purgative, but has lost its popularity to a very large degree. This last species is a small Asiatic tree with pointed egg-shaped leaves showing various lus-

trous tints of green, bronze, and orange for which it is planted for ornamental purposes in California.

Croton Aqueduct and Croton Dam, an aqueduct and dam connected with the water supply of the city of New York. The waters of Croton Lake, an artificial body of water formed by damming the Croton River, were first conveyed to the city in 1842, by what is known as the old aqueduct, and a new aqueduct was opened in 1890. (For dimensions of these conduits, see AQUEDUCTS.) The new aqueduct passes in its lower course under Manhattan Island and rises at 135th Street, where a gate-house is constructed from which the water is distributed by means of iron pipes. Throughout its entire length this great tunnel was blasted out of solid rock, with the exception of three or four spots where "blow-offs" were constructed with the object of rapidly emptying the aqueduct — which here meets the surface — for the purpose of examination, repair, or cleansing. The tunnel is lined throughout with brick, and in one or two places where the rock has been found imperfect and a leakage is possible, iron has been added as a lining.

As early as 1881 the question arose of providing a large water-supply for the future needs of the city, and a new dam across the Croton River was ultimately decided on, the contract for the structure being awarded 26 Aug. 1892, the work to be completed 1 July 1899. In 1901 the dam was but partially completed and a modification of the design at that time involved considerable delay. The estimated cost was $5,000,000, but was increased by the change of plan, and the total expense must include the value of the condemned land (about 7,000 acres) ultimately to be flooded, and the cost, estimated at over $1,000,000, of the new roads and suspension bridges required and to be built at the city's expense. The dam crosses the valley about three and a fourth miles above the mouth of the Croton. The first step in its construction was the making of a canal 1,000 feet long and about 200 wide to turn aside the river. The foundation pit for the dam was finished in September 1897, involving the removal of 1,000,000 cubic yards of earth and rock. The dam is 700 feet long and 294 feet high, the width at the base being 200 feet, from which the structure tapers to 20 feet at the top. Across the top is a space 20 feet wide, where a public drive will be constructed. At the north end of the dam is a spillway or overflow, 1,000 feet long, leading to the river-bed below. At the southern end the masonry of the old aqueduct runs through the dam. The amount of stone and materials used is estimated at 1,200,000 tons. Up to 1903 there was expended on the structure more than 2,000,000 days of labor performed by an average of 600 men employed nearly every working day in 10 years. This great mass of masonry forms the largest and most expensive dam ever constructed on this continent and its height exceeds that of any similar structure in the world. The steam and machinery equipment has equaled that of an ordinary railroad, for besides the many hoists and derricks, there are in use several miles of tracks and 50 locomotives and cars of the dinky type used in hauling earth and stone. The new dam will increase the storage capacity of the city water supply by 32,000,000,000 gallons, nearly doubling it. The present storage capacity in the Croton watershed is given as 43,000,000,000 gallons, so that the new dam will increase the capacity to a round 75,000,000,000. The reservoir formed by the dam will make a sheet of water 19⅔ miles long. The old Croton reservoir and dam lie in the tract to be overflowed. The intake from the large new reservoir will be from the upper gate-house, where there are 22 gates each supplied with charcoal-filters through which the water must pass before it is turned into the aqueducts. These intakes have a capacity of 400,000,000 gallons a day.

Croton Bug. See COCKROACH.

Croton Oil, a fixed oil expressed from the seed of *Croton Tiglium.* (See CROTON.) The seeds have been used in medicine for a great many years. The oil is a thick, viscid, pale yellowish or brownish-yellow liquid, having a slight fatty odor and an acrid burning taste. Its solubility is like that of similar fixed oils. Its composition is extremely complex, but the active principle is chiefly a glyceride of crotonoleic acid; this makes it an extremely powerful irritant, and administered to the skin it causes vesication and pustulation. Given internally it is a very active, drastic purgative and is used practically only in obstinate cases of constipation and in the insane, who refuse to take internal medication. It should be administered very sparingly, as five drops have been known to cause severe poisoning.

Croton River, a river in New York which rises in Dutchess County, runs south through Putnam County and southwest through Westchester County, emptying into the Hudson 32 miles north of New York. Its length is nearly 60 miles. It supplies the city with water through the Croton aqueduct (q.v.). The area of the Croton watershed is about 362 square miles and in this tract the city has many millions invested. Along the course of the river the following reservoirs are situated: the Boyd's Corners, the Middle Branch, the East Branch, the Titicus, the Carmel, and the new Croton. See CROTON AQUEDUCT.

Croto'na, Italy, a Greek republic in Magna Græcia or South Italy, founded about 700 B.C. Livy gives the circumference of the city of Crotona at 12 miles. This city was famous for producing the strongest athletes, among them the celebrated Milo. It is still more celebrated as the city where Pythagoras settled between 540 and 530 B.C., and where he taught. Milo was one of his disciples. Under the Romans Crotona was notorious for its luxury and dissoluteness. Crotona is the modern Cotrone, and the ruins of the ancient town are still to be seen above Capo della Colonna.

Crotophaga, krō-tŏf'a-gą, a genus of birds, the typical one of the sub-family *Crotophaginæ.* The bill is greatly compressed, and the ridge of the upper mandible keeled. The species are found in South America. *C. ani* is the ani or anno so called by the Latin races of South America, the razor-billed blackbird of Jamaica, called also the savannah bird and the great blackbird. It feeds on small lizards, insects, and seeds. It lives in flocks, and when one individual is slain the rest gather again

almost at the same spot. Several females are said to use the same nest.

Crouch, Frederick William Nicholls, American composer: b. London, England, 31 July 1808; d. Portland, Me., 19 Aug. 1896. He began his professional career at the age of nine at the Royal Coburg Theatre; became a violoncellist in the Drury Lane Theatre orchestra, and a member of the queen's private orchestra. In 1849 he came to the United States, played, taught music, lectured, and directed musical organizations in New York, Boston, Portland, Me., Washington, and Richmond, Va. During the Civil War he served in the Richmond Grays. His most famous composition is: 'Kathleen Mavourneen,' and others are: 'O'Donnel's Farewell,' and 'The Emigrant's Lament.' Cora Pearl, a Paris celebrity in the time of Napoleon III., was his eldest daughter.

Croup, a term of popular rather than of scientific significance, usually applied to any hard, harsh, discordant cough which may or may not be attended with difficulty in breathing. There are, however, two distinct and well-marked diseases that are commonly found in children to which this term has been widely applied. One, the commoner, is a form of mild inflammation of the vocal cords, a catarrhal laryngitis, and is popularly called false croup. The other, termed membranous croup, is a diphtheria of the larynx and adjacent parts. The term croup is, therefore, one best avoided. There are a number of other conditions less common than the one just named that give rise to a harsh, croupy cough. One of the most characteristic is a nervous affection of the vocal cords known as laryngismus stridulous.

In acute catarrhal laryngitis which affects chiefly young children following an exposure to wet or cold, the child without previous warning awakens at night and commences to cough. This cough is extremely harsh, prolonged, and paroxysmal and in the effort to get breath cold perspiration breaks out on the child's body, and in severe cases it often seems as though the child would choke to death, the inspirations being long and hissing and the expirations short, harsh, and difficult. The child becomes blue and almost convulsed. These attacks may last from half an hour to four or five hours, and then, sometimes without treatment, disappear as suddenly as they have come, and during the day the child is about, and apparently as well as ever. As a rule there is but little rise in temperature, and there are no signs of swelling of the throat, or of grave constitutional disturbances such as are found in diphtheria. In these mild cases of laryngitis a recurrence of the affection is to be expected and unless proper treatment is instituted throughout the day, nightly attacks of coughing may persist for a week or two. It is noticeable that this affection is found usually in many children of the same family and in those whose parents have been prone when children to have similar attacks, thus pointing to nervous factors as hereditary in its causation.

The treatment is comparatively simple, yet it is very important that a regular practitioner should be called in order to determine the exact diagnosis, for if severe disease, such as diphtheria, is mistaken for an acute spasmodic laryngitis of this type a fatal result may ensue. One of the very best modes of treatment for this affection is for the patient to breathe steam. This may be generated by means of an ordinary croup kettle and led beneath a sheet arranged like a tent over the crib or bed or, if the child is older and intelligent enough, a large water pitcher may be half filled with boiling water and the steam may be breathed at the mouth of the pitcher, a towel being thrown over the mouth of the child. Very frequently the mother or nurse by placing her own head beneath the towel at the same time, can reassure the child, if there is any struggling by reason of fear. The air of the room should be kept moist by means of steam and some quieting medicine may be given the child, one of the very best being minute doses of bromide or of codeine. Frequently an emetic is of service.

In diphtheria the disease is much more grave. Here one has to do with an acute infectious disease due to a specific bacterium, the *Bacillus diphtheriæ* that develops a very highly toxic poison. Very frequently the effects of the intoxication of the diphtheria bacillus are out of all proportion to the amount of membrane that may be developed in the child's throat and larynx, so that the amount of local swelling, which is nearly always present, and a high temperature, are not necessarily true criteria of the severity of this affection. For a full consideration of the symptoms and treatment of diphtheria of the larynx see the article on DIPHTHERIA. See also LARYNGISMUS STRIDULUS; NOSE AND THROAT.

Crousaz, Jean Pierre de, zhŏñ pē-ār dė kroo-zä, Swiss mathematician and philosopher: b. Lausanne, 13 April 1663; d. 22 March 1748. In 1682 he went to the University of Leyden, and on returning to his native town was ordained minister, appointed honorary professor, and remained pastor of the church at Lausanne. Here also he taught mathematics and philosophy, and in 1724 was appointed professor of the same subjects at the University at Groningen. The principal of his works are: a 'New Essay on Logic'; 'Summa Logica' (1724); a 'Treatise on Education'; 'Examination of Ancient and Modern Pyrrhonism'; 'Geometry of Lines and Surfaces.'

Crow Indians or **Crows,** or **Absoruque** or **Asaroka,** a tribe of the Hidatsa division of the North American Indians. They are named after a species of hawk, not after the bird commonly called the crow. They belong to the linguistic stock included under the name Siouan Indians and are of the same family as the Dakotas. It was common for them to be engaged at war with other tribes of the same family.

When the explorers Lewis and Clark visited the Crows, they found the tribe divided into four groups or "bands." Brown located them on the Yellowstone River in 1817, and in 1842 they were reported by the government agents as inhabiting the land around the head waters of the Yellowstone. They were then 4,000 in number. Later they were removed to a reservation in Montana. Pop. 2,287.

Crow. The crow family (*Corvidæ*), order *Passeres*, comprises birds that have a strong bill, compressed toward the points, and covered at the base with stiff, bristly feathers, which

advance so far as to conceal the nostrils. The plumage is dense, soft, and lustrous, generally dark, but sometimes of gay colors. They are very omnivorous, and remarkable for their intelligence. The family, widely diffused over the world, includes the common crow, type of the *Corvidæ*, and the above, which will be described here; and the raven, the fish crow, the rook, the jay, and the magpie. The common crow of North America, *Corvus americanus* (Audubon), is about 20 inches long, and the wings about 13 inches. It is remarkable for its gregarious and predatory habits. The bill is straight, convex, and compressed. The nostrils are placed at the base of the bill, and are pantalous; the tongue short, and bifid at the tip; the toes are separated almost to the base, and the middle one is the longest; the wings sub-elongated and acute, and the tail composed of 12 feathers. They pair in March; the old repair their nests, the young frame new ones; but they are such thieves that while the one is fetching materials the other must keep watch to prevent the rising fabric from being plundered by their neighbors. As soon as the nest is finished and the eggs produced (five, bluish green, with dark blotches), the male takes upon himself the care of providing for his mate, which he continues during the whole period of incubation. They frequent the same rookeries for years, but allow no intruders into their community. They feed chiefly on worms, and the larvæ of insects; they also eat grain and seeds, whence they have sometimes been supposed injurious to the farmer; but they amply repay him for what they take by destroying the vermin in his fields. The fish crow (*Corvus ossifragus*) is a closely similar but somewhat smaller species, chiefly maritime in the eastern United States, but found for a considerable distance along river valleys. Less social than the common crow it often associates with that bird, so that is very commonly overlooked. In England the name is applied to the rook, the carrion crow, which is typical of the *Cathartidæ*, and other species. In India there is a hooded crow, also of the genus *Corvus*.

Crow-blackbird, the name of certain American birds of the genus *Quiscalus*, family *Icteridæ* or hang-nests. The great crow-blackbird, or grackle, *Q. major*, found in the Southern States, Mexico, and the West Indies, is 16 inches long, and of a glossy black plumage. The female is of a light brown above and whitish beneath. The purple grackle, lesser or common crow-blackbird, *Q. versicolor*, is similar in color to the preceding, but smaller. They reach the Middle States of the United States from the South in flocks in the latter part of March, and build in April in swamp-bushes and trees. In their first arrival they feed upon insects, but afterward commit great ravages upon the young corn. In November they fly south again.

Crowberry, or **Crakeberry** (*Empetrum*), a genus of low-growing evergreen shrubs of the natural order *Empetraceæ*. The few species are characterized by small, crowded, evergreen leaves, inconspicuous blossoms and globular, usually black, edible berries, with 6 to 10 bony seeds in a slightly acid, very juicy pulp. They are natives of cold, northern climates (one in South America), and are sometimes used for making a fermented beverage. As dessert fruit they have little value, but they are eaten in northern Europe, where they are regarded as a scorbutic and diuretic. Crows are especially fond of them; hence the name. The plants are often used for ornament in rookeries where the soil is moist and peaty or sandy.

Crowe, Catherine Ann Stevens, English author: b. Borough Green, Kent, about 1800; d. 1876. She made her first essay in literature with a tragedy, 'Aristodemus,' and then turned to prose fiction. 'Lily Dawson' (1847) is regarded as the best of her novels. She became an ardent devotee of spiritualism and animal magnetism, and in 1852 published her most notable work, 'The Night Side of Nature.'

Crowe, Eyre, English historical and genre painter: b. London 3 Oct. 1824. He studied painting in the atelier of Paul Delaroche in Paris, and went with that artist to Rome in 1844. Acting as amanuensis to William M. Thackeray, he visited the United States in 1852–3. He was elected an associate of the Royal Academy in 1876. Among his paintings are: 'Goldsmith's Mourners' (1863); 'Blue Coat Subjects' (1872); 'French Savants in Egypt' (1875); 'The Rehearsal' (1876); 'Sanctuary'; 'Prayer'; and 'Bridal Procession at St. Maclou, Rouen' (1877); 'School Treat' (1878); 'Blue Coat Boys Returning from Their Holiday'; 'Marat: 13 July 1793'; 'The Queen of the May' (1879); 'Queen Eleanor's Tomb' and 'Forfeits' in 1880; 'Sandwiches' and 'Sir Roger de Coverley and the Spectator at Westminster Abbey' (1881); 'How Happy Could I Be with Either!' and 'The Defense of London in 1643,' exhibited in 1882; 'Old Porch, Evesham' (1884). He published 'With Thackeray in America' (1893).

Crowe, Sir **Joseph Archer,** English historian of art and miscellaneous writer: b. London 20 Oct. 1825; d. Bavaria 7 Sept. 1896. He was long eminent as a journalist, and for a time served in the British diplomatic service. His celebrity rests mainly on the 'History of Painting in Italy' (1864–71), the most important work on this subject, written in collaboration with G. B. Cavalcaselle (q.v.). He also published other volumes on art subjects.

Crowe, William, English clergyman and poet: b. Midgham, Berkshire, 1745; d. Bath, Somerset, 9 Feb. 1829. He was the author of 'Lewesdon Hill,' a descriptive poem, praised by Wordsworth, Coleridge, and Moore (1788); 'Treatise on English Versification' (1827); etc.

Crowell, Edward Payson, American educator: b. Essex, Mass., 1830. He was graduated at Amherst College 1853; was tutor there 1855–6; professor of German 1858–64; and of the Latin language and literature 1858 to the present time. He has edited 'Selections from the Latin Poets, Catullus, Tibullus, Propertius, etc.' (1882), and with Richardson, translated Herman Bender's 'Brief History of Roman Literature' (1880).

Crowell, John Franklin, American author: b. York, Pa., 1 Nov. 1857. He was graduated at Yale 1883; was president of Trinity College, North Carolina, 1887–93; and professor of sociology and economics at Smith College, Northampton, Mass., 1895–7. He became an expert agent for the United States Industrial Commission, and since August 1900 has been expert on internal commerce in the Treasury

Bureau of Statistics, Washington, D. C. He has published: 'Taxation in the American Colonies'; 'The Logical Process of Social Development'; and many contributions to the 'Monthly Summary of Commerce and Finance of the United States' (1900–3).

Crowest, Frederick J., English writer, manager, and editor of the Walter Scott Publishing Company: b. London 30 Nov. 1856. He was carefully trained in music and singing, and was for some years in the editorial employ of Cassell, Petter & Galpin, publishers. He has written: 'The Great Tone Poets' (1874); 'Book of Musical Anecdote' (1877); 'Advice to Singers' (1878); 'Phases of Musical England' (1881); 'Cherubini' (1890); 'Musical Groundwork' (1890); 'Dictionary of British Musicians' (1895); 'The Story of British Music' (1895); 'Verdi: Man and Musician' (1897); 'Beethoven' (1899); 'The Story of Music' (1902).

Crowfield, Christopher, a pseudonym sometimes used by Harriet Beecher Stowe.

Crowfoot, or **Buttercup,** common names of the genus *Ranunculus*, the typical genus of the natural order *Ranunculaceæ* or crowfoot family. The genus has over 200 species, widely distributed in the temperate regions of the world, and on the mountain-tops of the tropics. The plants of the genus are both aquatic and terrestrial, and are generally classed as useless weeds. The name buttercup is popularly applied in the United States to the species with large flowers and divided leaves. The buttercup is called «crazy» by the rustics of central England, who believe that its smell will cause madness.

Crowland, or **Croyland,** England, a town in the county of Lincoln, eight miles north of Peterborough; pop. (1891) 2,800. It consists of four principal streets, at the intersection of which is a very curious ancient triangular bridge. On one of the wings of this is a dilapidated statue, attributed to the 9th century, and supposed to be that either of Alfred or Ethelbald, king of Mercia. The only other remarkable edifice is the ruined abbey of Crowland, the north aisle of which forms the parish church. Ingulphus, to whom a history of the Abbey of Crowland, first published at London in 1596, afterward at Oxford in 1684, has erroneously been attributed, was abbot of Crowland from 1075 till 1109.

Crowley, La., a town and county-seat of Acadia, on the Southern Pacific R. R., about 142 miles northwest of New Orleans, and 45 miles from the Gulf. It is the centre of a rice district, and nearby are oil fields. Rice-milling is the principal industry. The electric plant and waterworks are owned by the town. Pop. 4,392.

Crown. 1. In the early ages, a wreath of flowers or leaves was one of the first emblems of honor or of joy. Such was the ornament of the priest in the performance of sacrifice, of the hero on his return from victory, of the bride at her nuptials, and of the guests at a feast. The ancient mythology, which gave everything a distinct beginning and a poetical origin, ascribes the invention of wreaths to Prometheus, who imitated with flowers the fetters which he had borne for his love to mankind, whom he had created. According to Pliny, wreaths were first made of ivy, and Bacchus first wore them. In process of time they were made of very various materials. Those worn by the Greeks at feasts in honor of a divinity were made of the plant consecrated to the god. Wreaths of roses afterward became very common. In some cases wreaths were even made of wool. Wreaths of ivy and parsley were worn by the Greeks on the head, neck, and breast at entertainments, with a view to prevent drunkenness. Mnesitheus and Callimachus, two Greek physicians, wrote entire books on wreaths, and their medical virtues. Corpses were covered with wreaths and green branches. Lovers adorned with wreaths and flowers the doors of their mistresses, and even captives who were to be sold as slaves wore wreaths, hence the phrase, «sub corona venire or vendere.» The beasts sacrificed to the gods were also crowned. Wreaths, in process of time, were made of metal, in imitation of flowers, or of the fillet which the priest wore round his head when he sacrificed, which was called diadema. This attribute of distinction was early adopted by the kings, when they united in their persons the temporal and spiritual power. Among the various crowns and wreaths in use among the Greeks and Romans were the following:

Corona agonothetarum, the reward of the victor in the great gymnastic games. The wreaths conferred at the great games of Greece were of different kinds; at the Olympic games, of wild olive; at the Pythian games, of laurel; at the Nemean games, first of olive branches, then of green parsley; at the Isthmian games, a wreath of pine leaves, afterward of ivy; subsequently pine leaves were resumed.

Corona aurea (the golden crown), the reward of remarkable bravery.

Corona castrensis, given to him who first entered the camp of the enemy.

Corona civica, the second in honor of the crowns bestowed by the Romans for military achievements. It was given to him who had saved the life of a Roman citizen in battle.

Corona convivialis, a wreath worn at feasts.

Corona muralis, given by the general to the soldier, who first scaled the enemy's wall. It was made of gold, and embattled above.

Corona natalitia, a wreath which parents at Athens and Rome hung up before the door at the birth of a child. At Athens it was made of olive branches if the child was a boy, and of wool if a girl.

Corona navalis, the next in rank after the civic crown, was given to him who first boarded and took an enemy's vessel. Like the corona muralis it was made of gold. It is not known whether the corona rostrata was the same with this one, or one which conferred a still higher honor.

Corona nuptialis, a crown or wreath worn by brides. The bridegroom also, and his relations, on the day of his wedding, adorned themselves with wreaths. At first the corona nuptialis was of flowers plucked by the bride herself; afterward of gold or silver and precious stones.

Corona obsidionalis, a reward given to him who delivered a besieged town or a blockaded army. It was the highest military honor among the Romans, and the most difficult to be obtained. It was made of grass, or weeds, and flowers; if possible, of such as grew on the delivered place.

Corona triumphalis, a wreath of laurel which was given by the army to the imperator. He wore it on his head at the celebration of his triumph. Another crown, made of gold, which was also presented by the army to a general holding a triumph, being too massive to be worn, was carried over the head of the general during his triumph. A third crown (also a golden one, and of great value) was received by the general from the provinces.

In the Middle Ages crowns became exclusively appropriated to the royal and imperial dignity; the coronets of nobles were only borne in their coats of arms. It is, however, with the eastern diadem rather than with the classic corona that the crown as a symbol of royalty is connected; indeed, it was only introduced as such a symbol by Alexander the Great, who followed the Persian usage. The English crown has been gradually built up from the plain circlet with four trefoil heads worn by William the Conqueror. This form was elaborated and jeweled, and finally arched in with jeweled bands surmounted by the cross and sceptre. As at present existing the crown of England is a gold circle, adorned with pearls and precious stones, and bearing alternately four Maltese crosses and four fleurs-de-lis. From the top of the crosses rise imperial arches, closing under a mound and cross. The whole covers a crimson velvet cap with an ermine border. The Scottish crown consists of a jeweled and enameled circle of gold, supporting 10 fleurs-de-lis and 10 crosses fleury in alternation. Each of the crosses is adorned with a diamond and pearls, and from them rise four gold arches, closing under a mound, which bears a pearl-bedecked cross pattée. The royal crown of France is a circle ornamented with eight fleurs-de-lis, from which rise as many quarter-circles closing under a double fleur-de-lis. The Austrian crown is a sort of cleft tiara.

2. The term crown is used figuratively for the royal power, in contradistinction either to the person of the monarch or to the body of the nation, with its representatives, interests, etc. Thus, in modern times, the word crown is used to express the rights and prerogatives of the monarch considered as a part of the state, which includes all powers — the legislative, judicial, etc. Thus the crown domains are distinguished from the state or national domains.

3. In architecture, crown denotes the uppermost member of a cornice; the corona; also a sort of ornamental structure surmounting a tower and formed by flying buttresses meeting together at top.

4. In English money, the crown is a coin, worth five shillings, or $1.22.

Crown-gall, a disease of many fruit and forest trees caused by a myxomycete fungus, *Dendrophagus globosus,* which obtains entrance usually at the juncture of the roots and the trunk (the crown), but sometimes appears upon the roots. In young trees the galls are often half an inch in diameter, colored like the roots or darker, soft and composed of apparently unorganized tissue, but in old trees they frequently show concentric rings and may become several inches in diameter. In Europe, America, and New Zealand, where this disease is known, considerable damage has been reported, even whole orchards being destroyed by the fungus. The only remedy thought to be of service is the annual removal of the galls and the covering of the wounds with thickened Bordeaux mixture.

Crown Glass, very hard and clear, made almost entirely of sand and alkali and a little lime, without lead or any metallic oxide except a very small quantity of manganese, and sometimes of cobalt. Crown glass is used in connection with flint-glass for optical instruments, in order to destroy the disagreeable effect of the aberration of colors. This important discovery by Dollond, who turned it to admirable account in the achromatic telescope, was carried to the highest perfection by Reichenbach. This glass is much used for windows.

Crown Lands, in American history. The British sovereign was formerly in theory the owner of all waste lands of the kingdom. After the downfall of the French power in Canada, the English government, to quiet the fears of the Indian tribes that their lands were to be gradually taken away, reserved all lands west of the colonies up to the Spanish line as "crown lands," for the use of the Indians. No purchases or settlements were to be made in this territory without permission from the royal government; but this conflicted seemingly with the bounty provisions (see BOUNTY LANDS), and in fact vast tracts were taken up in hope of future validation. These lands formed the claims which were ceded to the general government by the States when the Union was formed. See TERRITORIES.

Crown Point, Ind., the county-seat of Lake County, in the northwestern corner of the State, on the Erie and the Pittsburg, C., C. & St. L. R.R.'s., about 40 miles southeast from Chicago and 15 miles south of Lake Michigan. The town has grain elevators, iron-works, and a shirt factory. Pop. (1900) 2,336.

Crown Point, N. Y., a town in Essex County, on Lake Champlain, and on the Delaware & H. R. R.R., about 30 miles northwest of Whitehall. This town is noted because of its being the scene of some of the minor contests of the Revolutionary War. It was in possession of the French at one time, later the English took possession, and in 1775 the Americans, under Seth Warner, gained control; but in 1777 it was abandoned by the Americans at the approach of Gen. Burgoyne. For some years the chief industry was mining iron ore, but since that has been given up the town has lost some of its population. The town now is dependent upon the trade in the agricultural products of the surrounding country. Pop. (1900) 2,112.

Crown Point, Fortress of. Lake Champlain being the one open highway between French and English North America, its control was of vital importance when the struggle for mastery arose. The chief ground of vantage was the place where the lake suddenly narrows to the width of a river, so that a few cannon would command the passage. This was called Pointe à la Chevelure (Scalp Point) by the French, Crown Point by the English. In 1726 the French established a post opposite, on the east side of the lake; they withdrew in fear of Massachusetts, but that colony fell to quarreling with New Hampshire, and New York (which claimed the point) with New Jer-

sey. In 1631, on a false rumor that the English (whose colonies lacked both unity and foresight for such a purpose) were about to fortify the point, the governor of Canada sent workmen and troops under Sieur de la Fresnière to build a fort there, which was called Fort Frédéric, and had a heavy stone tower mounted with cannon to sweep the narrow lake. This advance of the French power into the very lands of the colonies was a defiance, if not an act of war; but it took nearly a quarter of a century more to join battle. In 1755, at the opening of the final contest, an expedition against Fort Frédéric was planned by Gov. Shirley of Massachusetts, and led forward by Sir William Johnson; but it got no farther than Fort Edward, and ended in the bloody drawn battle of Lake George (q.v.). In 1756 the French built Ticonderoga farther down, on the isthmus between Lake Champlain and Lake George; this left Crown Point a second instead of first line of defense, but the two were the chief French frontier posts through the war. In 1756 an expedition from Albany against them was undertaken, but came to nothing; in 1757 Major Robert Rogers' rangers raided around them. In 1759 they were captured by Amherst, Crown Point being abandoned as soon as Ticonderoga was taken. Both posts were kept up by the British, and at the outbreak of the Revolutionary War were the first thought of the colonists, to open the route to Canada and seize the stores they contained. On 10 May, while Arnold and Ethan Allen took Ticonderoga, Seth Warner captured Crown Point, with over 200 cannon and a quantity of ammunition. The present village of Crown Point is several miles below the point and the old fort.

Crown'inshield, Arent Schuyler, American naval officer: b. New York State 1843. He was graduated at the United States Naval Academy in 1863, and participated in both attacks on Fort Fisher in the Civil War. Later he rose through the grades to the rank of captain. During the war with Spain in 1898 he was a member of the board of strategy. In 1900 he was chief of the bureau of navigation, with the rank of rear-admiral, and in 1902 became commander of the European squadron.

Crowninshield, Frederic, American artist: b. Boston, Mass., 27 Nov. 1845. He was graduated at Harvard 1866; spent 11 years in Europe studying art under Rowbotham, Couture, and Cabanel, his first exhibited work appearing in the Paris Salon of 1878. He was instructor in the Boston Museum of Fine Arts 1879–85, since when he has devoted himself largely to mural painting and stained glass work. His water colors are greatly admired and sought for by collectors. He has published: 'Pictoris Carmina, a Painter's Songs' (1900), illustrated by himself, 'A Painter's Moods' (1903).

Crowninshield, Mary Bradford, American novelist and writer for young people: b. Maine 1854. She is a descendant in the 10th generation of Gov. William Bradford of Plymouth Colony, and wife of A. S. Crowninshield (q.v.). She has published over the signature «Mrs. Schuyler Crowninshield»: 'All Among the Light Houses' (1886); 'Light-house Children Abroad' (1889); 'Latitude 19°: a Romance of the West Indies' (1898); 'Where the Trade Wind Blows' (1898); 'Plucky Smalls'; 'San Isidro' (1899); 'The Archbishop and the Lady' (1900); 'Valencia's Garden' (1901).

Crowther, krō'thėr, **Samuel Adjai,** Anglican bishop: b. Ochegu, east of the kingdom of Dahomey, 1812; d. Africa 31 Dec. 1891. He was the first negro bishop of the Church of England. He was carried into slavery in 1821, but was freed, with a large company of his countrymen, by a British man-of-war in 1822, and landed at Sierra Leone, where he soon became an excellent scholar. He finished his education in England, where he took orders in the English Church in 1843, and accompanied the first and second Niger expeditions, publishing a narrative of the latter. In 1864 he was ordained Bishop of the Niger, and filled that place with honor. He published several books in and on the Niger languages and ranks high among African linguists.

Croydon, England, a municipal and parliamentary borough in county Surrey, 10 miles south of London, of which it is practically a suburb; near the sources of the Wandle, and not far from the Banstead Downs; on the London and Brighton R.R. It is a place of ancient origin, but from its recent rapid increase is almost entirely new. Of special interest are the remains of the ancient palace, long a residence of the archbishops of Canterbury. Pop. (1901) 133,885.

Crozat, Joseph Antoine, zhō'zĕf äñ twăñ krō-zä, MARQUIS DUCHÂTEL, French art collector: b. Toulouse 1696; d. 1740. The sketches in his collection exceeded 19,000, and he had expended above 450,000 livres in this particular branch. During the 60 years which he employed in collecting, no cabinet was sold in Europe of which some part was not purchased by him. On Crozat's death, his collection came into the possession of his brother, the Marquis Duchâtel, after whose death most of the articles of virtu were dispersed. The greater part of the picture gallery passed to Crozat's nephew, Baron Thiers, from whose heirs it was purchased by the empress of Russia. Consult Mariette, 'Description sommaire des Collections de M. Crozat' (1741).

Crozet Islands, a group of four, in the southern portion of the Indian Ocean, between Kerguelen and Prince Edward islands. They are all of volcanic origin, and the most easterly of them, called East Island, has precipitous cliffs on the coast, and in the interior lofty peaks, exceeding 4,000 feet. The largest, called Possession Island, visited by the Challenger expedition in 1873–4, is believed to be about 20 miles long by 10 broad.

Crozier, krō'zhėr, **John Beattie,** English philosophical writer: b. Galt, Ontario, 23 April 1849. He was educated at Toronto University, and in 1872 began the practice of medicine in London. He has written: 'God or Force'; 'Religion of the Future' (1880); 'Civilization and Progress' (1885); 'Lord Randolph Churchill, a Study in English Democracy' (1887); 'History of Intellectual Development' (1887–1901); 'My Inner Life, Being a Chapter in Personal Evolution and Autobiography' (1898).

Crozier, William, American military officer: b. Carrollton, Ohio, 19 Feb. 1855. He was graduated at the United States Military Academy in 1876; served for three years in the

West, taking part in the campaigns against the Sioux and Bannock Indians; was instructor of mathematics at the Military Academy in 1879-84, when he entered the ordnance department; and was commissioned captain in 1890. He invented a wire-wrapped rifle and a 10-inch gun, and with Gen. Buffington, the disappearing gun carriage. He took part in the Spanish-American war; and was appointed chief of ordnance with the rank of brigadier-general in November 1901.

Crozier Theological Seminary, in the borough of Upland, near Chester, Pa. It was founded by John P. Crozier, his wife, Sallie Knowles Crozier, and his children, who jointly endowed the school with lands, buildings, and invested funds amounting to $275,000. The school was incorporated in 1867 and in 1902 had in attendance 108 students.

Crucible, a vessel used in chemistry and the arts for containing substances that are to be subjected to high temperatures. A good crucible should be capable of withstanding great and sudden changes of temperature without fracture or disintegration; it should not be attacked by the substance it is to contain; and it should be infusible at the temperatures to which it is to be exposed. Numerous materials are used in the manufacture of crucibles, each having its own peculiar advantages and disadvantages. Platinum is an ideal material for many purposes, but it is exceedingly expensive, and it cannot be used for the fusion of metals. Clay, or a mixture of clay with sand, graphite, or old broken crucibles, is a favorite material, and Hessian crucibles, composed of equal parts of clay and sand, are in very general use. Hessian crucibles are commonly triangular in shape and coarse in texture. They are porous, they fracture easily from sudden changes in temperature, and they will not withstand the action of litharge; but they are cheap, and will not fuse at any temperature that is attained in ordinary operations. The clay that is used in the manufacture of crucibles should be "weathered" for some months, by exposure to air in a moist condition, in order to effect the decomposition or elimination of certain impurities, such as pyrites, that would be prejudicial to the finished vessel. Graphite is used to a considerable extent in the manufacture of crucibles, especially for those that are to be used for melting metals. Lime crucibles, cut from blocks of well-burned lime, are practically infusible, but they will not stand exposure to air for any length of time, since they absorb moisture, becoming converted into calcium hydrate, and then disintegrating. Magnesia crucibles are also practically infusible, and are not affected by exposure to the air. A mixture of equal parts of magnesia and bauxite (q.v.) makes excellent crucibles. Alumina (oxide of aluminum) is also highly recommended as a material for crucibles, as it will withstand sudden changes of temperature quite well, is practically infusible for all ordinary purposes, and is not attacked even by melted sodium.

Cruciferæ, kroo-sĭf'ē-rē (Lat. *crux,* cross + *ferre,* to bear), a large order of dicotyledonous plants, the mustard family, consisting of herbs and a few low shrubs with pungent and stimulating but not poisonous properties. The flowers of crucifers have four deciduous sepals and four regular, hypogyrous petals arranged in such a way as to suggest the form of a cross, whence the name of the plants. Of the six stamens two are shorter than the others, and have a lower insertion. The fruit is a two-celled pod, known in its long form as a silique, in its short form as a silicle or pouch, and when articulated and separating at the joints, as a loment. The seeds are without albumen; leaves alternate and exstipulate. The characters of the genera depend upon the pods and seeds. There are about 185 genera and nearly 2,000 species of crucifers dispersed throughout the temperate regions of the globe. They are most abundant in Europe and Asia Minor. Many useful vegetables belong to this family, such as the cabbage, cauliflower, kale, Brussels sprouts, broccoli, and kohlrabi, the various kinds of turnip, and the radish. The horseradish (*Nasturtium armoracia*) has long been known as a condiment. The watercress introduced from Europe now grows wild in America. The seeds of the white mustard (*Brassica alba*) and the black mustard (*B. nigra*) are ground for use as a condiment and also for medicinal purposes. Various well-known ornamental flowers belong to the *Cruciferæ,* such as the wall-flower, the stock, the rocket candytuft, sweet alyssum, honesty, etc. The curious plant known as the rose-of-Jericho or resurrection-plant (q.v.) is also a member of this family.

Crucifix, a cross bearing the figure of Christ. It cannot be said at what time this emblem of the Christian faith began to be used, either by the Christian Church or by individual Christians. A general feeling of repugnance toward the instrument of punishment which, among the Romans, was reserved only for the most infamous class of criminals, would for a long time prevent the early Christians from representing Christ upon the cross, and this feeling would have to be conquered before the crucifix could come into use in public worship. There are certain remains which would seem to show that crucifixes existed in the beginning of the 3d century; but it is probable that all these were merely tokens of individual piety. It is certain that the most ancient crucifixes known to exist belong to this class. Such, for example, is that painted in the Syriac evangelistary of the year 582, contained in the Laurentian library at Florence; and such also is the pectoral cross of the superiors of Monza, which is said to have been a gift of Pope Gregory the Great to Theodolinda, who founded the cathedral. Crucifixes appear to have been first used in public worship toward the end of the 6th century. The most ancient example known of a crucifix used for this purpose is one which, on the testimony of St. Gregory of Tours, was painted in a church at Narbonne. For more than 100 years after this period they were still rare, and it was not till after the Trullan Council, held at Constantinople in 692, which ordained that historic painting should be preferred to emblems or symbolical figures, that the images of Christ crucified began to multiply. As to the manner of representing Christ on the cross it appears to be unquestionable that, as a rule, the figures on the most ancient crucifixes were engraved on gold, silver, or iron crosses. On the pectoral cross of Monza, however, the figures are enameled on a gold cross. At a later

period they were painted on wood, and it is only in the 9th century, in the pontificate of Leo III., that the figure of Christ appears carved upon the cross in bas-relief. Although there can be no doubt that Christ, in accordance with the Roman custom of representation, was crucified naked, all the most ancient crucifixes, almost without exception, represent him as clothed with a tunic reaching down to the feet. This practice lasted down to the 8th century, when it began to be modified, the body of Christ being no longer covered above the loins; and at length it became the custom to represent Christ, as in the crucifixes of the present day, entirely naked with the exception of a cloth about the loins. Another point in which the ancient crucifixes differ from modern ones is as to whether Christ is represented dead or alive. Until the 11th century he is represented alive; since that period he has been represented as dead. The first example of Christ being represented as dead is furnished by a manuscript in the Laurentian library at Florence, belonging to about the year 1059. In the earlier crucifixes, also, the number of nails by which Christ is fixed to the cross is four, one through each hand and each foot, while in the more modern ones there are only three nails, one foot being laid above the other and a single nail driven through both. Many crucifixes bear also the inscription put upon the cross by the order of Pilate, but this is always found in an abbreviated form, both in ancient and modern times. In the Latin Church it is frequently omitted, but the Greek Church have adhered more strictly to this practice. Various accessories are also sometimes found in crucifixes, such as figures of the sun and moon, the lamb, of the Virgin Mary, and Saint John, of the two soldiers — one presenting the vinegar for Christ to drink, the other with the lance with which he pierced the side of Christ; emblematical figures representing the four evangelists; angels in a posture of adoration, and certain saints.

Crucifixion, the manner by which Jesus Christ was put to death by the Jews (see St. Matt. xxvii.). Nailing victims to a cross was a mode of punishment frequent among the ancients, but it is now confined to the Mohammedans. Different kinds of crosses were used, as the Latin, with two beams at right angles, the St. Andrew's, made in the form of the letter X, and others. The cross was sometimes employed by the ancients as a terrible instrument of destruction to a vanquished enemy. Thus Alexander the Great, after putting 8,000 or 10,000 Tyrians to the sword, on taking their city, crucified 2,000 more along the shores. Not less sanguinary was the vengeance of the Romans against the Jews; Minutius Alexander crucified 800, and Quinctilius Varus 2,000, on account of some revolt. Titus, whom we are wont to esteem as humane and merciful, crucified above 500 in a day; and at the sack of Jerusalem, under his command, the Romans, wherever they could seize the affrighted fugitives, either in hatred or derision nailed them to crosses about the walls of the city, until the multitude was so great that room was wanting for the crosses, and crosses for the bodies.

Cruden, kroo'dĕn, **Alexander,** Scottish biblical scholar: b. Aberdeen 31 May 1700; d. London 1 Nov. 1770. In 1722 he went to London, where he was employed as tutor in several families. Previous to 1732 he opened a bookseller's shop under the Royal Exchange, and in 1735 was appointed bookseller to Queen Caroline. His great work appeared in 1737, under the title of 'A Complete Concordance of the Holy Scriptures of the Old and New Testament.' In a pecuniary point of view it was not at first successful, and the embarrassments to which it reduced the author caused a return of a mental malady, which occasioned his being sent by his friends to a lunatic asylum. After his release he instituted an action of damages against those who had confined him, and published an account of his confinement under a whimsical title. In 1753 he was again placed in confinement, and again, on being liberated, published an account of his case. Of Cruden's great work, the Concordance, three editions appeared during his life. The pains which he took with it were prodigious, constructing it anew from the foundation, without availing himself of the labors of his predecessors, and verifying personally the accuracy of each quotation and reference. He was also the author of 'A Scripture Dictionary, or Guide to the Holy Scriptures'; and 'The History and Excellency of the Scriptures.'

Cruger, kroo'gėr, **Julia Grinnell Storrow** ("Julien Gordon"), American novelist: b. Paris, France. She has written: 'A Wedding and Other Stories'; 'A Diplomat's Diary'; 'Mademoiselle Réséda'; 'A Puritan Pagan'; 'Marionettes'; 'A Successful Man'; 'Vampires'; 'Poppæa'; etc.

Cruger, Mary, American writer: b. Oscawana, N. Y., 9 May 1834. She was a contributor to the 'Standard Dictionary,' and has written: 'Hyperæsthesia, a Novel' (1885); 'A Den of Thieves: or, the Lay Reader of St. Mark's' (1886); 'The Vanderheyde Manor-House' (1887); 'How She Did It: or, Comfort on $150 a Year' (1888); 'Brotherhood' (1891).

Cruikshank, krůk shănk, **George,** English illustrator and caricaturist: b. London 27 Sept. 1792; d. 1 Feb. 1878. Family necessities compelled him, when still a child, to produce what he could, and the want of careful preliminary study at his outset in art affected his productions through a great part of his career. Hence his defects were chiefly those of taste, and these have operated to his being popularly ranked somewhat lower as an artist than his merits deserve. For his drawing was always faithful, precise, and felicitous, his facility amazing, and his invention inexhaustible. The catalogue of his productions prepared by the keeper of the prints in the British Museum comprises 5,500 articles, many of them recalling Rembrandt's work by their richness in light and shade. The earliest of his drawings known is dated 1799, when he was only seven years of age, and when 15 he was comparatively distinguished. His first occupation was designing illustrations for children's books and popular songs. In 1837 Cruikshank commenced in 'Bentley's Miscellany' his famous series of etchings on steel illustrative of Dickens' 'Oliver Twist,' full of pathos, humor, and tragic power. Having connected himself with the temperance movement he produced the 'Bottle,' a powerful series of designs, characterized, from its subject and the artist's object, by inevitable vulgarity, but pregnant with genius and high moral teaching.

In spite of his genius, industry, and homely mode of life he never succeeded in acquiring a competency, and was compelled in extreme old age to depend on the aid of his admirers. His true life-work consisted in illustrating the costume, manners, and vices of the people for a period of considerably more than half a century.

Cruiser, an armed vessel which cruises, either to protect the commerce of its own country or to inflict damage on that of another. These vessels are generally built for fast sailing, and are well manned. The cruiser rates technically just below the battleship and just above the gunboat. An armored cruiser has side or vertical armor and horizontal or deck armor. A protected cruiser has horizontal or deck armor only. An unprotected cruiser has no armor. In the United States navy the name of cruiser is also given to small gunboats. Sometimes in war merchant steamships of great speed are armed to assist a navy, and such vessels are then called auxiliary cruisers. In the Spanish-American war cruisers of this class performed services of great importance to the United States Navy. See NAVY OF THE UNITED STATES, THE; WARSHIP.

Cruive, krûv, in Scotland, a kind of trap used in rivers for catching salmon, made of stakes or hecks, with a large opening by which the salmon may enter but by which they cannot escape, and with smaller openings between the stakes large enough to allow young salmon to escape freely.

Crummell, Alexander, American colored Episcopal clergyman: b. New York 3 March 1819; d. Point Pleasant, N. J., 9 Sept. 1898. His father was a native African and his mother a free woman. He received his education at the Oneida Institute, and in 1839 applied for admission to the General Theological Seminary. His request was refused owing to the intense prejudice against the higher education of the negroes. He accordingly went to England in 1848 and graduated at Cambridge University in 1853. He engaged in missionary work in Liberia 1853–73, when he went to Washington, D. C., and founded St. Luke's Church, of which he was rector until 1895. In 1897 he organized the American Negro Academy in New York. He published: 'The English Language in Liberia' (1861); 'The Future of Africa' (2d. ed. 1862); 'The Negro Race Not Under a Curse' (1863); 'The Greatness of Christ, and Other Sermons' (1882); 'Africa and America' (1891).

Crusade, Children's. See CRUSADES.

Crusades (Portug. *crusado,* "marked with the cross"), the wars which were carried on by the Christian nations of the West, from the end of the 11th till the latter half of the 13th century for the conquest of Palestine, so named because the warriors who followed the holy banner wore the sign of the cross. The Christian and Mohammedan nations had been during a long period in a state of war, not only in Asia, but also in Europe, where the Mohammedan Moors had taken possession of part of the Spanish peninsula. Grieved that the Holy Land should be in the power of unbelievers, pilgrims, on their return, related the dangers they had encountered. The Caliph Hakem was described as a second Nero, son of a Christian woman, who shed the blood of Christians without mercy, to prevent the suspicion of his being secretly attached to that religion. These representations kindled the religious zeal of Christian Europe into a flame, and a general ardor was awakened to deliver the sepulchre of Christ from the hands of the infidels. In the mental twilight of the close of the Dark Ages men were just in a state to receive a strong religious excitement. The idea of the Virgin harmonized well with the Teutonic reverence for the female sex; and to fight in her cause was gratifying to the spirit of chivalry. The undisciplined minds of men were bent on adventure, and their imaginations were easily roused by the reports of the riches of the East. The joys of paradise were promised to all who should fall in the holy cause. Thus a crowd of the strongest feelings, chivalrous devotion to women, hope of adventure, wealth, honor, and heaven, stirred the spirit of Europe. The Pope considered the invasion of Asia as the means of promoting Christianity among the infidels, and of winning whole nations to the Church. Monarchs expected victory and increase of dominion; the peasant, who, in the greater part of Europe, was struggling with wretchedness in the degrading condition of bondage, was ready to follow to a country which was pictured as a paradise. The East has always had a poetical charm for the people of the West. The Crusades, and the ardor with which whole nations engaged in them, must be attributed to these actual causes.

Peter of Amiens, or Peter the Hermit, was the immediate cause of the first Crusade. In 1093 he had joined other pilgrims on a journey to Jerusalem. On his return he gave Pope Urban II. a description of the unhappy situation of Christians in the East, and presented a petition from the patriarch of Jerusalem, asking the assistance of the Western Christians for their suffering brethren. The Pope disclosed to the council which was held at Piacenza in March 1095, in the open air, on account of the number of people assembled, the message which Christ had sent through Peter the Hermit, caused the ambassadors of the Greek emperor Alexius to describe the condition of Christianity in the East, and induced many to promise their assistance for the relief of their oppressed brethren. The sensation which he produced at the council assembled at Clermont in November 1095, where ambassadors from all nations were present, was still greater. He inspired the whole assembly so completely in favor of his plan that they unanimously exclaimed, after he had described the miserable condition of the Oriental Christians, and called on the West for aid, "*Deus vult*" (It is God's will!).

In 1096 numberless armies went forth in different divisions. This is considered the first Crusade. Many of these armies, being ignorant of military discipline, and unprovided with the necessaries for such an expedition, were completely destroyed in the different countries through which they had to pass before reaching Constantinople, which had been chosen for their place of meeting. A superficial knowledge of these holy wars throws a false glare round the character of the crusading armies. They contained, indeed, some men of elevated character; but the greater part consisted of crazy

fanatics and wretches bent on plunder. A well-conducted regular army, however, of 80,000 men was headed by Godfrey of Bouillon, Duke of Lower Lorraine; Hugh of Vermandois, brother to Philip, King of France; Baldwin, brother of Godfrey; Robert II. of Flanders; Robert II. of Normandy, brother of William II., king of England; Raymond of Toulouse; Bohemond of Tarentum, son of Robert Guiscard; Tancred of Apulia, cousin of Bohemond; and other heroes. With this army the experienced commanders traversed Germany and Hungary, passed over the Strait of Gallipoli, and conquered Nicæa in June 1097. Shortly after, on 4 July the Crusaders met an Eastern army in a pitched battle for the first time. This was at Dorylæum, where after a severe contest, the Crusaders were completely victorious, and the Turkish army put to flight. The Crusaders now marched through Asia Minor on Antioch, which, with the exception of the citadel, fell into their hands by treachery 3 June 1098. Before they could capture the citadel they had themselves to stand a siege in Antioch, a Turkish army having advanced and surrounded the town soon after its capture by the Crusaders. In three weeks' time the crusading army was reduced to the most pitiable condition; but on 28 June they sallied out in battle array, and succeeded, famished and exhausted as they were, in completely routing the well-equipped Turkish army. Meanwhile Baldwin, who had separated from the main army while it lay encamped on the banks of the Orontes, had proceeded toward Edessa, then in the possession of a Christian prince who maintained himself with difficulty against the neighboring Mohammedan emirs, and concluded a treaty with him by which he agreed to aid him against his Mohammedan foes, on condition that he himself should be his successor on his death. This treaty was concluded in February 1098; and soon after the prince of Edessa was killed in a popular insurrection, when Baldwin made good his claims to succeed him, and soon made himself ruler of an extensive territory stretching over the Armenian mountains and the plain of Mesopotamia. The Crusaders remained nearly a year in the neighborhood of Antioch; but at last, in May 1099, the march against Jerusalem was begun. The siege of this city was commenced by the crusading army, now reduced to little more than 20,000 men, early in June; and finally after terrible contests and the most violent exertions on the part of the besiegers, it was taken after a two days' storm, on July 15. Godfrey of Bouillon was chosen king of Jerusalem, but refused "to wear the king's crown on the spot where the Saviour of the world had worn a crown of thorns," and preferred to style himself Protector of the Holy Sepulchre. Godfrey died in 1100, and was succeeded by his brother Baldwin, who did not scruple to accept the title which Godfrey had refused. The news of the conquest of Jerusalem renewed the zeal of the West. In 1102 an army of 160,000 men left Europe, but perished partly on their march, and partly by the sword of the sultan of Iconium. The Genoese and other commercial nations undertook several expeditions by sea.

The second great and regularly conducted Crusade was occasioned by the loss of Edessa, which the Saracens conquered in December 1144. The news of this loss produced great consternation in Europe, and it was apprehended that the other acquisitions, Tripolis, Antioch and Jerusalem, would fall again into the hands of the infidels. In consequence of these fears Pope Eugenius III., seconded by St. Bernard of Clairvaux, exhorted the German emperor, Conrad III., and the king of France, Louis VII., to defend the cross. Both these monarchs obeyed the call in 1147, and led about 140,000 men to the East; but their enterprise was not successful, and they were compelled to withdraw, leaving the kingdom of Jerusalem in a much weaker condition than they had found it. They returned to Europe in 1149.

When Sultan Saladin in 1187 took Jerusalem from the Christians, the zeal of the West became still more ardent than at the commencement of the Crusades; and the monarchs of the three principal European countries — Frederick I. (Barbarossa), emperor of Germany; Philip Augustus, king of France; and Richard I. (Cœur de Lion), king of England, determined to lead their armies in person against the infidels. The army of Frederick assembled at Ratisbon in the spring of 1189, and marching along the Danube through Austria and Hungary, forced its way through the Byzantine empire, and embarked at Gallipoli for Asia Minor. At Philomelium, about 23 miles from Iconium, Frederick found an innumerable Turkish army assembled to oppose him, and a bloody battle ensued (7 May 1190). The attacks of the Turks were frequently renewed during the day, but without success, and under cover of night they made their escape from the battlefield. After this victory Frederick continued his march through Asia Minor, and had already reached Seleucia when his sudden death by drowning in the waters of the Kalykadnos crippled and almost immediately put an end to the expedition (10 June). His son Frederick, Duke of Swabia, was now chosen leader of the army, and with the small remains of it he reached Acre on 8 October, and took part in the siege of that fortress, which had already been begun. But when he also was carried off by disease on 20 Jan. 1191, the rest of the German army dwindled away, and the expedition thus came to an end. The other two who took part in this third Crusade, Richard of England, and Philip Augustus of France, met at Vézelay in June 1190, and agreed to unite their forces at Messina in Sicily. Here they spent six months at the end of 1190 and the beginning of 1191. Philip was the first to sail thence for the Holy Land; and on the day before Easter (13 April 1191) he joined the other Crusaders before Acre, who had already arrived there from various Italian ports. Richard was not so fortunate. Soon after leaving Sicily his fleet encountered a violent storm, and many of the vessels were driven out of their course to the island of Cyprus, and one of these contained his mother and Berengaria of Navarre, to whom he had been betrothed in Sicily. The island of Cyprus was then an independent kingdom subject to Isaac Comnenus, a Byzantine prince, despotic, cruel, and avaricious. All strangers landing on the island, and all who were shipwrecked on its coasts, were treated by him as enemies; and the English knights who had been compelled to take shelter in the island were put in chains and robbed of their property. Even the ladies of the royal household were in danger of being

conveyed to the castle of the king, when Richard himself, who had been driven to the island of Rhodes arrived and ultimately succeeded in taking Isaac and his daughter prisoners, whereupon he caused himself to be recognized as king of Cyprus. (He afterward made over the island to Guy of Lusignan, on condition of his renouncing his claim to the title of king of Jerusalem.) It was not till 8 June that he reached Acre to take part in the siege of that fortress, which was still going on. Little more than a month after his arrival Acre surrendered (12 July). The Christian camp was now torn by dissensions. Richard and Philip Augustus, who had never been very friendly allies, were jealous of the honors paid to the other, and within a few weeks after the fall of Acre the French king returned to Europe. Richard thus became recognized as the sole leader of the expedition; and it was chiefly in the battles, sieges, and forays which ensued that he acquired that reputation for personal valor and prowess for which he is celebrated in romance and song, and which secured him the title by which he is generally known. He did not, however, exhibit the same ability as a general. Although nearly always victorious in his engagements with the enemy, his enterprises can scarcely be regarded as successful. He defeated Saladin at Adsoof, and soon after occupied Jaffa or Joppa; but having twice set out with the design of besieging Jerusalem, he retired both times without effecting his purpose; and at last despairing of ever accomplishing the object of the Crusade, he concluded a truce of three years and three months with Saladin, who agreed that pilgrims should be freely permitted to visit the Holy Sepulchre, and that the whole sea-coast from Tyre to Jaffa (including the fortress of Acre), together with half the district between Ramleh and Lidda, should belong to the Crusaders. This treaty was concluded on 2 Sept. 1192, and in the following month Richard departed from Syria. The chief result of this Crusade was the possession of Acre, which, until the entire termination of the Crusades, remained the bulwark of the Christians in the East.

The fourth Crusade was set on foot at the instigation of Pope Innocent III., who commissioned Fulk of Neuilly to preach it in 1198. Among its chief promoters were Godfrey of Villehardouin, seneschal of Champagne; Baldwin, Count of Flanders; and Hainaut Dandolo, the aged doge of Venice; and the Marquis of Montferrat, who was chosen leader. The Crusaders assembled at Venice in the spring of 1202, but instead of proceeding at once to Egypt, their objective, they were induced by Dandolo, in spite of the protests of Innocent and the ban of excommunication which he pronounced on them, to attack the town of Zara in Dalmatia — a town which had formerly belonged to the Venetians, but which had renounced its allegiance, and now under the protection of the king of Hungary inflicted considerable loss on the commerce and shipping of Venice. Zara was captured in November; but while the Crusaders were still lying before it messengers had come to them from Constantinople requesting their aid for one of the claimants for the throne of the Byzantine empire. The Marquis of Montferrat, who through his brothers was connected with the Comneni and with Alexius, who aspired to the rank of emperor, was favorable to the request; and as Dandolo, expecting that considerable advantages might accrue to Venice from the expedition, was not disinclined to it, the Crusade was thus diverted from its original purpose and turned against Constantinople. In 1203 the city was taken, but in consequence of a revolution in the royal palace hostilities between the Crusaders and the Byzantines soon broke out again, Constantinople was again taken, and on this occasion sacked, and the Crusade ended, without ever reaching its original destination, in the establishment of a Latin empire at Constantinople (1204).

In the decade that followed came a new proof of the mystic spirit of the time in the Children's Crusade, a thing so strange that in spite of the detailed account given by Alberic de Trois Fontaines it was long held a myth. Now it is very generally believed that in June 1212 a boy named Etienne, a French peasant of Cloyes, near Vendôme, urged on by priests, began to preach a children's crusade, proclaiming his divine mission and his assurance of miraculous aid in his behalf. At the same time a like army raised in Germany by a lad called Nicholas set out 20,000 in number, crossed the Alps and came almost decimated to Genoa, where finding no way opened up for them through the sea they turned about and made their way to Germany. The French army in the meantime gathered at Marseilles about 30,000 strong and there got free passage to Alexandria from two famous outfitters of the day, Ferri and Porc. Two ships were wrecked on the Sardinian coast and those who survived the voyage on the five others were sold, boys and girls alike, to Arab slave merchants. About 700 of them were alive 17 years afterward when Frederick II. made peace with Alkamil and regained their liberty. Roger Bacon explained the crusade, which must have been nothing but the product of half crazed fanaticism, as a plot of the khan of the Tartars; others saw in it the work of the Old Man of the Mountains or some other Moslem who took this way of cutting off the supply of soldiers for a new crusade; and the more pious took it as the direct interposition of the devil. Consult: Rohricht's article in von Sybel's 'Historische Zeitschrift' (1876) and the popular account by Gray, 'The Children's Crusade' (1871).

The fifth Crusade was undertaken by Andreas of Hungary in 1217, and was shared in by John of Brienne, to whom the title of king of Jerusalem was given, and by a large number of prelates and nobles. Egypt was invaded and Damietta captured, Nicholas of the German Children's Crusade taking part in the siege. But the Crusaders quarreled so fiercely among themselves that their power was broken and they had to evacuate the Nile delta. Dămietta was recaptured in 1221 and so ended a crusade so short and fruitless as often to be omitted from the enumeration, the next being styled the fifth.

The sixth (sometimes called the fifth) Crusade was led by Frederick II. of Germany. It was undertaken at the command of the Pope Honorius III., and was pressed forward by Gregory IX., the successor of Honorius, who died in 1227, before the expedition started. When everything was ready for setting out a pestilence broke out in the army, and Frederick himself was attacked by it, in consequence of which he postponed his departure and retired to

the baths of Pozzuoli till he should recover. All the preparations for the expedition were thus frustrated, and Gregory angrily pronounced the ban of excommunication on Frederick for his delay. Frederick, however, without waiting for the ban to be taken off, renewed his preparations in the following year when he actually started for the Holy Land. Here, without any fighting, by negotiations with the sultan of Egypt, he recovered for himself, as the heir of John of Brienne, the small kingdom of Judea, on the condition of tolerating in his kingdom the Mohammedan worship. In spite of the remonstrances of the Pope he concluded on behalf of the Christians of the East a truce of 10 years (which was soon broken), and was crowned at Jerusalem. There was then seen the extraordinary spectacle of the cross being erected on the Church of the Holy Sepulchre by the hands of an excommunicated prince overwhelmed with the papal anathemas. Nevertheless, he returned to Europe in 1229 without having done anything to secure the possession of the territory which he had recovered, and which now once more remained exposed to the ravages of the infidels.

The last two Crusades were led by St. Louis of France (Louis IX.) in person. Resolved to strike a blow at Mohammedanism in Egypt, which country since the foundation of the Ayoubite dynasty had become in some measure the centre of the Moslem faith, or which had at least risen in importance with the decay of Bagdad, he embarked at Aigues-Mortes in 1248, and having reached Egypt laid siege to Damietta, which he took in June 1249. The same year Louis entered on a march up the Nile, which terminated disastrously both for himself and the Crusaders. His army became involved in the numerous bogs and streams about the delta, and being attacked at Mansourah was obliged to retreat. It was overtaken by the army of the sultan in a position in which resistance was hopeless, and the whole army was forced to surrender (1250). Louis recovered his liberty by the surrender of Damietta, and then proceeded with what was left of his army to Palestine, where he repaired the fortresses and anxiously awaited reinforcements. When these did not appear, and when the news was brought to him of the death of his mother, Blanche of Castile, whom he had left regent in his absence, he determined to return home. In the spring of 1254 he embarked at Acre, and landed in France in July, after a stormy voyage.

The second expedition of Louis was still more disastrous. He was stirred up to this enterprise by his brother Charles of Anjou, king of the Two Sicilies, and partly induced to undertake it by the chimerical hope of converting the Moorish king of Tunis to Christianity. With this idea he landed his army in 1270 on the northern coast of Africa, where, however, he himself and a large number of his knights died before Tunis. Soon after the king's death a treaty was concluded with the king of Tunis by Charles of Anjou, and the majority of the French Crusaders returned home. A crusading army which had been equipped at the same time under Prince Edward of England (afterward Edward I.) did not join the army which had set out under Louis till after this peace had been concluded, but rejecting the determination which the French had reached to postpone the further prosecution of the enterprise it continued the voyage to Syria. Edward arrived at Acre in April 1271, but finding that little was to be effected he in the following year concluded a truce for 10 years and returned to England. For 19 years longer the Christians in Palestine succeeded, but with great difficulty, in holding the remnants of the Latin kingdom there. But Tyre and Berytus were successively snatched from them, and finally the capture of Acre by the sultan of Egypt in 1291, just 100 years after it had been taken by Richard of England and Philip Augustus of France, extinguished forever the kingdom founded by the Crusaders.

The results and importance of the Crusades in the world's history are not to be estimated by what they accomplished in Palestine. Their effects on Europe are felt to the present day, although the object for which the Crusaders strove was a futile one, and remains to this day unaccomplished. By means of these joint enterprises the European nations became more connected with each other, the class of citizens increased in influence, partly because the nobility suffered by extravagant contributions to the Crusades, and partly because a commercial intercourse took place throughout Europe, and greatly augmented the wealth of the cities; the human mind expanded, and a number of arts and sciences, till then unknown in Europe, were introduced there. The present civilization of the European world is, in a great degree, the result of these Crusades. It belongs to a history of poetry to describe how much contemporary poetry was affected by the Crusades, and the extent to which they gave currency to a certain class of ideas that has prevailed ever since.

The best history of the Crusades down to the year 1184, and that on which all subsequent histories for that period are principally founded, is the comprehensive work of William Tyre, 'Belli-Sacri Historia,' printed in 1549, at Basel. The original sources are collected in the 'Recueil des historiens des croisades' (1887). Consult, besides, the incidental narratives in Gibbon, 'Decline and Fall of the Roman Empire,' and the special works, Robson, 'History of the Crusades' from the French of Michaud (1881); Lady Duff-Gordon, 'The History and Literature of the Crusades' from the German of von Sybel (1861); Archer and Kingsford, 'The Crusades' (1895), and Ludlow, 'The Age of the Crusades' (1896).

Cru'sé, Christian Frederick, American scholar: b. Philadelphia, Pa., 27 June 1794; d. New York 5 Oct. 1864. In 1815 he graduated with honor at the University of Pennsylvania, having been the first moderator of the Philomathean Society of that college. After several years as Lutheran minister he was ordained by Bishop White in the Episcopal Church 1822. He was assistant professor in the university in which he had been educated 1831–3; was rector of churches in several places; became librarian of the General Theological Seminary of the Episcopal Church, New York, 1853. He translated the 'Ecclesiastical History of Eusebius Pamphilus' (1833) and the whole of Eschenburg's 'Classical Manual' (1836), only the part relating to Roman literature being incorporated in N. W. Fiske's translation.

Crustacea, krŭs-tā'shĕ-a, a primary group (phylum) of animals represented by the bar-

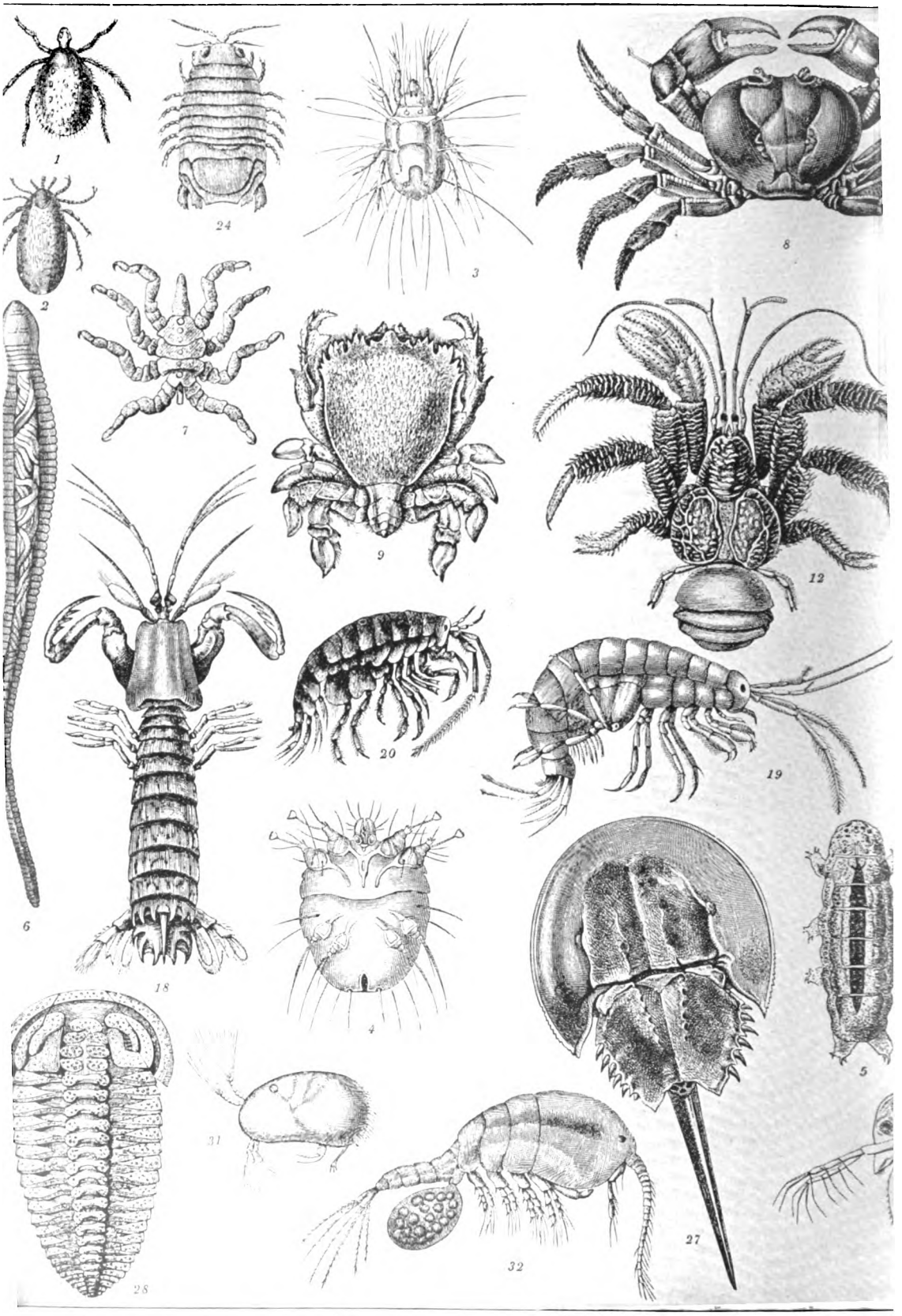
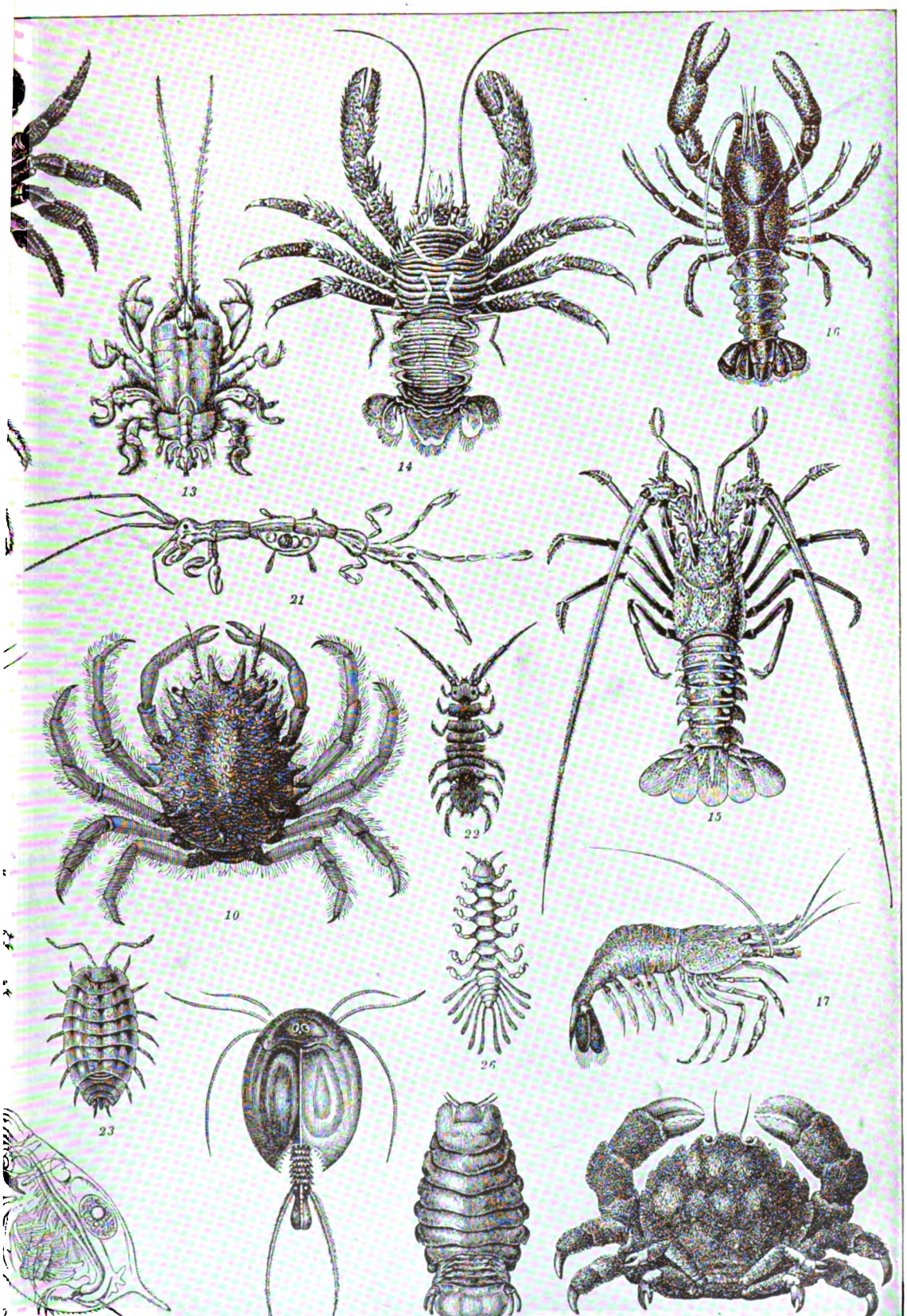
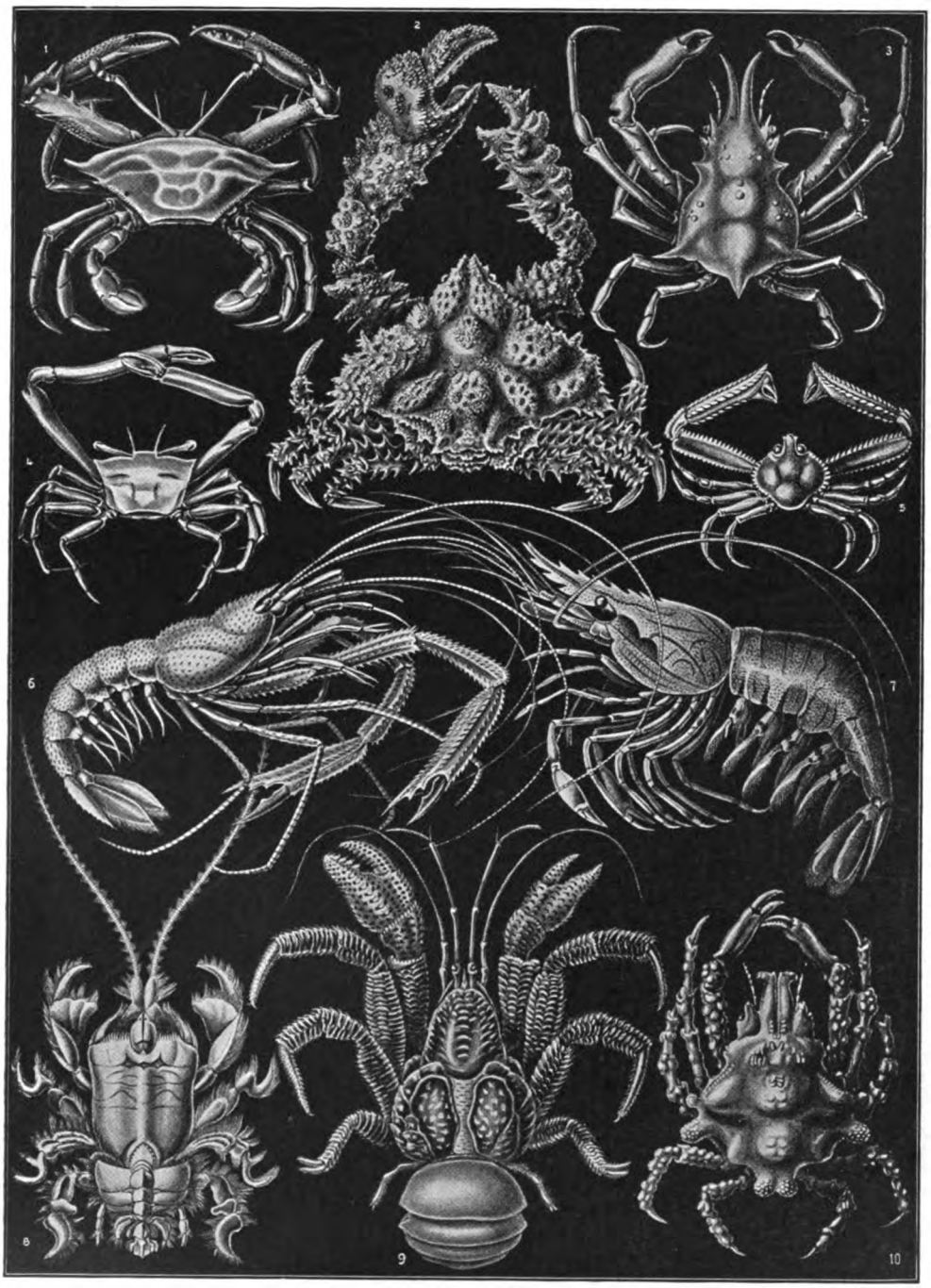


Fig. [1] Harvest Bug. [2] Hedgehog Tick. [3] Cheese-Mite. [4] Itch Animal. [5] Bear Animalcule. [6] Linguatulina. [7] Sea-Sp
[15] Spiny Lobster. [16] Crayfish. [17] Prawn. [18] Squill, or Mantis Shrimp. [19] Freshwater Shrimp. [2
[27] Limulus, or King-Crab. [28] Trilobite. [29] Apus, or S



ler. [8] Land-Crab. [9] Frog-Crab. [10] Spider-Crab. [11] Woolly-Crab. [12] Purse-Crab. [13] Albunea. [14] Plated Lobster.
Hermit Screw. [21] Caprella. [22] Isopod. [23] Wood-Louse. [24] Sphæroma. [25] Fish-Louse. [26] Ione.
eld-Shrimp. [30] Water-Flea. [31] Cypria. [32] Cyclops.



1. An East Indian edible crab (Podophthalmus vigil).
2. East Indian sping crab (Parthenope horrida).
3. A Mediterranean crab (Pisa armata).
4. Three-angled Mediterranean crab (Gonoplax rhomboides).
5. Three-angled Atlantic crab (Pisolambrus nitidus).
6. East Indian shrimp (Stenopus hispidus).
7. Northern shrimp (Palæmon serratus).
8. A Mediterranean porcelain crab (Albunea symnista).
9. Cocoanut crab (Birgus latro).
10. Mediterranean purple crab (Lissa chiragra).

nacle, lobster, crayfish, shrimp, and crab. Crustacea differ from other arthropod animals. The body consists of about 20 segments which in the more specialized forms are grouped into two regions, the head-thorax (cephalothorax) and hind-body or abdomen. The segments of the cephalothorax are fused together so that the limits between the segments are lost, and the whole mass is protected by the shield or carapace. The skin is thick and rendered solid by the deposition of lime (carbonate and phosphate), so that the integument forms a dense crust, hence the name Crustacea. They differ from trilobites and king crabs (qq.v.) in having two pairs of antennæ, while they breathe by means of gills attached to the legs. Like the other marine arthropods named, they have legs which are divided into two divisions, an outer (exopodite) and an inner (endopodite). Crustacea differ from the *Palæopoda* also (trilobites, merostomes and arachnids) in the high degree of specialization of their appendages, there being from three to six kinds, with corresponding functions, while in the trilobites, so far as we know, the single pair of antennæ are succeeded by numerous (over 20) pairs of legs, all of the same shape and functions. In the head-thorax, besides the antennæ, there is on each side of the mouth a pair of mandibles, each with a palpus, two pairs of maxillæ or accessory jaws, which are flat, divided into lobes, and of unequal size; three pairs of foot-jaws (maxillipedes), which differ from the maxillæ in having gills like those on the five following pairs of legs. There are thus 13 pairs of cephalothoracic appendages, indicating that there are 13 corresponding segments; these, with the seven abdominal segments, indicate that there are 20 segments in a typical crustacean. There are six pairs of swimming legs (swimmerets), the last very broad in the lobster and shrimp, with the telson forming the "tail-fin."

The Crustacea as a rule respire by gills. These, as in the lobster and crab, are composed of a series of little filaments into which the blood flows to be aërated. The filaments branch out from a common stalk which grows out of the basal joint of the five pairs of legs and the three pairs of foot-jaws. These gills are folded up toward the back, and are contained in a sort of chamber made in part by the carapace. In shrimps, lobsters, and crabs the sea-water passing into the cavity between the body and the free edge of the carapace is afterward scooped out through an opening or passage on each side of the head by the movements of membranous flaps called "gill-bailers." The digestive organs are well developed, especially the fore stomach, in the hinder part of which are several very large calcareous teeth for crushing the food, serving, when closed together, as a strainer through which the partly digested food presses into the long slender straight intestine, which ends in the telson. The liver is very large, as in all marine arthropods, or in such terrestrial types as the scorpions and spiders, which are derived from the king crabs. The brain of the higher Crustacea is very complex, corresponding with the complicated reflex movements of an animal composed of so many segments, and bearing such a complicated series of appendages devoted to so great a variety of functions. The eyes are usually compound or many-faceted, and are mounted on freely movable stalks. The ear is a sac in the basal joint of the smaller or second pair of antennæ. The organs of smell are usually well developed, as Crustacea mainly depend on this sense in finding their food. These consist of minute delicate sensory rods on the smaller antennæ. The hairs fringing the mouth-parts and legs are often delicate tactile organs. The green glands in the head function as kidneys, and open out at the base of the larger antennæ.

With only a single known exception (*Squilla*), Crustacea carry their eggs about attached to the swimming or other legs. The eggs of some crabs (*Neptunus*) are minute and excessively numerous, their number amounting to millions, while the lobster may produce from 20,000 to 80,000 eggs. Crustacea pass through a well-marked metamorphosis, nearly all (except the amphipods and isopods) hatch from the egg as a larva called a "nauplius," which has an oval non-segmented body, with three pairs of appendages, by which it swims about at the surface of the sea. After a series of molts, at each of which new segments with their appendages arise, they finally reach maturity. The shrimps and crabs hatch in a more advanced larval stage called the zoëa, the nauplius stage being partly suppressed and thrust back into the embryo period. The zoëa has a head and abdomen, but no thorax: this, however, is developed later, and after a series of molts the parent form is attained.

The process of molting is a precarious one, not infrequently resulting in death. The crust being too solid to admit of a continuous growth, and increase in size being rapid, frequent sheddings of the skin are necessary. In the lobster, the old skin being detached from the under cellular layer by the secretion of the new cuticle beneath, it ruptures between the thorax and abdomen, and the lobster draws itself out of the rent, shedding not only the entire skin and every hair, but also the lining of the mouth, throat, and fore stomach, and likewise the end of the intestine. In about three weeks after the casting of the shell the new one becomes solid and hard. In the crayfish the old skin is loosened and pushed away from the cellular layer beneath by the growth of temporary, short stiff hairs, which disappear after the skin is shed.

The Crustacea are a very ancient type. The earliest remains are found in the Cambrian rocks, but are very scanty compared with the trilobites. They comprise traces of barnacles, *Ostracoda* or small shelled forms, *Phyllocarida*, and an obscure form supposed to be allied to the modern freshwater *Apus*. In the Devonian Period shelled phyllopods (*Estheria*) appeared, while in the Carboniferous arose an order (*Syncarida*) represented by an ancient form (*Anaspides*) still living in a lake in Tasmania. From this group the existing *Schizopoda* or "opossum shrimps" (*Mysis*), the *Squilla*, and the ordinary shrimps and crabs, are supposed to have descended. *Isopoda* also appeared as early as the Devonian. A shrimp-like Crustacean occurs in the Devonian, and true crabs date from the Jurassic.

The Crustacea are divided into 11 orders, the *Branchiopoda*, *Phyllopoda*, *Ostracoda*, *Copepoda*, *Cirrepedia* or barnacles, *Arthrostraca*, *Cumacea*, *Phyllocarida*, *Syncarida*, *Schizopoda*, *Stomatopoda*, and *Decapoda*. There are over

5,000 species known. See BARNACLE; CRAB; FISH LICE; HERMIT CRAB; SHRIMP.

Crutched Friars. This order appeared in England in the 13th century, and had monasteries in London, Oxford, and Reigate. From the staff which they carried in their hand, on the top of which was a cross, they received the name croisiers, which soon was corrupted into "Crouched" or "Crutched" friars. A street in London bears this name.

Cruveilhier, krü'vā'li-ā', **Jean,** French anatomist: b. Limoges 9 Feb. 1791; d. Jussac 6 March 1874. He obtained in 1835 the chair of pathological anatomy created in Paris by Dupuytren. He published an important work on 'The Pathological Anatomy of the Human Body' (1829–40), and other works.

Cruz, Juana Ines de la, hoo-ā'nä ē-nĕs' dā lä, Mexican poet: b. 12 Nov. 1651; d. 17 April 1695. Having retired from the vice-regal court at the age of 17, she became a nun of the Hieronymite order, and devoted herself to poetry, music, and mathematics, leading at the same time a life of great austerity. Her writings consist of songs, dramas (all these except two on religious themes), prologues, and dramatic sacred allegories. Her contemporaries styled her "the Tenth Muse" and "the Mexican Phœnix."

Cruz, Ramon de la, rā'mōn dā lä krooth, Spanish dramatic poet: b. Madrid 1731; d. 1799. He rescued the native Spanish drama from an inundation of French influence. A marvelously prolific writer, he produced some 300 pieces in all departments of dramatic composition; but of them all only some interludes can now command attention; these are alive in every line, reflecting with absolute truth the life of the lowest orders.

Cruz, San Juan de la, sän hoo-ān' dā lä, (Saint John of the Cross), Spanish mystic and poet: b. Fontiveros, Old Castile, 1542; d. Ubeda 14 Dec. 1591. He was a Carmelite friar, canonized in 1674. His prose writings on the inner life won for him the title "The Ecstatic Doctor"; famous among them is 'The Soul's Darksome Night.' In form and spirit his poetry is noble, deep, and inspired by profound feeling. His complete 'Spiritual Works' were first published in 1619, and in a 12th edition in 1703.

Cruz y Goyeneche, Luis de la, loo-ēs' dā lä kroos-ē-gō-yā-nā'chā, Chilean military officer: b. Concepcion 25 Aug. 1768; d. near Valparaiso 14 Oct. 1828. He bore a leading part in the revolution against Spain, commanding a regiment and falling into the hands of the enemy, but was liberated in 1817. He next became a political leader of the young republic, serving for a time as acting president of Chile. He was invested by Peru with the dignity of grand marshal.

Cruzado, kroo-zā'dō, or **Crusado,** a Portuguese coin. The old cruzado or cruzado-velho was worth 400 reis, 43 cents; the new cruzado, cruzado-novo or pinto, is worth 480 reis, 52 cents.

Cryolite, krī'ō-līt (Gr. "ice-stone," in allusion to its translucent whiteness), a native fluoride of aluminum and sodium, having the formula $3NaF.AlF_3$. It crystallizes in the monoclinic system, and also occurs massive. It is transparent or translucent, and the purer varieties are colorless or white. Its lustre is vitreous, and it has a hardness of 2.5 and a specific gravity of about 3. The best-known deposit of cryolite is in West Greenland, whence large quantities of it have been taken for use in the preparation of metallic aluminum (q.v.). Less important deposits are also known in the Urals, and in El Paso County, Col. Cryolite is also used in the manufacture of alum, soda, and certain kinds of glass, notably the so-called "milk-glass," or hot-cast porcelain, which is composed of cryolite, silica, and oxide of zinc.

Cryophorus, krī-ŏf'ō-rŭs (Gr. "ice-bearing"), a simple instrument devised by Wollaston for illustrating the freezing of water by rapid evaporation. The instrument consists of a bent tube of glass, provided with a bulb at each end. A small quantity of water is placed in it, and boiled until the air is entirely expelled and replaced by steam. The tube is then hermetically sealed. In using the instrument, the water is brought into one of the bulbs, and the other, containing only water-vapor, is placed in a freezing mixture. The vapor condenses rapidly in the chilled bulb, and a correspondingly rapid evaporation is induced in the other one. The formation of vapor, however, is attended by the absorption of large quantities of heat; and the water in the free end of the apparatus, being the chief source from which this heat is obtained, presently becomes chilled to such a degree that it freezes.

Crypt, in architecture, a cell or vault constructed underground. The underground tombs of the Christian martyrs were so called, where the early Christians met to perform their devotions, for fear of persecution. Hence crypt came to signify a church underground, or the lower story of a church, which may be set apart for monumental purposes, or used as a chapel. The crypt is not common in churches built after the Norman period and when found in those of the Gothic period is usually much older than the structure above them. The usual position of a crypt is beneath the choir, but occasionally, as at Glasgow Cathedral, beneath the transept also. The largest crypt in England is that at Canterbury Cathedral. Crypts rarely occur as a feature of a parish church. The larger crypt at Glasgow Cathedral is entirely above ground and at one time was used by itself as a church.

Cryptidine, krĭp'tĭ-dĭn ($C_{11}H_{11}N$), a base homologous with quinoline, obtained in the preparation of that body, and also found in the less volatile parts of coal-tar. Its boiling-point is about 525° F., but it has not yet been prepared perfectly free from its lower homologues. It forms a double salt with platinum.

Cryptobranchidæ, krĭp to-brăn'kĭ-dē (Gr. "with hidden gills"), a family of urodele *Amphibia* (q.v.) most nearly related, according to Cope, to the *Amblystomidæ*. There are no gills in the adult, but a single pore-like branchial fissure may persist on each side. Respiration is pulmonary, but the inspirations occur only at intervals of several minutes. The vertebræ are biconcave but, like the remainder of the skeleton except the cartilaginous carpi and tarsi, are well ossified. There is no ethmoid bone, and the internal ear is separated from the brain by membrane only. A maxillary bone is developed, and teeth are borne on the margins of

both jaws, as well as on the vomers, but not on the parasphenoid. The eyes are very small and devoid of lids; two pairs of limbs with four and five digits respectively are always present, and the tail is permanently provided with a fin. Two genera are known: *Megalobatrachus,* which has no branchial opening and contains only the giant salamander of eastern Asia, and *Cryptobranchus,* which contains the American hellbenders (q.v.).

Cryptog'amous Plants, or **Cryptog'ams** (from Gr. κρυπτός, hidden + γάμος, marriage). All plants below the Phanerogams or flowering plants. The names were first used by Linnæus, who may thus have indicated his conviction that all plants possess sexuality. (They do not.) For a long time the vegetable kingdom was divided into two groups, as follows: (1) *Phanerogamia,* with stamens, ovules, seeds, and embryos. (2) *Cryptogamia,* without stamens, ovules, seeds, and embryos, and with spores. These distinctions, although long since acknowledged to be unscientific, are still maintained, especially in popular usage. The Cryptogams, instead of being a single group co-ordinate with the Phanerogams, include several such groups, namely: Waterslimes (*Protophytes*); Spore-tangles (*Phycophytes* or *Algæ*); Fruit-tangles (*Carpophytes* or *Fungi*); Mossworts (*Bryophytes*); Fernworts (*Pteridophytes*).

Cryptograms. See CIPHER WRITING.

Cryptography. See CIPHER WRITING.

Cryptomeria, krĭp-tō-mē'rĭ-ą (Gr. "with hidden parts," its seeds being concealed in bracts), a beautiful tall-growing conifer, known also as the Japanese cedar. The tree grows in the mountainous regions of China and Japan, and many varieties are cultivated. It was introduced into Europe in 1842, and is now widely cultivated. It is closely allied to the *Sequoia* (q.v.).

Cryp'ton. See KRYPTON.

Cryptoprocta, krĭp-tō-prŏk'tą (Gr. "with hidden anus"), a genus of carnivorous animals, of which there is only one species (*C. ferox*), regarded also as forming a family by itself. It is a native of Madagascar, and about three feet long, with a tail about two feet in length. It is sometimes called the fossa after its native name foussa, and also tambasading. It somewhat resembles a civet-cat, but is more nearly allied to the true cats, though a plantigrade, or to the genets.

Crypturi, krĭp-tū'rī (Gr. "hidden tail," because of the rudimentary tail), an order of birds, sometimes called the *Tinami* or *Tinamiformes,* from their native name tinamou, generally regarded as *Ratitæ* (q.v.), but placed among the *Carinatæ* (q.v.) by those who regard the presence of a keeled sternum as of greater classificatory value than the desmognathous palate. Besides the characters just mentioned, which are combined in no other known birds, other remarkable osteological features are the complete union of the vomer and palatine bones, the single articular head of the quadrate, the rudimentary tail skeleton (pygostyle), the ostrich-like pelvis and legs (but not feet), and the well-developed clavicles, all but the last being ratite characters. The quill feathers of the tail are 10 or 12 in number and completely hidden beneath the coverts; the wings, which are very short and concave, have 10 primary and from 13 to 16 secondary quills; contour feathers are of the ordinary type found in flying birds, with the aftershaft rudimentary or absent. There are three long anterior toes with claws like a pheasant's, and the hallux is short and elevated, or, very rarely, absent; in fact the feet are of a strictly gallinaceous type. About 9 or 10 genera and 70 species are known, all but 6, which are South American, occurring especially in Argentina and Brazil. See TINAMOU.

Crys'tal (Gr. "ice"), a body whose molecules are arranged according to a definite geometrical scheme; and which is bounded by a series of surfaces that are plane (or nearly so), and which fulfil certain simple mathematical relations. The external regularity of form is the most obvious peculiarity of a crystal, and for many years the attention of physicists was directed to the study of this external form, almost to the exclusion of the other remarkable features that crystals possess. It is now understood, however, that the most essential thing in a crystal is its definite internal structure, the external form being merely one way in which this definite structure makes itself manifest. A piece of glass may be cut or cast into the precise form of a given crystal, and yet the glass does not thereby become a crystal, because it still lacks the molecular structure which is the prime requisite. The glass will break as readily in one direction as in another; it does not exhibit any systematic difference in hardness, according to the face on which we scratch it, or the direction in which the scratch runs; its acts upon a ray of light in substantially the same manner, whatever be the direction from which the light comes; and, in general, its properties are the same in all parts and in all directions, save for such slight and unsystematic differences as may be introduced by accidental irregularities in density and in internal stress. In crystals the case is very different. With certain exceptions in special cases, they manifest differences in hardness, elasticity, heat-conduction, optical behavior, and other physical properties, in different directions; these properties remaining the same in any two parts of the crystal, however, so long as the tests are applied in parallel directions. That these differences are really due to an internal structure is shown by the fact that they may still be observed, unchanged, when the external form of the crystal is modified in any way whatever. A sphere of glass, for example, remains spherical when it is heated, because it expands equally in all directions; but if a sphere that is cut from a quartz crystal is heated, it will cease to be a sphere and will assume an ellipsoidal form, because the coefficient of expansion of quartz is different in different directions, and hence the quartz sphere expands more rapidly along some diameters than along others. A body whose properties are the same in all directions is said to be "isotropic"; while a crystalline body, having different optical or physical properties in different directions, is said to be "non-isotropic," or "æolotropic."

Crystals are most commonly formed when the substance of which they are composed solidi-

fies from a state of fusion, or is precipitated, slowly, from a state of solution. In the latter case the best specimens are obtained by the gradual, spontaneous evaporation of a saturated solution. Faraday, who paid much attention to matters relating to chemical and physical manipulation, found that excellent crystals may be had by selecting, from a crop of crystals that are forming, one that has a good, representative shape, and transferring it to a fresh saturated solution, in which crystallization has not yet begun. If the new solution be allowed to evaporate very slowly, and the crystal be turned at frequent intervals so that no face of it remains for any considerable time in contact with the bottom of the containing vessel, a well-developed crystal may be obtained, often of large size. Faraday also observed that if a saturated solution, in which crystals of various sizes exist, be alternately warmed and cooled slightly, there is a marked tendency for the larger crystals to increase in size, the smaller ones diminishing at the same time until they ultimately disappear. If a crystal be removed from the solution in which it is forming, and be carefully preserved, it never loses the power of resuming its growth. If at any future time it is submerged in a solution similar to that in which it was first formed, the invisible molecular forces again assert themselves, and the crystal slowly enlarges, precisely as if there had been no interruption. A crystal may even have been produced in some former geological period, thousands of centuries ago; and yet, upon placing it in a suitable solution, we find that the work of molecular architecture is at once resumed, just as though all the intermediate ages were blotted out. The crystal may even be almost entirely destroyed in the interval of inactivity, and yet it will grow as before, provided there remains within it some small fragment that has the structure of the primitive crystal. Crystals also possess the power of self-repair to a considerable extent, so that if they are scored or bruised the subsequent growth is abnormally rapid over the injured areas, until the injuries disappear and the crystal resumes its perfect form.

Geometrical Crystallography.— The actual crystals that occur in nature exhibit the greatest diversity of shape, so that at first thought any attempt to classify them in a satisfactory manner would appear to be out of the question. Systematic study has shown, however, that they may all be considered to be derived from certain typical or fundamental forms, by the truncation of angles or edges, or by a species of distortion in which the planes of the primitive form are displaced in such a manner as to remain always parallel to their original positions. Modification by truncation will be considered subsequently; but since distortion by the parallel displacement of the fundamental planes must be understood before the classification of crystals can be explained, an example of such distortion will be given here. If a crystal of alum be prepared with proper care, by keeping the mother-solution well mixed and turning the crystal frequently as it forms, it is possible to obtain it in the shape of a perfect octahedron, such as is shown in Fig. 1. On the other hand, if it is allowed to lie against the bottom of the containing vessel in one constant position, it will be likely to develop in a flattened, almost tabular form, as is indicated in Fig. 2. In general appearance these two forms are very different; but if the angle between the faces A and B in Fig. 1 be accurately measured and compared with that between the faces A and B in Fig. 2, it will be found that the two are precisely equal. The angle between the faces B and D in Fig. 1 is likewise equal to that between B and D in Fig. 2, and so on. In other words, the corresponding interfacial angles of the alum crystal are equal in both figures. We are therefore led to the conception that it is the angles included between the faces of a crystal that constitute the crystal's essential individuality, rather than the sizes of the faces themselves; and this idea is borne out by all the observations on crystal forms that have been made. We may think of the growth of the crystal as consisting in the laying on of a series of molecular films of material, all of equal thickness. If these films are laid on with equal rapidity on all faces, a crystal that is originally symmetrical, as shown in Fig. 1, will remain symmetrical; but if the molecular layers are added faster to some faces than to others, the corresponding faces will be developed more rapidly, and the original symmetry will be speedily destroyed. In the case of the alum crystal that has been taken for illustration, it is evident that no molecular layers have been lain on directly upon the bottom face, since this has been all the time in contact with the bottom of the containing vessel. The faces A, C, and D have developed most rapidly, and hence the tabular form. The point to notice is, that the distortion in form was due to external causes, rather than to any forces operating within the crystal. Hence the tabular state should be regarded as accidental, and therefore not essential to the alum crystal, as such. The form shown in Fig. 1 is called the "ideal form" of the alum crystal, since it is the form that that crystal takes when its development is ideally perfect in all directions. Distorted forms are met with, in nature, much more commonly than the ideal forms from which they are derived, and the study of crystallography can hardly be pursued with advantage until the student has familiarized himself, by the aid of models, with the various "ideal forms" to which the crystals of nature can be referred.

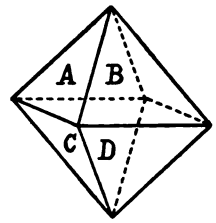


FIG. 1.

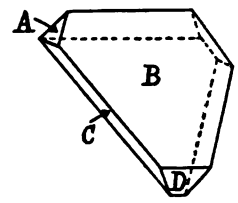
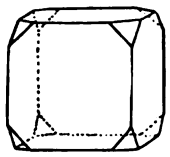


FIG. 2.

Law of the Interfacial Angles.— This law is stated by Williams in the following words: "However much the crystals of the same substance may vary in habit and in the relative size and development of similar planes, their corresponding interfacial angles remain constant in value; provided that (1) the crystals possess identically the same chemical composition, and (2) that they are compared at the same temperature." This is merely a formal statement of the facts that the alum crystal was intended to illustrate, in the previous paragraph.



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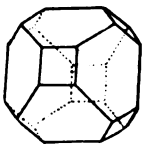

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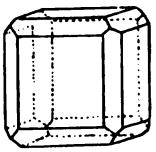

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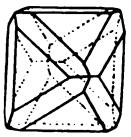

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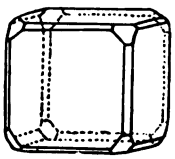

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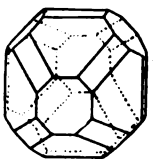

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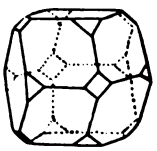

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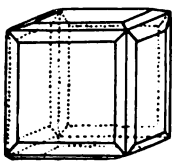

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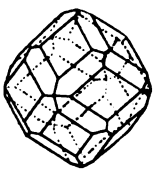

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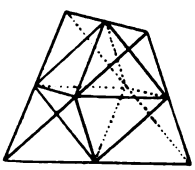

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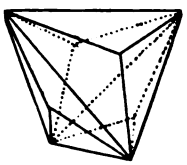

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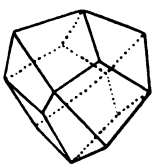

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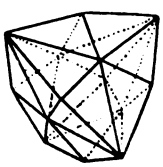

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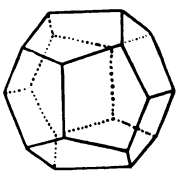

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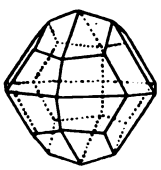

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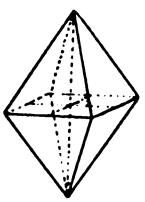

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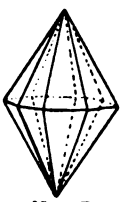

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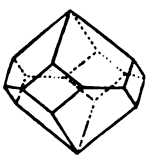

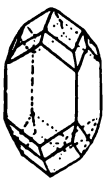

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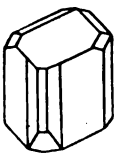

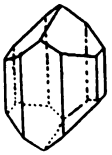

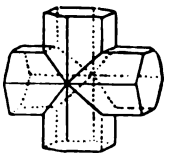

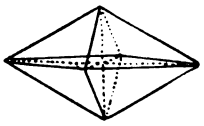

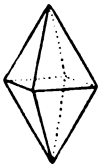

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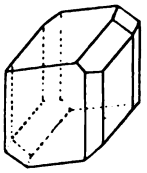

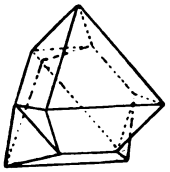

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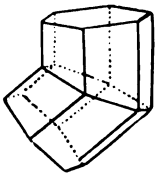


No. 21.

1, 2. Combinations of Hexahedron and Octahedron.
3. Combination of Hexahedron and Dodecahedron.
4. Combination of Octahedron and Dodecahedron.
5, 6, 7, 8 and 9. Various combinations of regular systems.
10. Derivation of Tetrahedron from an Octahedron.
11. Trigonal Dodecahedron.
12. Deltohedron.
13. Hexoctahedron.
14. Pentagonal Dodecahedron.
15. Dyakisdodecahedron or Diploid.
16. Tetragonal Deuteropyramid.
17. Ditetragonal Pyramid,
18. Tetragonal Combinations.
19. Triclinic.
20. Rhombic Pyramids.
21. Twin Crystals.

Law of the Parameters.— In analytic geometry it is customary to specify the position of a plane in space by giving the lengths that the plane in question cuts off from three fixed straight lines, which meet at a common point, and are called "axes." This convention is also employed in crystallography. In Fig. 3 let OX, OY, and OZ be the three fixed axes, drawn through the point O. Sometimes these lines are drawn at right angles to one another, and sometimes it is more convenient to draw them so that they make oblique angles with one another.

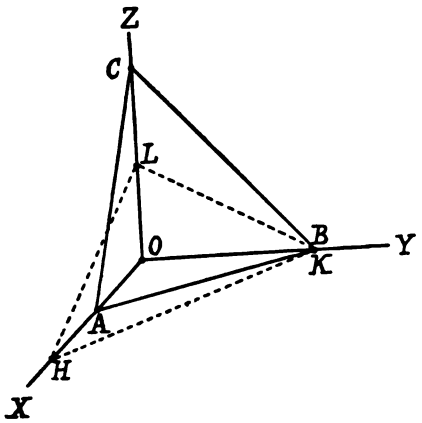


FIG. 3.

In the present case we shall suppose them to be all at right angles. Let OA, OB, and OC be unit lengths, measured off along the three axes respectively. These lengths are not necessarily equal to one another, but each is to be the unit in terms of which all the measurements along the corresponding axis are to be made. Through the points A, B, and C let a plane be passed, as is indicated by the lines AB, BC, CA. The position of any other plane, such as HKL, is then fully known, when we have specified the lengths OH, OK, and OL, in terms of the corresponding unit lengths, OA, OB, and OC. In the present case, $\frac{OH}{OA}=2$; $\frac{OK}{OB}=1$; and $\frac{CL}{OC}=\frac{1}{2}$. The ratios $\frac{OH}{OA}$, $\frac{OK}{OB}$ and $\frac{OL}{OC}$ are called the "parameters" of the plane HKL. If the lengths OA, OB, and OC are respectively represented by the letters A, B, and C, for the sake of brevity, and N, P, and M are the respective parameters of any plane whatever, then the lengths that this plane cuts off from the axes OX, OY, and OZ are respectively NA, PB, and MC. In crystallography the three axes are conceived to be drawn in certain conventional positions in every crystalline "ideal form," and the planes of the crystal are referred to these imaginary axes in the same way as in analytical geometry. In geometry the "parameters," N, P, and M, may have any values whatever; but it has been discovered that in crystals no planes occur save those that fulfil a certain remarkably simple mathematical condition. If N, P, and M are the parameters of a plane actually occurring in a crystal, and if P (for example) is the smallest of the three, then N and M are either infinite, or else they are unity, or a small multiple of unity (such as 2 or 3). This law is called the "law of rationality of the parameters."

Crystal Axes.— In crystallography, three (or sometimes four) axes are assumed to be drawn in each ideal crystal form, and to these axes the various planes that may occur in the crystal are referred. The position of the axes is determined by the symmetry of the crystal. In some cases it happens that a crystal that really belongs to one system simulates another system so closely that a study of its optical properties must be made, before the position of the axes can be determined with satisfactory precision. In general, the position of the axes must be determined by calculation, after the angles between the various planes have been observed by means of the goniometer (q.v.). The calculations involved are often complicated, and reference must be made to special treatises upon the subject, for full particulars concerning them. It must suffice, here, to say that by means of such calculations it is possible to determine, for each crystal form, a set of axes such that every plane bounding surface that occurs on the said crystal form shall, when referred to these axes, conform to the "law of rationality of the parameters." The relation of these axes to one another affords a convenient means of classifying such crystal forms.

Crystalline Systems.— If the "axes" of a crystal are understood to be lines of definite length, such as OA, OB, and OC in Fig. 3, inclined to one another at angles that may be oblique or rectangular, and of such magnitudes that it is possible, in each crystal system, for the boundary planes to fulfil the "law of rationality of the parameters" when they are referred to the particular axes selected for this system, then it is known that all the crystals that occur in nature may be included in one or another of the following six fundamentally different classes:

1. The isometric, monometric, cubic, or regular system, in which there are three axes of equal length, which intersect one another at right angles.

2. The tetragonal, or dimetric system, in which there are three axes that intersect one another at right angles, two of these axes being equal in length, while the third is longer or shorter.

3. The orthorhombic, rhombic, or trimetric system, in which there are three axes that intersect at right angles, all three being different in length.

4. The monoclinic, monosymmetric, or oblique system, in which there are three axes, all unequal in length, two of which intersect each other at an oblique angle, while both make right angles with the third.

5. The triclinic, asymmetric, or anorthic system, in which there are three axes, all oblique to one another, and all unequal in length.

6. The hexagonal system, in which there are four axes, three of which are equal, lie in the same plane, and make angles of 60° with one another, while the third has a different length, and is at right angles with the plane of the first three. The hexagonal system, as thus defined, includes an important section known as the "rhombohedral system," which is often classed as a separate system, but which may be regarded as a hemihedral division of the hexagonal system; that is, a division in which one

half of the planes that the hexagonal system would admit have been suppressed.

Axial Ratios.— In the isometric system the three axes are all equal, but in the other systems the axes are not all equal, and, in such cases the ratios that the lengths of the axes bear to one another constitute important physical constants that are of even greater value, in determining the identity of minerals, than the specific gravity, hardness, and other commonly given attributes.

Modifications of Form.— The fundamental form of a crystal in any given system (or "ground form," as it is often called), is assumed to be the form in which all the bounding planes cut the axes at their extremities (or at infinity, in the case of the longitudinal axis in the hexagonal system). Thus the fundamental form, or "ground form," of the isometric system is an octahedron whose six vertices are situated at the six extremities of the equal axes. In such fundamental forms the parameters are all unity (or infinity), in those planes of the hexagonal system that are parallel to the longitudinal axis). But in addition to the planes so defined, the crystal may exhibit any others that conform to the parameter law given above, and for this reason it is often difficult for the beginner in crystallography to recognize the "system" to which a proposed crystal belongs. The secondary planes may modify the "ground form" in three ways: (1) by "truncation," when an edge of the ground form is replaced by a surface, which may be either parallel to it, or placed obliquely; (2) by "bevelment," when the edge is replaced by a pair of planes that are parallel to it; and (3) by "acumination," when the original vertices of the crystal are replaced by others that are more obtuse. Sometimes the secondary faces become dominant, the primary faces becoming subordinate, or even disappearing altogether.

Twinning.— Crystals not uncommonly develop in a form that strongly suggests that two or more individuals have become merged together. Such a crystal is known as a "twin," and its parts are definitely related as regards position, so that if one of them were rotated through an angle of 180°, about a certain straight line called the "twin axis," its surfaces would be thereby brought into exact parallelism with the corresponding surfaces of the rest of the crystal. Sometimes the component parts of a twin have the aspect of two partial crystals that are merely cemented together along a certain plane, and in such a case the crystal is known as a "contact twin." In other instances the parts of the crystal have the aspect of penetrating each other in a more or less irregular manner; whence such crystals are called "penetration twins." The phenomena of twinning are not well understood, but it is known that barium chlorid and certain other salts that commonly crystallize in simple forms, crystallize in twinned forms when the mother solution is made viscous by the addition of gummy matters. See ELASTICITY; LIGHT; MOLECULAR THEORY.

Consult, also, Williams, 'Elements of Crystallography,' and the many references that it contains; Dana, 'Text-book of Mineralogy'; and Moses and Parsons, 'Elements of Mineralogy, Crystallography, and Blowpipe Analysis.'

HENRY MARION HOWE,
Columbia University.

Crystal Palace. a building at Sydenham, England, about seven miles from London. The material in this building was at one time used in the Crystal Palace erected for the World's Fair which was held at Hyde Park, and was formally opened by Queen Victoria, 25 Feb. 1851. The original building was designed by Sir Joseph Paxton; the materials composing it were glass, iron, and wood. Its area was nearly 21 acres. In 1854, when the building was about to be demolished, a company formed to purchase it, tore down the original and removed the material to Sydenham in Kent, about eight miles from London. The new edifice was patterned after the World's Fair building. The grounds around the present Crystal Palace are in area about 200 acres, and are beautifully laid out. This palace was opened by Queen Victoria, 10 June 1854. The name of Crystal Palace was also given to a large building erected in 1853 in New York. The site was on Sixth Avenue, between 40th and 42d streets. It was a favorite place for large exhibitions, but in 1858 it was destroyed by fire.

Crystallin, a proteid substance obtained from the crystalline lens of the eye, of which it constitutes about 36 per cent by weight. It is usually classed with the globulins, and was formerly called globulin. To prepare it, the minced lens is triturated with water, and the aqueous extract is filtered and evaporated. Dry crystallin, as thus obtained, is yellow in color, and not greatly different in appearance from albumin. Crystallin is soluble in water and in dilute solutions of salt; but it is precipitated when the strength of the salt solution is increased to saturation. Its saline solution becomes milky at 163° F., but actual coagulation does not occur until a temperature of 199° F. is attained. The crystallin is then deposited in a granular mass. A neutral solution of crystallin becomes acid upon coagulation, whereas most of the proteids give an alkaline reaction under similar circumstances. Crystallin is probably not a definite chemical substance, since it appears to contain at least two proximate constituents, which can be separated by precipitation with alcohol.

Crystallography. *The General Properties of Crystals.*— If we examine a number of crystals (Figs. 19–26) we note the following characteristics. Crystals are solids bounded by flat surfaces called faces, the intersection of two faces is an edge, and the intersection of three or more faces is a quoin. The number of faces, edges, and quoins varies on different crystals but they are always so related that the number of faces plus the number of quoins is equal to the number of edges plus two. The faces not only differ in number but in shape and position. On a given crystal several kinds of faces may occur. The sum of like faces, that is those of the same shape, on a crystal constitute a form. A form may consist of a single face or of a number of faces up to as high as 48. A crystal may consist of a single form (Figs. 3–10) or of two or more forms, when it is known as a combination (Figs. 19–26). The relative position of crystal faces may be indicated by the interfacial angle between two faces. This interfacial angle is defined by the plane angle formed by a line in each face drawn normal to the intersection-edge at the same point and is meas-

ured by means of a goniometer. Measurement of interfacial angles is the starting point for all determinations and descriptions of crystals. The recurrence of faces and angles is one of the most important properties of crystals. The kind of recurrence varies in different crystals. We also notice that the faces of crystals are arranged in belts of planes called zones with their intersection edges parallel. The faces and angles of crystals do not occur in a haphazard way but they are arranged according to certain definite laws so that on a given crystal for example certain planes may occur as faces while others can not occur. Between the faces, angles, and zones of crystals there exist exact mathematical relations. The importance of crystallography lies in the fact that a given substance (mineral or artificial salt) forms crystals characteristic of that substance and hence the crystal form may often be used in the determination of the substance.

The Symmetry of Crystals.— Symmetry or the recurrence of faces and angles in accordance with fixed laws is one of the most important properties of crystals and deserves detailed study, for it is the property which distinguishes crystals from all other substances and also distinguishes the various kinds of crystals among themselves. The several kinds of recurrence may be defined by the elements of symmetry which are plane, axis, and centre of symmetry. A solid is said to have a plane of symmetry (denoted by P) if it is divided by a plane so that one half of it is a mirror-image of the other half. A solid is said to have an axis of symmetry (A) if about any line the figure may be revolved so that it occupies the same position in space a whole number of times (n) during a complete revolution. The number of times in a revolution defines the axis of symmetry (An). A solid is said to have a centre of symmetry (C) if for every face there is another opposite and parallel to it. Figs 3 to 10 have centres of symmetry, Fig. 25 does not. Geometrical solids made of paper or wood may possess axes of any degree of symmetry, but in crystals all axes of symmetry except those of 2, 3, 4, or 6-fold are inconsistent with the law of rational indices (see later). In crystals only certain combinations of symmetry elements are possible, and there have been deduced mathematically 32 combinations of symmetry elements which characterize the 32 crystals classes. Like the periodic law of chemistry, this law foretold the existence of several crystal classes which were discovered later. To-day there are three combinations to which no known crystals belong. A crystal of a given substance always possesses the symmetry elements characteristic of that substance but no other. In natural crystals it is difficult to determine the symmetry because of distortion of the faces. On account of the vagaries of growth, the size and shape of faces are rarely as represented in ideal drawings or models but it is really the angles that count. Hence the law of constancy of interfacial angles, "in all crystals of the same substance, the angles between corresponding faces are constant." If faces of the crystals, they intersect the sphere at its centre and radii are drawn normal to the faces of the crystals, they intersect the sphere in points which take the place of the faces and the size and shape of the faces are eliminated. Such a drawing as Fig. 1, known as a stereographic projection shows that the outer distorted crystal has an axis of 6-fold symmetry the same as the inner regular one, for their faces are both projected on the circle at 60° apart.

The Notation of Crystals.— In describing crystals something more than symmetry is

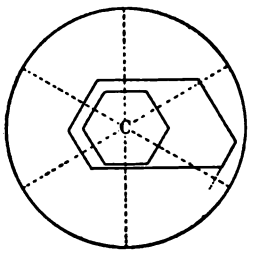


Fig. 1.

needed for there may be differences in crystals with exactly the same symmetry elements (Figs. 6 and 7). Like faces on a crystal constitute a form. There are a number of kinds of forms and they are defined by their shape. A form consisting of a single face is a pedion (plane);

Fig. 2.

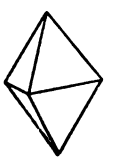


Fig. 3.

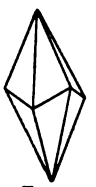


Fig. 4.

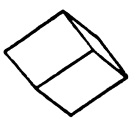


Fig. 5.

two parallel faces, a pinacoid (table); two non-parallel faces astride a plane of symmetry, a dome (house-top); two non-parallel faces not astride a plane of symmetry, sphenoid (wedge). Prisms are forms consisting of three, four, six, eight, or 12 faces in one zone, with an axis of 3, 4, or 6-fold symmetry and are defined ac-

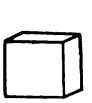


Fig. 6.

Fig. 7.

Fig. 8.

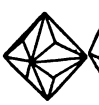


Fig. 9.

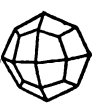


Fig. 10.

cording to the cross-section as rhombic, trigonal, tetragonal, hexagonal, ditrigonal, ditetragonal, or dihexagonal. Pyramids (Fig. 2) are analogous to and named in the same way as prisms but all the faces intersect in one point; two pyramids placed end to end constitute a bipyramid (Fig. 3), defined in the same way as pyramids. Two sphenoids placed together form a bisphenoid, rhombic or tetragonal according to cross-section. A ditrigonal scalenohedron is composed of 12 scalene triangle faces, six at each end of an axis of 6-fold composite symmetry (Fig. 4), a ditetragonal scalenohedron of eight scalene triangle faces, four at each end of an axis of 4-fold composite symmetry. A rhombohedron (Fig. 5) is composed of six rhomb faces, three at each end of an axis of 6-fold composite symmetry. Trapezohedrons are forms with six, eight, or 12 faces with an axis of 3-fold, 4-fold, or 6-fold symmetry, tri-

gonal, tetragonal, and hexagonal respectively. In the isometric system there are special forms such as cube (6 faces) (Fig. 6); octahedron (8 faces) (Fig. 7); dodecahedron (12 faces) (Fig. 8); trisoctahedron (24 faces) (Fig. 9); trapezohedron (24 faces) (Fig. 10), etc. Some of these, called closed forms, enclose space, hence may occur alone, while others, open forms, can not of themselves enclose space, hence must occur with other forms. Among the closed forms are the bipyramids, bisphenoids, scalenohedrons, rhombohedrons, trapezohedrons, and the special isometric forms; all others are open forms. In order to make use of the mathematical relations of crystals the faces are defined in position by the method of analytic geometry which consists in referring all faces of a crystal to three straight lines passing through the centre of the crystal. These three lines are called axes of reference or crystallographic axes, or simply axes. The selection of these axes is arbitrary but they are always chosen so as to yield the simplest relations possible. They are therefore lines parallel to prominent edges which are usually axes of symmetry or lines normal to planes of symmetry. In Fig. 17 let OX, OY, and OZ be the three axes intersecting in O; any plane ABC is defined by its intercepts, OA, OB, and OC on these three axes, HKL is defined by its intercepts OH, OK, and OL. Now the ratios OA:OH, OB: OK, OC:OL may be expressed in simple numbers, 1, 2, 3, 4, etc., while

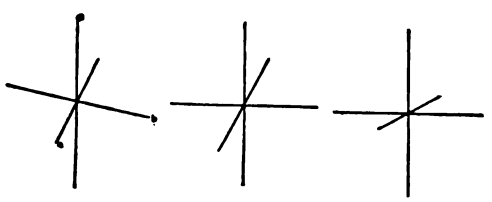


FIG. 11. FIG. 12. FIG. 13.

the ratios OA:OB:OC and OH:OK:OL are complex. So instead of the absolute values of the intercepts use is made of relative values in terms of a unit plane which intercepts the axes at assumed unit lengths. Thus if ABC is the assumed unit plane, OA = a, OB = b, OC = c, are the unit lengths of the axes. Then another plane HKL may be expressed as

$$\frac{a}{OH} : \frac{b}{OK} : \frac{c}{OL} = h : k : l,$$

in which h, k, l, are simple rational numbers such as 1, 2, 3, 4, rarely above 6. The simplest whole numbers which express the ration h, k, l are called the Miller indices of the face and are always written in the invariable order, h index on a, k index on b, and l index on c. A negative index is written $\bar{h}$. The expression hkl or (hkl) is called the symbol of the face, while $[hkl]$ is the symbol of the form of which hkl is the face. Thus there are eight planes which cut the axes at the same relative distances as HKL but on different sides of the origin O. They are hkl, $\bar{h}kl$, $h\bar{k}l$, $hk\bar{l}$, $\bar{h}\bar{k}l$, $\bar{h}k\bar{l}$, $h\bar{k}\bar{l}$, $\bar{h}\bar{k}\bar{l}$. Together they constitute the form (hkl), which is a rhombic bipyramid. Besides (hkl), which cuts all three axes, there are other faces which are parallel to some of the axes. Thus we have (Fig. 17) okl, hol, and hko, each of which cuts two of the axes but are parallel to the other axis, the o in the symbol standing for parallelism and also 001, 010, and 100 which each cut one axis and are parallel to two. These constitute the seven type symbols, hkl, okl, hol, hko, 001, 010, 100. In order to determine the type symbol it is only necessary to select the axes and write the indices in the order h, k, l, substituting a o when the face is parallel to an axis. The indices of crystal faces are usually simple numbers such as 110, 120, 011, 012, 101, 201, 111, 221, 321, etc. To determine the indices requires calculation (see

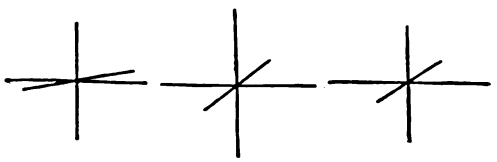


FIG. 14. FIG. 15. FIG. 16.

Calculation of Crystals). In order to have the indices as simple as possible it has been found necessary to have six kinds of axes of reference, to one of which every crystal must be referred and crystals of one substance are always referred to the same kind of axes of reference. The most general case is (1) three non-equivalent axes at oblique angles to each other (Fig. 11). Then we have (2) three non-equivalent axes, two of which are at oblique angles, the third at right angles to the other two (Fig. 12). (3) Three non-equivalent axes at right angles (Fig. 13). (4) Three axes at right angles, two of which are equivalent (Fig 14). (5) Three equivalent axes at right angles (Fig. 15). With some crystals we make use of (6) four axes, three equivalent ones in one plane at 60° to each other, perpendicular to the fourth one (Fig. 16). In the latter case the symbol is made up of four indices as $10\bar{1}0$, $h\bar{o}hl$, $hk\bar{i}l$, etc.

The Structure of Crystals.— It is the general belief that matter is coarse-grained, not continuous. The law of rational indices is accepted

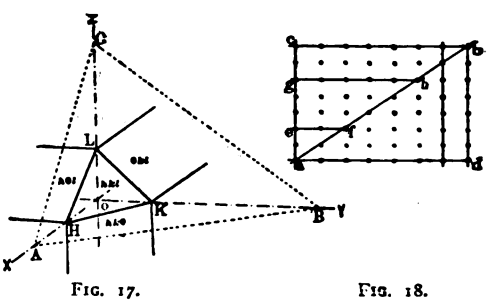


FIG. 17. FIG. 18.

as proof of some kind of molecular structure and indeed Haüy's conceptions of crystal structure probably led to his discovery of the law. In physical crystallography (q.v.) we learn that the physical properties are alike in parallel directions, which leads to the conclusion that the grouping of the molecules around each molecule is the same. So the only possible form of structure is a network or space-lattice. The varieties of space-lattices possible in crystals have been deduced mathematically by Sohncke, Schönflies, Barlow and others with the

conclusion that 230 types are possible. While we know little or nothing as to the nature of molecules we do know something as to their arrangement. If we assume a molecular network in crystals it is possible to explain symmetry, constancy of interfacial angles, rationality of indices, differences of habit, cleavage and many physical properties. Thus in a network like every crystal belongs and no crystal belongs to more than one class. The form with the largest number of faces consistent with the symmetry of the class is the *general form* of the class and has the symbol (*hkl*). The class takes its name from the general form. The following table gives the name of the class which also includes the name of the general form and

Triclinic.	1	Triclinic pediad	1	.....	$CaS_2O_3.6H_2O$
	2	Triclinic pinacoidal	2	C	Axinite
Monoclinic.	3	Monoclinic sphenoidal	2	A_2	Cane sugar
	4	Monoclinic domatic	2	P	Clinohedrite
	5	Monoclinic prismatic	4	A_2.P.C	Gypsum
Orthorhombic.	6	Rhombic bisphenoidal	4	$3A_2$	Epsomite
	7	Rhombic pyramidal	4	$A_2.2P$	Calamine
	8	Rhombic bipyramidal	8	$3A_2.3P.C$	Barite
Tetragonal.	9	Tetragonal bisphenoidal	4	A_2	.....
	10	Tetragonal pyramidal	4	A_4	Wulfenite
	11	Tetragonal scalenohedral	8	$3A_2.2P$	Chalcopyrite
	12	Tetragonal trapezohedral	8	$A_4.4A_2$	$NiSO_4.6H_2O$
	13	Tetragonal bipyramidal	8	A_4.P.C	Scheelite
	14	Ditetragonal pyramidal	8	$A_4.4P$	$AgF.H_2O$
	15	Ditetragonal bipyramidal	16	$A_4.4A_2.5P.C$	Zircon
Trigonal.	16	Trigonal pyramidal	3	A_3	$NaIO_3.H_2O$
	17	Trigonal rhombohedral	6	$A_3.C$	Phenacite
	18	Trigonal trapezohedral	6	$A_3.3A_2$	Quartz
	19	Trigonal bipyramidal	6	$A_3.P$	.....
	20	Ditrigonal pyramidal	6	$A_3.3P$	Tourmaline
	21	Ditrigonal scalenohedral	12	$A_3.3A_2.3P.C$	Calcite
	22	Ditrigonal bipyramidal	12	$A_3.3A_2.4P$	.....
Hexagonal.	23	Hexagonal pyramidal	6	A_6	Nephelite
	24	Hexagonal trapezohedral	12	$A_6.6A_2$	Cmplex tartrate
	25	Hexagonal bipyramidal	12	A_6.P.C	Apatite
	26	Dihexagonal pyramidal	12	$A_6.6P$	Iodyrite
	27	Dihexagonal bipyramidal	24	$A_6.6A_2.7P.C$	Beryl
Isometric.	28	Isometric tetartoidal	12	$3A_2.4A_3$	Ullmannite
	29	Isometric gyroidal	24	$6A_2.4A_3.3A_4$	Sylvite
	30	Isometric diploidal	24	$3A_2.4A_3.3P.C$	Pyrite
	31	Isometric hextetrahedral	24	$3A_2.4A_3.6P$	Tetrahedrite
	32	Isometric hexoctahedral	48	$6A_2.4A_3.3A_4.9P.C$	Galena

Fig. 18 the symmetry is apparent, (2) it is easy to see why the crystals *ghb* and *efb* have their angles *ghb* and *efh* equal, (3) all the planes that pass through the points must have rational indices, (4) a given substance may crystallize in forms like *abc* or *adbc* under different conditions for the structure is the same in each, (5) cleavage may take place in directions like *bd* more easily than in others for the distances between parallel planes are greater in these directions than in others, (6) we also see that cleavage takes place parallel to crystal faces or possible crystal faces, (7) the fact that the physical properties are alike in parallel directions is explained.

The Classes and Systems of Crystals.— Under symmetry of crystals it was found that only 32 combinations of symmetry elements are possible in crystals. These constitute the so-called *crystal classes,* to one of which the system, the number of faces in the general form, the elements of symmetry, and a typical representative of the class, a mineral if one belongs to the class.

For convenience certain classes are grouped together according to the kinds of axes of reference which give the simplest relations. These groups are called systems, the seven systems being the triclinic, monoclinic, orthorhombic, tetragonal, isometric, hexagonal, and trigonal, corresponding respectively to the kinds of axes of reference previously given. The hexagonal and trigonal systems have the same axes of reference. By some authors they are included in one system, the hexagonal. The grouping of the classes into systems is shown in the table. The classes of a system usually have several things in common (1) similarity of symmetry elements (thus all the classes of the hexagonal system have one axis of 6-fold symmetry), (2)

some of the forms are identical, for example the cube and dodecahedron are common to each of the five classes of the isometric system, (3) the combination of certain forms of a class give rise to a form of a more symmetrical class of the same system (thus two tetrahedra (111) and ($1\bar{1}1$) of class 31 together form an octahedron of class 32). So that it is not always possible to determine the class to which a given crystal belongs. Of the 32 classes, the nine most important ones are described in detail.

Triclinic Pinacoidal Class, C.— Crystals are referred to three non-equivalent axes at oblique angles to each other (Fig. 31). The selection of the axes is arbitrary, but they are usually taken parallel to prominent edges. The axial elements are a:b:c and the axial angles α ($b\wedge c$), β ($a\wedge c$) γ ($a\wedge b$). The mathematical relations in the triclinic system are complicated. All forms, whatever the symbol, are pinacoids composed of two parallel faces. The type forms are (*hkl*),

Monoclinic prism	4	hkl
Monoclinic prism	4	hko
Monoclinic prism	4	okl
Pinacoid	2	hol
Pinacoid	2	001
Pinacoid	2	010
Pinacoid	2	100

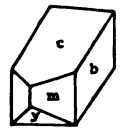


FIG. 19.

(*hkl*), (*hkl*), (*hkl*), (*hko*), (*hko*), (*hol*), (*hol*), (*okl*), (*okl*), (001), (010), and (100). The plagioclases (albite, oligoclase, etc.), rhodonite, cyanite, axinite, chalcanthite, and other minerals, belong to this class.

Monoclinic Prismatic Class, A_2.P.C.— Crystals are referred to three non-equivalent axes, two of which are at oblique angles, the third perpendicular to the plane of the other two. The axial elements are *a*:*b*:*c*, and axial angle β ($a\wedge c$). The axis of symmetry is the b-axis the selection of the other axes is arbitrary but they must be in the plane of symmetry.

Orthoclase, pyroxene, amphibole, monazite, borax, gypsum, and many other minerals belong to this class. Fig. 19 represents an orthoclase crystal with *b*(010), *c*(001), *m*(110), and *y*(201).

Orthorhombic Bipyramidal Class. $3A_2.3P.C.$ — Crystals are referred to three non-equivalent axes at right angles to each other (Fig. 20). The axial ratio is *a*:*b*:*c*. The axes of symmetry are the axes of reference.

Rhombic bipyramid	8	hkl
Rhombic prism	4	hko
Rhombic prism	4	hol
Rhombic prism	4	okl
Pinacoid	2	001
Pinacoid	2	010
Pinacoid	2	100

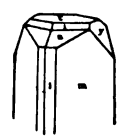


FIG. 20.

Sulphur, marcasite, aragonite, topaz, niter, barite, anglesite, and many other minerals belong to this class. Fig. 20 represents a topaz crystal with *m*(110), *l*(120), *c*(001), *u*(111), *i*(223), and *y*(041).

Ditetragonal Bipyramidal Class $4A_2.A_4.5P.C.$ — All crystals are referred to three axes at right angles to each other, two of which are equivalent. The 4-fold axis is the *c*-axis. The axial ratio is a:c.

Rutile, wernerite, vesuvianite, zircon, apophyllite, and a few other minerals belong to this class. Fig. 21 represents a vesuvianite crystal with *a*(100), *m*(110), and *p*(111).

Ditrigonal Scalenohedral Class. $3A_2.A_3.3P.C.$ — All crystals are referred to four axes of

Ditetragonal prism	16	hkl
Tetragonal bipyramid	8	hko
Tetragonal bipyramid	8	hhl
Tetragonal prism	8	hol
Tetragonal prism	4	100
Pinacoid	4	110
Ditetragonal bipyramid	2	001

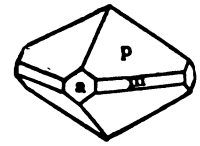


FIG. 21.

reference, three equivalent ones of which are in one plane at 60° to each other and a fourth one normal to these (Fig. 16). The axis of 3-fold symmetry is the *c*-axis. The axial ratio is *a*:*c*.

Ditrigonal scalenohedron	12	hkil
Dihexagonal prism	6	hkio
Rhombohedron	6	hohl
Hexagonal bipyramid	6	hh2h.l
Hexagonal prism	6	$11\bar{2}0$
Hexagonal prism	6	$10\bar{1}0$
Pinacoid	2	0001

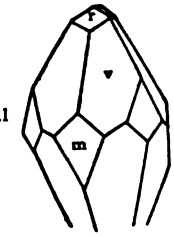


FIG. 22.

Corundum, hematite, calcite, chazabite, soda niter, and a few other minerals belong to this class. Fig. 22 represents a calcite crystal with *v*($21\bar{3}1$), *r*($10\bar{1}1$), and *m*($10\bar{1}0$).

Dihexagonal Bipyramidal Class. $A_6.6A_2.7P.C.$ — All crystals are referred to same axes as in the trigonal system (Fig. 16). The axial ratio is *a*:*c*.

Dihexagonal bipyramid	24	hkil
Dihexagonal prism	12	hkio
Hexagonal bipyramid	12	hohl
Hexagonal bipyramid	12	h.h.2h.l
Hexagonal prism	6	$10\bar{1}0$
Hexagonal prism	6	$11\bar{2}0$
Pinacoid	2	0001

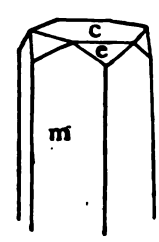


FIG. 23.

Beryl and connellite are the only two minerals that belong to this class. Fig 23 represents a beryl crystal with *c*(0001), *m*($10\bar{1}0$), and *e*($11\bar{2}1$).

Isometric Hexoctahedral Class. $6A_2.4A_3.3A_4.9P.C.$ — All crystals are referred to three equivalent axes at right angles to each other (Fig. 15). Forms of this class are the most symmetrical of all crystals, and sometimes approach a spherical form. Galena, halite, fluorite, spinel, magnetite, garnet, and other minerals belong to this class. Fig. 24 represents a crystal of galena with *o*(111) and *p*(221).

Isometric Hextetrahedral Class. $3A_2.4A_3.6P.$ Crystals of this class have a tetrahedrid aspect. Diamond, sphalerite, tetrahedrite, boracite and a few other minerals belong to this class. Fig. 25 represents a crystal of tetrahedrite with *o*(111) and *n*(211).

Isometric Diploidal Class. $3A_2.4A_3.3P.C.$— Pyrite, cobaltite, sperrylite, kalinite, and a few other minerals belong to this class. Fig. 26 rep-

	Hexoctahedral		Hextetrahedral		Diploidal	
hkl	Hexoctahedron	48	Hextetrahedron	24	Diploid	24
hhl	Trisoctahedron	24	Deltohedron	12	Trisoctahedron	24
hll	Trapezohedron	24	Tristetrahedron	12	Trapezohedron	24
hko	Tetrahexahedron	24	Tetrahexahedron	24	Pyritohedron	12
111	Octahedron	8	Tetrahedron	4	Octahedron	8
110	Dodecahedron	12	Dodecahedron	12	Dodecahedron	12
100	Cube	6	Cube	6	Cube	6

resents a pyrite crystal with $e(210)$, $a(100)$, and $o(111)$.

Aggregates of Crystals.— Crystals are very frequently grouped together and this grouping may be with or without law. Irregular aggregates, where there is a haphazard arrangement of the individual crystals, are perhaps the most frequent. The regular grouping of crystals is one of two kinds. Either the edges and faces are all parallel or a part of them are parallel, that is the parallelism is either complete or partial. Aggregates with partial parallelism are called twins and are usually composed of two individual crystals united in a definite way. One individual appears to have been revolved 180° about a line called the twin-axis and the plane normal to this axis is called the twin-plane. The face of union of the two individuals, which may or may not be the twin-plane, is the composition-face. The twin-plane is a crystal face or a possible crystal face, usually one with simple indices and is never a plane of symmetry. The twin-axis is a crystal edge or is normal to a possible crystal face. The twinning law is defined by the twin-plane or twin-axis. Twins may usually be recognized by the presence of re-entrant angles or by striations, as in the plagioclases. Twins are either contact twins with definite composition-face or penetration-twins with irregular composition-face. In twins

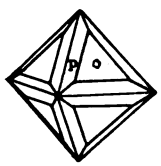


FIG. 24.

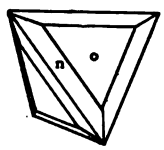


FIG. 25.

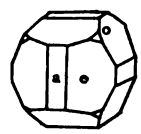


FIG. 26.

the axes of reference are parallel or inclined. Besides simple twins composed of two individuals, twins may consist of several individuals either polysynthetic or cyclic, depending upon the particular faces that serve as twinning-planes. Two or more twinning laws may be exemplified in the same crystal. The tendency of twinning is to raise the grade of symmetry. This is especially prominent in orthorhombic crystals with prism angles of about 60°. In parallel aggregates of the same mineral the individuals are usually of the same habit. But sometimes individuals of different habit are in parallel position as in calcite.

The Habit of Crystals.— Crystals are distinguished in habit as tabular, prismatic, or pyramidal according to the dominant form or prevailing shape. A particular habit often characterizes a certain mineral, for example, barite is usually tabular. Prismatic crystals of barite are so rare that when first found they were described as a new mineral. But a diversity of habit for a mineral is more usual. For example apophyllite occurs tabular, pseudo-cubic, and pyramidal. Octahedrite is either tabular or steep-pyramidal. Crystals from a certain locality may often be recognized as coming from that locality on account of the habit. Evidently a change in conditions causes a change in habit. The presence of a foreign substance is known to modify the crystal habit considerably. Alum, which ordinarily crystallizes in octahedrons, separates from an alkaline solution in cubes. The habit assumed by crystals is often such that the grade of symmetry is lowered or raised. Thus dodecahedrons of garnet according to the particular faces that are developed often simulate tetragonal, orthorhombic, or even monoclinic symmetry. An apparent raise of symmetry is perhaps more common and may result (1) by close approach in angle as in adularia, monoclinic, is often orthorhombic in habit, tetragonal sphenoids of chalcopyrite are usually difficult to distinguish from isometric tetrahedra, and also (2) by twinning as has been stated under crystal aggregates.

The Measurement of Crystals.— The starting point for all exact work in the determination of the indices, axial elements, and system of crystals is the measurement of their angles. There are two kinds of angles that can be measured, interfacial angles as BP and AP in Fig. 27, corresponding to the distance between two places on the earth's surface and coordinate angles ϕ(BCP) and ρ(CP) (Fig. 27), corresponding to the longitude and co-latitude of a place. These angles are measured by instruments called goniometers, which range from the simplest home-made device to an elaborate apparatus costing upward of $200. Interfacial angles are measured by means of one-circle goniometers; co-ordinate angles by means of two-circle goniometers. The one-circle contact or hand-goniometer is a simple apparatus consisting of two pivoted arms which allow

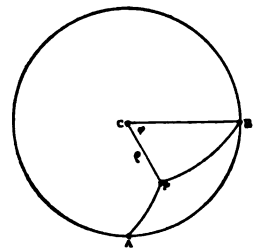


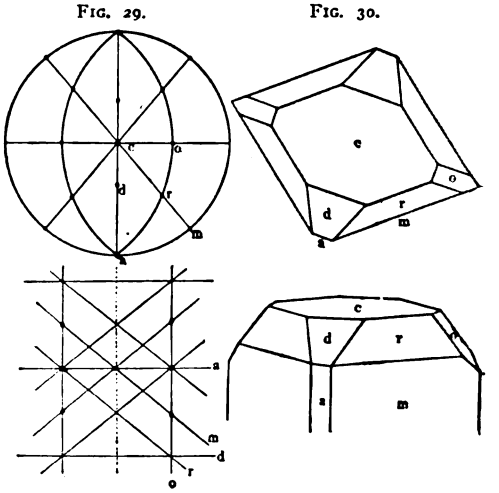
FIG. 27.

easy motion and can be clamped securely. The arms are placed so that each is normal to the intersection edge of the crystal and in close contact with the faces, the interfacial angle of which is to be measured. The arms are then clamped and applied to a graduated semicircular arc. In some cases the arms are permanently attached to the semicircle. These goniometers are usually made of brass, but a simple wooden one may easily be made from two little sticks of wood and a rivet. The hand-goniometer only suffices for fairly large crystals with even faces.

Small crystals with bright faces may be measured very exactly with the reflection goniometer, the invention of Wollaston in 1809. The modern reflection goniometer consists essentially of a graduated circle mounted horizontally on a tripod. Through the centre of the circle is an axis bearing a crystal carrier which is capable of several kinds of adjustments. The crystal is adjusted on carrier until the edge, the interfacial anlge of which is to be measured, coincides with the axis of revolution. A beam of light sent througn the collimator is reflected by one of the crystal faces and an image is seen through the telescope. A reading in this position is taken and then the crystal together with the circle, is revolved until the image from the adjacent face is observed in the telescope, when another reading is made. The difference in the two readings is the supplement of the true interfacial angle, but the supplement angle for various reasons is the one usually recorded and used in calculations. Many precautions are necessary to obtain good readings. The two-circle goniometer is like the one-circle one except that a second circle which bears the crystal carrier is fixed so as to revolve always perpendicular to the horizontal circle. After adjustment of the crystal readings are obtained from each circle for each face. These two angles give the co-ordinate angles ϕ and which can be used in calculation as well as the interfacial angles. The principal advantage of the two-circle goniometer lies in the fact that only one adjustment of the crystal is necessary while with the one-circle goniometer angles are measured in zones and there must be a separate adjustment of the crystal for each zone.

The Calculation of Crystals.— In the case of described crystals it is only necessary to compare the measured with the calculated angles which are on record in the larger works on mineralogy. In the case of new forms or new minerals calculation which involves plane and spherical trigonometry is necessary. The principal steps in the calculation are (1) determination of the indices from the measured angles — in many cases the indices can be accurately determined graphically from a spherical projection (in any crystal determination it is always well to make a stereographic projection for it presents a picture of the mathematical operations involved), (2) calculation of the axial elements from graphically determined indices and measured angles in which proper weight is given to character of faces, etc., (3) calculation of theoretical angles from calculated elements and indices. This is a necessary check on the other work for the proof of the accuracy of the work lies in the closeness of agreement of the observed with the calculated angles. The calculation of crystals is much simplified by zonal relations. If a face is common to two zones its indices may be found without measurement. The indices of each zone written $[uvw]$ must be found by combining the indices of two faces of the zone hkl, and $h'k'l'$ in the following manner: $u = kl' - lk'$, $v = lh' - hl'$; $w = hk' - kh'$; $[u'v'w']$, the symbol of the other zone is also found and (pqr) the desired indices result in a similar manner. If a face (pqr) lies in a zone $[uvw]$ the following is true: $pu + qv + rw = 0$.

The Delineation of Crystals.— Crystal drawings are made for the purpose of furnishing a picture of a crystal to other persons and as an aid in crystal determination. There are two classes of crystal projection (1) those in which the faces are represented by points or lines, their size and shape being eliminated, and (2) those in which the faces are represented in their actual development. In the linear projection (Fig 28) the crystal faces are represented by lines, their intersections are zones. In the stereographic projection (Fig. 29) faces are represented by points, zones, by lines connecting these points, which are arcs of great circles. In the stereographic projection graph-



ical solutions are easily made and zonal relations are prominently brought out. To the second class of projection belong the orthographic and clinographic projections. In the orthographic projection (Fig. 30), which usually is a basal one, the plane of projection is at right angles to the visual rays. In the clinographic projection (Fig. 31) which is the one ordinarily used in descriptions and in this article the plane of projection is oblique to the visual rays, the point of sight being to the right and above the crystal, which gives the appearance of solidity. A very convenient drawing is a combination of the clinographic projection with an orthographic projection revolved about the vertical axis (Figs. 30 and 31).

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Csaba, chŏb'ŏ, Hungary, a market town near White Körös, in the county of Bekes, about 120 miles southeast of Budapest. The trade is chiefly in grain, wine, hemp, flour, and cattle. It has increased greatly in volume of business and population since 1850, when it was a quiet village. Pop. (1900) 37,547.

Csoma de Körös, chō'mŏ dė ke'rish, **Alexander** (Hungarian *Sandor*), Transylvanian traveler and philologist: b. Körös, 4 April 1784;

d. Darjeeling, India, 11 April 1842. He was in early life seized by the desire to investigate the origin of the Magyar race, and after a course of study at Göttingen, he went, in 1820, to the East. He visited Egypt and Persia, and spent several years in a Buddhist monastery in Tibet, diligently studying the Tibetan language and literature; imagining he recognized resemblances between the Tibetan and Magyar. He next lived some years in Calcutta, where he compiled his 'Dictionary of Tibetan and English,' and a 'Grammar of Tibetan.'

Csongrad, chŏn'grăd, Hungary, a market town, capital of a county of the same name, at the junction of the Körös with the Theiss, 72 miles southeast of Budapest. The surrounding country is very flat, and has excellent pastures. Pop. (1900) 22,619.

Ctenoid, tĕn-oid (Gr. "comb-like"), applied to the scales of fishes when jagged or pectinated on the edge like the teeth of a comb, as in the perch, flounder, and turbot.

Ctenophora, tē-nŏf'ō-ra (Gr. "comb-bearing"), a division of the sub-kingdom *Cœlenterata,* comprising free-swimming marine animals, usually glassy and transparent, which move by means of ciliated comb-like plates. The typical form is pear-shaped or ovoid, but aberrant types, such as the ribbon-shaped Venus' Girdle, are also included in this group. All the species are hermaphrodite. They are carnivorous, and are themselves preyed upon by jelly fishes and sea-anemones. The group comprises two orders, *Tentaculata,* or those with tentacles, and *Nontentaculata,* or those, forming the family *Beroïdæ,* without tentacles.

Ctesias, tē'shĭ-as, Greek historian: fl. about 400 B.C. His writings are particularly valued for the light they throw on the history of eastern nations. He was a physician and lived for 17 years at the court of Persia, and wrote his 'History of Persia' with the view of correcting the errors prevalent among his countrymen about that country. According to Diodorus his work is derived from the official history of the Persians, written according to the law of the country. This work was written in the Ionic dialect, and contained 23 books. Of this work all that remains is an abridgment in Photius and the fragments contained in Diodorus and other historians. An edition of Ctesias, with an introductory essay on his life and writings, was published by Bähr (1824). Consult Gilmore's edition of the fragments of the 'Persika,' with notes and introduction (1889).

Ctesibius, tē-sĭb'ĭ-us, Greek mechanician. He flourished under Ptolemy Philadelphus and Euergetes, at Alexandria, about 250 B.C., and was famous for his inventions in mechanics. We owe to him and his pupil, Hero Alexandrinus, the pump, the bent siphon, and also the discovery of the elastic force of air and its application as a motive power.

Ctesiphon, tĕs'ĭ-fŏn, or **Tak-i-Kesra,** Asia, a city of Babylonia, on the east bank of the Tigris and opposite Seleucia, the common winter residence of the Parthian kings, and finally the capital of the Parthian kingdom. It was conquered by the Romans in 115 A.D., and destroyed by the Arabs under Omar in 637. Its ruins still attest its former magnificence. The two places Ctesiphon and Seleucia are known as the Arab town, El-Modein.

Cuajiniquilapa, kwä-hē-nē-kē'lä-pä, Guatemala, the chief town of the eastern department of Santa Rosa. Its altitude above the level of the sea is 3,254 feet. Pop. 3,062.

Cuautla Morelos, kwä-oot'la dä mō-rā'lōs, Mexico, the chief town of the district of Morelos, in the state of Morelos. It is about 26 miles from Cuernavaca, the capital of the state, and 85½ miles from the city of Mexico, with which it is connected by railway. The surrounding country is a fertile sugar-producing district. Cuautla is historically interesting because it occupies the site of an old Indian town; and furthermore, in the war of independence, the famous patriot leader, José Maria Morelos y Pavón, was besieged here. Pop. about 14,000.

Cuba, an island of the West Indies, separated from the United States by the Strait of Florida, and from Mexico by the Yucatan Channel, and commanding the only entrances into the Gulf of Mexico. Extending east and west from the 74th to the 85th meridian, it constitutes the most important part of the northern barrier of the Caribbean Sea, and guards the Windward Passage, the natural route for commerce between the Atlantic Ocean and the "American Mediterranean," which is equivalent to saying, if we take the larger view, that it guards the route of commerce between the Atlantic and Pacific Oceans, via the Isthmus of Panama. Its eastern point, Cape Maisi, lies directly south of New York city; its western point, Cape St. Antonio, nearly south of Cincinnati. But the total length of the island, 730 miles, is somewhat greater than that statement would indicate, for Cuba curves "like a bird's tongue," as the Spaniards used to say, from lat. 19° 40′ N. in the province of Santiago up to lat. 23° 33′ N., the most northerly provinces being those of Matanzas and Havana. In its upward curve the coast-line attains to a point that is only 96½ miles distant from Key West; thence it falls away again until but 130 miles separate it from the mainland of Mexico. Its width decreases gradually from 100 miles in the east to less than 25 near the line between the two western provinces, Pinar del Rio and Havana. Its total area, including the Isle of Pines and the *cayos* or keys (more than 1,000 islets that form an irregular border along both the northern and southern coasts) is estimated at 44,000 square miles. Thus it is larger than Virginia; smaller than Pennsylvania. Nature has provided unusual facilities for making the most of Cuba's favorable situation upon a great and permanent marine highway. The coast-line is 2,000 miles long, or much more than that if we take into account all its indentations. Capacious harbors, quite evenly distributed along the north coast, are those of Baracoa, Nipe, Gibara, Neuvitas, Sagua la Grande, Matanzas, Havana, Cabanas, and Bahia Honda; and, on the south coast, Cienfuegos, Trinidad, Manzanillo, Santiago de Cuba, and Guantanamo. Besides these there are scores of fairly safe roadsteads and harbors of moderate size. Therefore no plantation on the narrow island can be very far away from some port at which supplies may be received and from which produce may be shipped. The mountains of Cuba occur in three distinct groups. Beginning in the westernmost province,

Pinar del Rio, we find the Guaniguanico range (Sierra de los Organos; greatest altitude, 2,532 feet), extending from Cape San Antonio to the boundary-line of Havana province, and thence continued in lower disconnected hills which give a bold outline to the northern coast of the four central provinces, and become the chief feature of the impressive landscapes around Sagua de Tanamo and Baracoa, far away in the east. The Guamuhaya group occupies but a limited area in the southern part of Santa Clara province, between the cities of Cienfuegos and Trinidad. Its highest summit, El Poterillo, is 2,900 feet. While the foregoing are of no great height, but owe their attractiveness rather to beauty or oddity of outline, the luxuriance of the foliage on their slopes, and the exquisite charm of the valleys they enclose, we find on the southern coast of Santiago province a range that, in sheer majesty, certainly rivals and probably surpasses any mountains of the North American continent, east of the Mississippi — the Sierra Maestra, including the Sierra del Cobre and the Macaca group. Rising precipitously above the Caribbean Sea, this cyclopean wall extends through two degrees of longitude, from Cape Cruz to the city of Santiago, in a nearly straight east and west line. The altitudes of three widely separated peaks are given as follows: The Cerro del Oro, 3,300 feet; La Gran Piedra, 5,200 feet; the Pico Turquino, 8,600 feet. From this it will be seen that all the northern parts of the island, and the southern coast as far west as Cape Cruz, are either mountainous or at least well above sea-level. But a long stretch of coast on the Caribbean Sea, especially the southern portions of Santa Clara and Matanzas provinces, is comparatively low-lying and swampy. The great Zapata swamp is formed where the gradual southern slope reaches the Caribbean level. Beyond the limits of the Zapata is an archipelago of islets, the so-called "Gardens" or "Little Gardens" (Jardinillos), crowding the shallow waters between Cuba and the Isle of Pines.

As we study the geology of these mountain groups we come upon the secret of Cuba's natural wealth — the fertility and depth of the soil that covers the pre-Tertiary sedimentary rocks forming the base of the island's structure. Above the diorites, basalts, and serpentines, the granitoid rocks, the primary and secondary sandstones, limestones, and conglomerates, is a great sheet of late Tertiary limestone. This white sheet or crust, of remarkable thickness, was formed as a deposit of "organically derived oceanic material," says Dr. Robert T. Hill; and the same authority adds: "The island was reclaimed from the sea by a great mountain-making movement in late Tertiary time, succeeding the deposition of these limestones. In later epochs, Pliocene and Pleistocene, the island underwent a series of epeirogenic subsidences and elevations which affected the coastal borders, producing the wave-cut cliffs and a margin of elevated reef rock which borders the coast in many places." About two thirds of the entire area of Cuba is covered with soils derived from this organic limestone — soils whose colors, red and black, are not at all suggestive of their origin. In quality, in depth, and in the proportion they sustain to less productive districts of the island, these calcareous soils are probably unrivaled in the world. It is quite certain that they have no rival in any land whose situation is equally favorable for easy and cheap transportation of the produce to foreign markets. A different type of soil, also valuable in agriculture, is the clay and gravel resulting from the decomposition of Tertiary igneous rocks. This occurs in parts of the provinces of Santiago de Cuba, Santa Clara, and Matanzas. Approximately one half of the island has been cleared, but between 13,000,000 and 15,000,000 acres are still covered with forests. The climate also favors vegetation, for the air is moist and injurious extremes of temperature are unknown. At Havana the thermometer averages 77° F. for the year, or 82° F. in the months of July and August, and 72° F. in December and January. At Santiago the average temperature for a year is somewhat higher — about 80° F.; on the other hand, towns located in the interior at an elevation of 200 or 300 feet above sea-level have an agreeable climate, the temperature averaging not more than 74° F. Rain falls most abundantly between the end of April and the beginning of November. The largest river is the Cauto, which flows westward through Santiago province and empties into the Gulf of Guacanayabo. Many smaller streams make their way from the mountains to both the southern and northern coasts; not a few have carved out subterranean passages through the white limestone, and thus, in ages long past, caverns of remarkable beauty have been formed. Even today in the western provinces, a number of streams disappear from view in some underground channel long before the sea is reached. In normal years nearly one half of the entire cane-sugar product of the world comes from Cuban soil, and yet the limit of the island's capacity in this direction has not been reached. As early as the 16th century the sugar industry was established under the special protection of Spanish sovereigns, but after more than 300 years have passed we find, at the beginning of the 20th century, only about 7 per cent of the area of the island devoted to the sugar crop — in other words, about 2,000,000 acres out of the total 28,000,000 acres. During the 17th and 18th centuries the annual output was about 28,000 tons. This increased to 75,000 tons in the first quarter of the 19th century, to 200,000 tons in 1840, and to nearly 300,000 tons in 1850. The increase is significant, for it was directly occasioned by the withdrawal of an annual allowance of $1,000,000 that Spain made to the Cuban administration out of the revenues from Mexico. The loss of Mexico to the Spanish crown closing that source of income, Cuba was thrown upon her own resources, with the result that she turned her attention more earnestly to the development of this profitable form of agriculture. The rapid gain in the amounts produced is shown in the following:

TABLE NO. 1. THE GOLDEN AGE OF CUBA.

Year	Tons	Year	Tons
1853	322,000	1861	466,000
1854	374,000	1862	525,000
1855	392,000	1863	507,000
1856	348,000	1864	575,000
1857	355,000	1865	620,000
1858	385,000	1866	612,000
1859	536,000	1867	507,000
1860	447,000	1868	749,000

TABLE NO. 2. PERIOD OF THE TEN YEARS' WAR.

Year	Tons	Year	Tons
1869	726,000	1871	*547,000
1870	726,000	1872	690,000

*Short crop caused by hurricanes in October, 1870.

Year	Tons	Year	Tons
1873	775,000	1876	590,000
1874	681,000	1877	520,000
1875	718,000	1878	533,000

TABLE NO. 3. FROM TREATY OF ZANJON TO LAST INSURRECTION.

Year	Tons	Year	Tons
1879	670,000	1888	656,719
1880	530,000	1889	560,333
1881	493,000	1890	632,368
1882	595,000	1891	816,980
1883	460,397	1892	976,960
1884	558,939	1893	815,894
1885	631,000	1894	1,054,214
1886	731,723	1895	1,004,264
1887	646,578		

The insurrection beginning in 1895 reduced the crop of the following year to 225,221 tons, and the continuance of hostilities in 1897 and 1898 forced the output of those years down to 212,051 and 300,000 tons. With the restoration of peace in 1898, a new era of development began; and though four years passed before the injuries to mills and fields could be fully repaired, the conditions at the beginning of 1903 justified the hope that the prosperity of the best years before 1896 would be regained.

In the year 1840 the output of beet-sugar for the world was but 50,000 tons, principally grown in France. From that date the production of this competing industry increased so rapidly that in 1894 it was 3,841,000 tons, and naturally this enormous addition to the world's supply caused a reduction in the price of cane-sugar which seemed ruinous, and indeed proved to be ruinous to the planters of many sugar-growing countries. But in Cuba the problem of producing sugar at a profit, despite the constant tendency toward lower prices, has always been solved with brilliant success. It was solved in the great crisis of 1884, and in more recent years whenever it has been presented. In 1902-3 improvements in agricultural methods, in machinery, and in management effected a reduction of the cost of the standard grade on some of the larger estates to much less than two cents a pound. It is evident that such results could not be achieved unless the soil and climate were in the highest degree favorable to the growth of sugar-cane; and what we have stated above is sufficient to show that large districts in which the soil is equally good have never been touched by the plow. Soil and climate are also favorable to the production of the most valuable kind of tobacco. The area in which the characteristic Cuban leaf can be grown is, however, as we shall see, much more restricted. The systematic cultivation of tobacco was not begun in Cuba until 1580, though the discovery of the use of the indigenous plant by the natives of this island dates from the first voyage of Columbus in 1492. Early in the last century the leaf grown in the Vuelta Abajo district (an area of about 90 miles in length by 10 in width, situated in the province of Pinar del Rio) won recognition the world over on account of its excellence; and as the profits of this industry, wherever it could be carried on advantageously, were much greater than those of sugar-making, no effort was spared to extend the area of production into other parts of the island. At least 10,000 tobacco plantations were in operation before the year 1880, but all experiments demonstrated the inferiority of the soil for this use outside of the Vuelta Abajo. Before the revolution of 1895, the production of leaf-tobacco in all the island was about 560,000 bales (averaging 50 kilos each) in a year. Of this amount about 260,000 bales were harvested in Pinar del Rio province, about 70,000 bales in the province of Havana, 130,000 bales in the province of Santa Clara, and 100,000 bales in the province of Santiago de Cuba. Only the 260,000 bales from the Vuelta Abajo were of the finest quality, the other components of the annual crop being known as the Partido leaf, the Remedios leaf, and the Gibara or Mayari — in the main coarser and cheaper grades. The amount of soil available for the production of first-class tobacco being thus limited, the conditions under which it had to be grown were also not at all favorable to either great or cheap production before the year 1903. First-class tobacco lands of the Vuelta Abajo were held at an exceedingly high price, and large rentals were demanded. Irrigation and constant care in most sections were absolutely necessary; efficient labor was scarce, and untrained laborers were not employed lest their blundering should ruin the product of the best fields. The following estimate generalizes the studies of a representative of the Merchants' Association of New York who made his investigations in Cuba during October and November 1902:

ESTIMATE OF COST TO PRODUCE TOBACCO IN PINAR DEL RIO, CUBA.

Lands rent for from $50 to $600 per caballeria (33.17 acres) according to distance from town and fertility of soil.

Average cost per caballeria for raising tobacco from beginning of planting until it is baled ready for market, viz.:		
Preparing land for planting, per caballeria		$ 450.00
Cost of 560 arobas of fertilizer, 7 tons at $60		420.00
Cost of 561,000 tobacco plants, at $2.50 per M.		1,402.50
Labor of planting and distributing fertilizer		165.00
Caring for the plants three months		1,982.00
Cutting and carting to dry house		644.00
Piling the tobacco		40.00
Gathering the seed to produce 1 caballeria		50.00
Depreciation of material and unforeseen expenses		300.00
Expenses for selecting and binding material, and baling, estimating 211 bales per caballeria		1,688.00
Total		$7,141.50
The product is calculated as follows:		
Value of 211 bales, at $50	$10,550	
" " 54 arrobas of seed at $4	216	
" " sticks of tobacco which are sold for fertilizing	12	10,778.00
Profit		$3,636.50

This computation should be regarded as very moderate. One of the leading manufacturers of Havana prepared an estimate for this publication which showed the cost of production in the San Luis district,—perhaps the best part of the Vuelta Abajo,—to be $15,802 for 260 bales of tobacco, the product of one caballeria of land. Avoiding extremes, we may say that the average cost per caballeria in that portion of the island was shown to be between $8,000 and $9,000; and the conclusion is that the production of tobacco in Cuba before 1903 was much more expensive than in any other part of the world. For this reason, and in view of the failure to secure good results outside of a few small districts, it appeared that the tobacco industry was destined, as compared with the cultivation of sugar, to play a secondary role, though still an important one, in the commercial development of Cuba. During seasons of

moderate prosperity it has furnished employment for about 80,000 persons. The value of that part of its product exported to the United States alone, before the insurgents laid waste the Vuelta Abajo and Partido districts, was as follows: In 1888, $7,941,516; in 1889, $9,261,441; in 1890, $11,088,240; in 1891, $10,484,604; in 1892, $10,802,690; in 1893, $11,727,088; in 1894, $7,881,468; in 1895, $9,311,980; in 1896, $12,707,352.

The transfer in 1902–3 of large interests to American capitalists led to the introduction of modern labor-saving devices and economical methods. Formerly growers made the mistake of collecting seeds from inferior third-growth plants, and the result was seen in a gradual degeneration of the plants and diminution of their leaves. To check this degeneration, strong fertilizers had occasionally been used in such large quantities that the leaves, while regaining their lost size, lost much of their fine quality. This was done even after it became a matter of common knowledge that the crops could be improved by scientific selection of seeds. For work in the fields, antiquated wooden plows were still used in 1902; and the tobacco land was cultivated in small farms, an arrangement that seemed necessary to those who employed only the primitive methods of destroying insects and ignored the spraying machine. So long as the old methods prevailed, a native family could not take care of more than a small field; moreover, the labor of the entire family was required, for work went on day and night. Every leaf had to be examined frequently and kept free from tobacco caterpillars. The wife and children aided the adult male laborer, taking turns throughout the 24 hours. In such details as these, improvements were made by the new management, not without opposition. The early attempts to introduce reforms in the established methods of handling the leaf in the manufactories was one cause of the strike of operatives and the riots in Havana (November 1902). Up to the close of the year last mentioned it was supposed that the soil of Pinar del Rio province was unique, both with respect to the rest of Cuba and all other countries as well. But the report of the secretary of agriculture of the United States, published 4 Dec. 1902, contained the announcement that in eastern Texas tobacco had been grown, under the direction of experts of the Department, which could "not be distinguished from the imported Cuban." The Department's representatives made their successful experiments or observations in Texas at Willis, Woodville, Nacogdoches, and Liberty. The area thus roughly defined is larger than all of the tobacco districts of Cuba.

Natural Resources.— In the mountainous eastern province deposits of copper, iron, manganese, and lead exist, and some of the mines have been worked on an extensive scale. The copper mines at Cobre, near the city of Santiago, were opened in 1524, and ranked as the greatest copper mines in the world until the deposits of this metal in the United States were developed. Iron ore of excellent quality outcrops on the southern slope of the Sierra Maestra range, and several companies operate mines east of Santiago which, together, have produced nearly half a million tons of iron in the best years. Deposits of silver have been found in the provinces of Puerto Principe, Santiago, and Santa Clara, and every province contains mines of asphaltum. Cedar, mahogany, pine, lignum-vitæ, ebony, rosewood, logwood, and other dyewoods, are valuable products of the forests for export; for the use of the Cubans themselves the royal palm stands unrivaled. Besides these well-known varieties, there are many less familiar trees — not only the characteristic flora of the other West Indian islands, of Central America, and Florida, but plant-forms that developed quite distinctive characteristics in the depths of these forests whose borders only were touched by the inexpert native lumberman. More than 3,350 native plants were catalogued before an exhaustive study of the subject could be undertaken. All kinds of tropical fruits grow luxuriantly, many of them without cultivation. In point of value the banana heads the list. Cocoanuts, oranges, lemons, limes, and pineapples are grown for shipment in larger or smaller quantities to correspond with the demand in foreign markets, the supply being practically unlimited within a short time after the demand becomes known. The anon, mango, rose-apple, pomegranate, sapote, tamarind, fig, citron, guava, aguacate (alligator pear), mamey, guanabana, etc., are abundant. The cultivation of grapes was forbidden by the Spaniards in the interest of the wine merchants of the Peninsula. No intelligent effort to realize the island's possibilities in this direction has yet been made, though in the year 1893 the value of fruit and vegetables exported to the United States from Cuba was $2,464,191. Coffee culture was at one time a flourishing industry; and since the comparatively small amount still grown in the eastern end of the island is of excellent quality we may expect coffee-raising to prove one of the minor sources of wealth in the future. Cotton grows freely in Cuba. Its cultivation on a commercial scale, abandoned after the liberation of the slaves, was resumed experimentally in the province of Santiago in 1902-3. In all parts of the island grasses grow rankly, and forage is abundant throughout the year. Other conditions favorable to cattle-raising are the mildness of the winters, the streams of fresh water, and the ready access to important markets on the Atlantic coast. Before the insurrection there were two and one half millions of cattle in Cuba; at its conclusion not more than 75,000. The promotion of this industry was encouraged by the Palma administration in 1902–3, and undertaken largely by American capitalists.

Population.—The first census of Cuba was taken in 1774, and we are enabled to trace the growth of population from that date onward. A study of the figures given below shows a decrease of 12.99 per cent in 1819, of 1.47 per cent in 1827, of 10.80 per cent in 1846, and of 1.86 per cent in 1869:

Year.	Pop.	Year.	Pop.
1774	171,620	1841	1,007,625
1787	176,167	1846	898,754
1792	273,939	1855	1,044,185
1804	432,000	1867	1,426,475
1810	600,000	1869	1,399,811
1817	635,604	1874	1,446,372
1819	553,033	1877	1,521,684
1825	715,000	1887	1,631,687
1827	704,487	1903 (est.)	1,590,000
1830	755,695		

As more than 200,000 people were killed or died of starvation and disease during the insurrection of 1895–8, we must assume that the

population increased more rapidly during the eight years before that outbreak than at any other period in the island's history. The natural increment, if we base our calculation upon the United States census rates, excluding the gain through immigration, would have given Cuba a population of considerably more than 5,000,000 in 1903. Destructive wars and oppressive laws account for the difference in part but not wholly. The black or colored element has shown from the first a marked tendency to decline in numbers. Over 1,000,000 African slaves were imported, but the census of 31 Dec. 1887 showed only 528,798 colored persons and 1,102,889 whites, the percentage being 67.59 for whites and 32.41 for colored people, the latter comprising Asiatics as well as negroes. The census of 1877 placed the number of Asiatics at 43,811. We must remember, also, that a large number of the colored people of Cuba, are descendants of the negroes who accompanied the 16th century Spanish explorers and earliest settlers. The Chinese who were brought to the island under contract to work on the sugar plantations have drifted into other occupations, such as market-gardening. The white inhabitants are not all known as Cubans, but are divided into two classes, Cubans and Spaniards — the latter being identified by birth and sympathies with the mother country. In both classes we find some persons of good character and excellent ability. More than elsewhere the custom has been for members of the wealthier families to receive their education abroad; and whereas they were formerly in many instances sent to France, England, or Germany for educational purposes, in recent years, and especially since 1901, the schools of the United States have been almost invariably preferred. The peasants also form a class that deserves a somewhat better reputation than it bears in the world at large. Revolutions and destruction of property were induced by intolerable oppression; it is not true that the natives are more lawless than are the ignorant classes in other countries; and instead of being hopelessly slothful, as travelers have commonly represented them, they are capable of doing fairly good work under proper direction. Between the extremes of wealth and poverty is the class that is most corrupt and least useful; in the structure of Cuban society a student does not find the vigorous and substantial middle class known to Anglo-Saxon and Teutonic communities.

Cities and Towns.— Each of the six provinces has the same name as its capital city. The most populous of the provinces, Havana, with an area of 8,610 square miles and about 436,000 inhabitants, represents the tendency of manufacturing districts to mass their people in a few centres. The city of Havana alone had a population of 235,981 when the government of intervention took its census, and immigration increased that number to more than 247,000 in the next four years. Contrast with this the agricultural province of Pinar del Rio, of which the capital is a town of less than 9,000 inhabitants. Matanzas, capital of the province of that name, is not only important commercially,— its shipments of sugar to the United States having been in value about $60,000,000 in the five years before the late war,— but it is interesting to tourists in search of the picturesque because it adjoins the valley of Yumuri, Cuba's earthly paradise, and the famous caves of Bellamar. Santa Clara (popularly known as Villa Clara), high above sea-level in the centre of its province, is surrounded by a fine grazing country, and both silver and asphaltum are found in its neighborhood. Puerto Principe, a "port" that is 35 miles from the north coast and 45 miles from the south, was the centre of a prosperous grazing district before its cattle were destroyed. Of all the provincial capitals the most famous is that one which the natives call simply "Cuba," and Americans call Santiago — Santiago de Cuba, the second oldest town, formerly the capital of the island, the metropolis of the Roman Catholic Church in Cuba, and the theatre of the main events of the Spanish-American war of 1898. Its safe harbor; its situation, as the natural outlet for the important mining and agricultural industries of the province; even more, its proximity to the Windward Passage, assure the future development of this city. Besides these capitals there are 109 cities and towns in the island that have a population of more than 200: Cienfuegos (see that title), Guanabacoa, Cardenas, Trinidad, Sancti Spiritus (Santo Espiritu), Sagua, Regla, Manzanillo, Guantanamo, ranging from 30,000 to 8,000; and 100 smaller places, some of which are quite important commercially. On the Isle of Pines (area 840 square miles, population about 3,000) there are two small towns, Nueva Gerona and Santa Fé, connected by steamers with Batabano, on the south coast of Havana province. Both lie in an attractive though somewhat inaccessible region, renowned for its excellent climate and products, such as marble and hardwoods. In the past the Isle of Pines was administered as part of the judicial district of Bejucal (province of Havana); but the official declaration of transfer of the government and control of Cuba to the President and Congress of that republic put the ownership of the smaller island in doubt. The following reservation was made: "It is understood by the United States that the present government of the Isle of Pines will continue as a *de facto* government, pending the settlement of the title to said island by treaty pursuant to the Cuban constitution and the act of Congress of the United States approved 2 March 1902." This reservation or condition was accepted by the Cuban president.

History.— A score of years after the discovery, the town of Baracoa was founded by Spaniards under the leadership of Velasquez; next, in rapid succession, came Trinidad, Sancti Spiritus, Puerto Principe, and Santiago, dating from 1514 to 1515. In the year last mentioned Velasquez founded the original town of Havana (San Cristóbal de la Habana) on the south coast; but in 1519 the present site on the north coast was chosen, and to it the settlers of the older town were transferred. So important did this new Havana appear to be that the first governor of Cuba called it "The Key of the New World." Burnt by the buccaneers in 1528, it was rebuilt and surrounded with fortifications by De Soto. Again captured and sacked by pirates in 1556, it was again fortified, and more strongly, by direction of the Spanish crown. Morro Castle was begun before 1600. During the 16th century the value of Cuba in Spanish eyes was precisely what the words "Key of the New World" expressed: at its ports expeditions were fitted out for conquest and exploration of the main-

land, but there was no thought of obtaining revenues from the island itself except by the discovery of the precious metals, the futile search for which was never quite abandoned. When the first plants of sugarcane were imported from the Canary Islands to start an industry more remunerative than mining, it became necessary to import slave-labor from Africa also. The Indians had been nearly exterminated — not entirely so, as is commonly asserted, for the aboriginal strain can still be detected in the physiognomy of some Cubans. English, French, and Dutch pirates continued to ravage the coasts during the next century. Cuban cities of that time, with their old-fashioned defensive works, were like the walled towns of mediæval Europe. An attack of the Dutch fleet upon the capital was repulsed in 1628; in 1762, however, a force of English and American colonial troops, under Lord Albemarle, took Havana, which they held until, by the terms of the treaty of Paris of 1763, Spain regained possession. A period of moderate prosperity and exceptionally good government followed. Las Casas, who came out as captain-general in 1790, worked earnestly and wisely to promote Cuba's interests; the Cubans, for their part, evinced their appreciation of such considerate treatment by a chivalrous display in Spain's time of need. Havana learned in 1808 that the Spanish dynasty had been overthrown by Napoleon; thereupon her citizens declared war against Napoleon. And when Spain was losing one after another of her American colonies, Cuba remained loyal. But prosperity,— the brilliant achievements in agriculture to which we have already referred,—brought long years of suffering to the "ever-faithful island" and the mother country as well. The result was inevitable. When the long-sought treasures of Cuba were at last brought forth, not from gold mines but from the fertile soil, Spain sought to make the treasure all her own, as she had monopolized the precious metals three centuries before. With a few noble exceptions, the high Spanish officials sent to Cuba were simply belated *conquistadores,* lacking the personal valor, but possessing the acquisitive talent of the adventurers who first exploited Mexico and Peru. The decree of 1825 placed the lives and fortunes of all Cubans at the disposal of the captains-general. Conspiracies, insurrections, filibustering expeditions from the United States, called forth by oppressive measures, and in turn furnishing a poor justification of repressive measures,— are the main incidents of the story of the 70 years next following. We may mention only the conspiracy of 1829, the rising of the blacks in 1844, the Lopez expeditions in 1849, 1850, and 1851, the revolts in 1855, the Ten Years' war (1868-78) and the revolution of 1895. About 200 Americans took part in the ill-starred expedition of 1851, and of those who surrendered after Lopez's defeat many were shot. Capt.-Gen. Taçon (1836) set native Cubans against resident Spaniards by harsh discrimination, persecuting the former and favoring the latter, thus intensifying that antagonism between the two elements of the white population which to-day makes political controversies rancorous. The cause of the revolutionary movements between 1849 and 1855 was the cruelty of a military commission in 1848, more than 3,000 persons being tortured, imprisoned, banished, or executed at that time for real or supposed complicity in a plot. During a part, at least, of the Ten Years' war, the aim of the Spaniards was, as Capt.-Gen. Valamaseda wrote, to convert the island into a desert. Spain sent 257,000 men against the insurgents and lost 208,000 of them, according to official reports; the Cubans lost 40,000 persons, men, women, and children; the cost of the war, excluding the value of property destroyed, was $300,000,000. Midway in this struggle the Virginius, a vessel whose American register had been fraudulently obtained, was captured by a Spanish warship, taken into the harbor of Santiago, and about 50 of her officers and men were shot without civil trial. The Treaty of Zanjon (1878), while apparently making concessions, restored in effect the old oppressive conditions. The cost of the war was made a new burden for the island to bear, while vexatious restrictions hampered its commercial relations with other countries. "Underground Cuba" gathered force for a final effort; in February 1895, a little flame of insurrection was kindled; in the course of three years the whole island was again laid waste. Throughout the last century the government of the United States manifested an interest in Cuba's fate. In 1823, Mr. Monroe being President, a despatch was sent by the secretary of state to the American minister at Madrid, in which the secretary (Mr. Adams) called particular attention to the commanding position which Cuba occupies with reference to the Gulf of Mexico and the Caribbean Sea, and expressed the opinion that there was no other foreign territory which could compare with it in the sum of the national interests of the United States. In 1825 and 1826 Colombia, being then at war with Spain and designing to invade Cuba and Porto Rico, refrained from this projected attack on the strength of a protest from the United States — a protest in the interests of the slave-power; the new Spanish-American states "always marched under the standard of universal emancipation." Martin Van Buren said in 1829: "It is the interest of the southern section of the Union that no attempt should be made in Cuba to throw off the yoke of Spanish dependence." Webster, in 1848, declared that Cuban emancipation "would strike a death blow at the existence of slavery in the United States." Thus for 20 years the southern slave-owners insisted that the status of Cuba and Porto Rico should not be changed.

The annexation idea came to the front in 1848. A proposition for the purchase of the island was made by President Polk, through his secretary of state, Mr. Buchanan, who wrote to the American minister authorizing the latter to offer $100,000,000 to Spain as compensation for the surrender of a colony which was, as we have seen, a particularly troublesome possession just then. The strategic value of Cuba was dwelt upon in this correspondence, and the fear was expressed that the island might fall into Great Britain's hands, in which event that nation would exercise supreme control over the Gulf of Mexico. The offer was declined by Spain. Both England and France were warned in 1852 that the United States would not admit the claim of any other power to intervene in a dispute of which Cuba was the subject. In February 1854 the cargo of an American steamer, the Black Warrior, was

seized unjustifiably in Havana. It seemed for a time that war, and the acquisition of Cuba by force, might ensue; but reparation was offered by Spain, and was accepted. President Grant intimated in 1875 that "mediation and intervention" might become necessary to put an end to the long struggle then in progress.

The revolution of 1895 falls naturally into three periods: First, that of Capt.-Gen. Martinez Campos, whose fair fighting utterly failed to prevent the spread of the revolutionary movement from the eastern to the western provinces; second, that of Capt.-Gen. Weyler, who inaugurated the shameless policy of reconcentration; third, that of Capt.-Gen. Blanco — including the events from Weyler's recall to the destruction of the Maine. Fighting fairly and like a gentleman, Campos was fairly beaten by men who developed positive genius in guerrilla warfare — Gomez and Antonio Maceo, who knew how to win by skilful evasion, by opportune attack, and, above all, by making an ally of every peasant and living on the country. Maceo crossed both trochas, and reached Pinar del Rio province, thus carrying revolt from one end of the island to the other. Among the hills of the Sierra de los Organos he maintained his band of followers and defied all efforts to dislodge him up to the close of the year 1896. Then he risked his life once too often, and was killed. Campos failing to check the insurrection, Weyler was sent to crush it. The reasoning of the latter was strictly logical. He learned that Cuban peasants supplied the rebels with food, with information in regard to the movements of Spanish columns, and with ammunition — bought, stolen, or brought to the coast by filibusters; he did not shrink, then, from the extreme cruelty involved in the removal of the country folk from their homes to garrisoned cities, where, as "reconcentrados," they should become quite harmless. On 21 Oct. 1896, his infamous proclamation was issued. Thousands of Cuban families were pent in towns or zones under surveillance of a Spanish garrison; and as time went on they died of starvation and fever.

When Spain's prime minister, Señor Cánovas del Castillo, was assassinated, 8 Aug. 1897, the prop of Weyler's Cuban policy was withdrawn. His successor, Gen. Blanco, took to Cuba a policy of compromise. Autonomy was offered; and, for the rescue of the reconcentrados, the suggestion was made that charitable people in the United States might forward supplies to be distributed by the American consuls in Cuba. The proposal of autonomy was rejected with emphasis: Gen. Blanco's emissary who brought the message was shot by an insurgent commander. And when it became known that an appeal for contributions to feed starving Cuba had been made in the United States, formidable riots in Havana expressed resentment of the proffered relief, which was regarded as the entering wedge of the dreaded intervention. For the protection of American interests the Atlantic squadron was ordered to make its headquarters at the Dry Tortugas, within six hours' sail from the Cuban capital; and on 25 January the battleship Maine was sent to Havana harbor. The Spanish government sent the cruiser Vizcaya to New York harbor soon afterward. On 9 Feb. 1898, a letter addressed to Señor Canelejas by Señor Dupuy de Lome, Spanish minister to the United States, was published in the newspapers of the latter country. Its cynical tone and insulting characterization of President McKinley were resented, and Señor de Lome resigned his office. One week later the Maine was destroyed "by the explosion of a submarine mine,"— to quote from the report of the court of inquiry,— "which caused the partial explosion of two or more of her forward magazines." The court was unable to obtain evidence fixing the responsibility upon any person or persons; before the official investigation was made, however, public opinion in the United States had rightly or wrongly assigned the responsibility, and war with Spain seemed inevitable. On 8 March, the House of Representatives passed a bill appropriating $50,000,000 for national defense. Senator Redfield Proctor's statement of his personal observations in Cuba, read to the Senate 17 March, did not make for peace: it confirmed previous reports which had excited pity and indignation. Diplomatic representatives of the six great European powers called at the White House 7 April to present a joint note, a "pressing appeal" for "the maintenance of peace." President McKinley's reply was conciliatory, but the resolve he had formed was expressed in his message of 11 April: "In the name of humanity, in the name of civilization, in behalf of endangered American interests, which give us the right and the duty to speak and act, the war in Cuba must stop." The war in Cuba had, indeed, stopped or halted. The queen regent of Spain had directed Gen. Blanco to proclaim a suspension of hostilities, in order to prepare and facilitate the restoration of peace; and the President's message concluded with the statement that he had received official information of this circumstance. The text of Gen. Blanco's proclamation had been published, and the orders of Gen. Weyler revoked. It was asserted that the reconcentrados were to be permitted to return to their homes, that the sum of $600,000 had been voted for their relief, and that public works had been undertaken for the purpose of giving employment to the poor. Spain had offered to submit to arbitration the disputes which might arise in the matter of the Maine. President McKinley called attention to all these things, and requested that they should be given full weight in the deliberations of Congress. But the "full weight" of such programmes had been ascertained. The reports of American consuls in Cuba accompanying the message described conditions which it seemed impossible to reform without forcible intervention. The famous joint resolutions of 19 April, recognizing "the independence of the people of Cuba, demanding that the government of Spain relinquish its authority and government in the island of Cuba, and withdraw its land and naval forces from Cuba and Cuban waters, and directing the President of the United States to use the land and naval forces of the United States to carry these resolutions into effect," concluded with the words: "The United States hereby disclaims any disposition or intention to exercise sovereignty, jurisdiction, or control over said island, except for the pacification thereof, and asserts its determination when that is accomplished to leave the government and control of the island to its people."

The Spanish-American war began on 21 April 1898; Admiral Cervera's fleet was destroyed off Santiago 3 July; the formal surrender of Santiago took place on 17 July.* See UNITED STATES, SPANISH-AMERICAN WAR. In the protocol suspending hostilities which was signed on 12 Aug. 1898, it was provided that Spain should relinquish all claim of sovereignty over and title to Cuba, and that Cuba should be immediately evacuated. The evacuation proceeded gradually; the last of the Spanish troops leaving 1 Jan. 1899. The participation of the revolutionary army in these events has two noteworthy features: A force of about 3,000 Cubans, led by Gen. Calixto Garcia, joined the American troops at Aserraderos and served through the Santiago campaign, forming a part of the line about the city. Later, the retiring Spanish army was closely followed, outside of the chief cities, by the Cuban army, which took charge of the towns and country, maintaining order and performing police duty; and, when finally disbanded, dispersing peacefully among the people. The treaty of Paris, signed 10 Dec. 1898, provided for the temporary occupation of the island by the United States. By an order dated at Headquarters of the Army, Washington, 13 Dec. 1898, a division known as the Division of Cuba was created, under command of Maj.-Gen. John R. Brooke. The authority of military governor of the island was exercised by Gen. Brooke from 28 Dec. 1898, until 20 Dec. 1899, when he was succeeded by Maj.-Gen. Leonard Wood, who continued in office until 20 May 1902. During the entire period of American occupation (18 July 1898 to 20 May 1902), the total revenues were $57,197,140.80; amount in hands of the treasurer at the close of business, 19 May 1902, $635,170.29. The latter sum was paid to the Republic of Cuba; the former was expended for maintenance of the government ($2,780,781.16), justice and public instruction ($11,108,187.46), sanitation ($9,706,258.20), public buildings, works, ports, and harbors ($5,833,607.90), charities and hospitals ($4,124,986.60), barracks and quarters ($2,525,483.78), etc. A comparatively small amount was used for the pay of officers and men; very large sums devoted to works of public utility, in the interests of the Cuban people. Cuban imports during this period amounted to $225,437,135, the largest items being foodstuffs, animals, and animal products, cotton, silk, vegetable fibres, wool, etc., and metals and metal manufactures. From the United States came 43 per cent of imports, while the rest of the world supplied 57 per cent. Cuban exports amounted to $180,609,067, the United States taking 75 per cent. The articles exported to the United States were tobacco and its manufactures, $45,400,670; sugar and molasses, $77,648,819; wood, unmanufactured, $1,752,451; iron and manganese ore, $2,587,715; fruits and nuts, $2,547,392; all other articles, $5,479,092. Thorough sanitary measures were adopted; the death-rate of the island was lowered; the causes of yellow fever were discovered, and that disease nearly exterminated. Especially successful were the efforts to beautify Havana and improve its sanitary condition; that city became one of the most attractive in Latin America. The reforms extended to the prisons, hospitals, and asylums; a general system of free schools was established throughout the island; in many practical ways Cuba was prepared for self-government.

A constitutional convention, the members of which were elected 15 Sept. 1900, met in the city of Havana the following November. The Constitution of Cuba was adopted 21 Feb. 1901, and an appendix thereto (the "Platt Amendment") 12 June 1901. A form of government was thus provided which, in its main features, resembled that of the United States. The appendix, however, curtails Cuban independence. Its eight articles follow:

I. The Government of Cuba shall never enter into any treaty or other compact with any foreign power or powers which will impair or tend to impair the independence of Cuba, nor in any way authorize or permit any foreign power or powers to obtain by colonization or for naval or military purposes, or otherwise, lodgment or control over any portion of said island.

II. That said Government shall not assume or contract any public debt to pay the interest upon which, and to make reasonable sinking-fund provision for the ultimate discharge of which the ordinary revenues of the Island of Cuba, after defraying the current expenses of the Government, shall be inadequate.

III. That the Government of Cuba consents that the United States may exercise the right to intervene for the preservation of Cuban independence, the maintenance of a government adequate for the protection of life, property, and individual liberty, and for discharging the obligations with respect to Cuba imposed by the Treaty of Paris on the United States, now to be assumed and undertaken by the Government of Cuba.

IV. That all the acts of the United States in Cuba during the military occupancy of said island shall be ratified and held as valid, and all rights legally acquired by virtue of said acts shall be maintained and protected.

V. That the Government of Cuba will execute, and, as far as necessary, extend the plans already devised, or other plans to be mutually agreed upon, for the sanitation of the cities of the island, to the end that a recurrence of epidemic and infectious diseases may be prevented, thereby assuring protection to the people and commerce of Cuba, as well as to the commerce of the Southern ports of the United States and the people residing therein.

VI. The Island of Pines shall be omitted from the boundaries of Cuba specified in the Constitution, the title of ownership thereof being left to future adjustment by treaty.

VII. To enable the United States to maintain the independence of Cuba, and to protect the people thereof, as well as for its own defense, the Cuban Government will sell or lease to the United States the lands necessary for coaling or naval stations, at certain specified points, to be agreed upon with the President of the United States.

VIII. The Government of Cuba will embody the foregoing provisions in a permanent treaty with the United States.

The convention adopted the foregoing articles reluctantly, after considerable delay, and relying upon representations made to certain delegates by President McKinley, Senator Platt, and other officials at Washington, that the tariff on Cuban products sent to the United States would be reduced, as a proper concession in view of the surrender by Cuba of such valuable privileges. The Congress of Cuba (elected 31 Dec. 1901 and 24 Feb. 1902) was convened in Havana 5 May 1902, to examine into the credentials of its own members, and to count and ratify the electoral vote.

At 12 o'clock, noon, 20 May 1902, the Republic of Cuba was established; Tomás Estrada Palma being president, and Luis Estevez Romero vice-president. The transfer was made in the reception hall of the palace of the military governor. A salute of 45 guns was fired while the document of transfer and President Palma's

*For the history of military and naval operations in Cuba and Cuban waters in 1898, see 'UNITED STATES' HISTORY,' subdivision, 'The Spanish American War.'

LAST DAY OF AMERICA

OCCUPATION IN CUBA.

reply were being read; the troops of the Seventh United States Cavalry, formed in the plaza before the palace, presented arms; the band played the American national air, and the American flag was lowered. Next, the Cuban flag was hoisted and greeted with the national salute of 21 guns by the U. S. S. Brooklyn; the Cuban national air was played; the American troops saluted the Cuban flag, and then immediately embarked. There remained on the island, at Santiago, Cienfuegos, and Havana, small forces of artillery, for the preservation and care of the coast defenses, and to avoid leaving the island entirely defenseless against external attack, pending such arrangements for naval stations as were contemplated. Though the failure to secure tariff concessions from the United States as promptly as was expected increased the difficulty of their financial problems, the people of Cuba have a fair record for the first year of the republic's existence. An intelligent effort was made to keep the most important industries moving along in the usual way, and to preserve order throughout the island — the single conspicuous exception being the strike of tobacco workers, which we have mentioned. From the first the balance in the treasury showed a tendency to increase. The completion of the central railway, connecting Santa Clara with Santiago, and the western with the eastern provinces for the first time by a continuous line of railway transportation, gave a new impetus to industrial development in 1903.

Exports from Cuba to the United States in 1903 (fiscal year) were valued at $62,942,790, or $28,258,106 more than in 1902. On the other hand, exports from the United States to Cuba, which in 1902 were valued at $25,012,109, in 1903 amounted to $20,140,132, a decrease of nearly $5,000,000.

On 2 July, 1903, the coaling-stations and the Isle of Pines treaties were signed at Havana. The former contained the "conditions of the lease of areas of land and water for the establishment of naval or coaling stations in Guantanamo and Bahia Honda," made to the United States in fulfilment of the provisions of article VII of the "Platt Amendment." The treaty relating to the Isle of Pines provided that "The United States of America relinquish in favor of the Republic of Cuba all claim to the title to the island of Pines, . . . in consideration of the concessions of coaling and naval stations which have heretofore been made to the United States of America by the Republic of Cuba."

The famous treaty of commercial reciprocity between Cuba and the United States, designed "to strengthen the bonds of friendship between the two countries, and to facilitate their commercial intercourse by improving the conditions of trade between them," having been approved by the Senate of the United States 17 March 1903, and by the Cuban Senate 28 March 1903, was submitted to the House of Representatives at Washington, convened in extraordinary session 9 Nov. 1903. Consideration of the Cuban reciprocity bill was begun in the House 16 Nov. and was under discussion during the early part of the extra session.

Cuba's population, according to the census taken under the direction of the War Department of the United States, was 1,572,797 on 16 Oct. 1899.

MARRION WILCOX.

Cube, in geometry, a solid contained by six equal square sides. The content of a cube is found by multiplying the superficial area of one of the sides by the height; or, in other words, by multiplying the number that expresses the length of one of the edges by itself, and the product thus found by that number again. Cubes are to one another in the triplicate ratio of their diagonals; and a cube is supposed to be generated by the motion of a square plane along a line equal to one of its sides, and at right angles to it; whence it follows that the planes of all sections parallel to the base are squares equal to the base, and consequently to one another.

Cube, or **Cubic Number,** in arithmetic, the result of taking any number thrice as a factor; thus 64 is a cube number, and arises by multiplying 4 by 4 and the result again by 4.

Cubeb, the unripe fruit of *Piper cubeba*, a climbing perennial with smooth stem and alternate lance-shaped, bright green, shining leaves. It is a native of the West Indies, being extensively cultivated in Java and Sumatra. It was introduced into medicine by the Hindus and Arabians, who employed it widely as a condiment also. Cubebs contain about 14 per cent of volatile oil, a small amount of an indifferent substance termed cubebin, and cubebic acid. It also contains a small amount of resin. A mixture of oils, resins, and acids comprises the oleorosin of cubebs that is used in medicine. It is an active spice somewhat related to pepper, its botanical ally, but the taste is more pleasant and less pungent. It is used as a local stimulant in indigestion and as a flavoring vehicle in mixtures and gargles. It is valuable, particularly in diseases of the mucous membrane, especially of the bronchi, of the bladder and of the urethra. Cubebs are very frequently smoked in cigarettes, in which form they have a pleasant stimulating effect on the mucous membrane of the bronchi and larynx.

Cubic Equations, equations in which the highest exponent of a given quantity in any term is 3. Every such equation of one unknown quantity can be reduced to the form $x^3 + px + q = 0$, where x is the variable and p and q are constants. Every equation of this form has three roots, all of which may be real, or one may be real and two imaginary. An equation containing any number of variables in which the greatest sum of the exponents of the variables in any term is 3 is called a cubic equation. Thus $x^2y + 5y^3 + 6 = 0$ and $xyz + z^3 = 0$ are cubic equations in x, y, and x, y, z, respectively.

Cubitt, Sir William, English civil engineer: b. Dilham, Norfolk, 1785; d. 13 Oct. 1861. He was a miller, cabinet-maker, and millwright until 1812, when he became chief engineer in Messrs. Ransome's works at Ipswich. In 1823 he joined the Institution of Civil Engineers, and removing to London, was afterward engaged in most of the public undertakings of his day. The improvement of the Severn and of Boulogne port, the Bute docks at Cardiff, and the water-works for Berlin are among his works. He also invented the treadmill, and constructed the Southeastern Railway; and for his services in connection with the erection of the Great Exhibition buildings he was knighted in 1851.

Cucking-stool, a kind of a chair, used anciently in England and Scotland for the punishment of scolds or refractory women, or for dishonest tradesmen. The culprit was placed in the chair, there to be hooted and pelted at by the mob. It was sometimes used as a ducking-stool (q.v.). It was in common use up to the 17th century. Chambers says that one was used at Kingston-on-the-Thames as late as 1745 A.D., and one at Cambridge till 1780. Townsend states that a woman was punished by means of the cucking-stool at the former place in 1801. Many cucking-stools are still in existence. It was called also goging-stool, trebuchet, castigatory, or tumbrel; and the term cucking-stool, the etymology of which had become unintelligible to the common people before the apparatus itself ceased to be used, was corrupted into ducking-stool.

Cuckoo, formerly spelled cuckow, the English name of a common bird, so called from the note of the male, and now generally applied to all related birds of the family *Cuculidæ* (q.v.). The cuckoo of Europe, the *Cuculus canorus* of ornithologists, perhaps occupies more space in general literature than any other bird, on account of the interest which attaches to its remarkable habit of nest parasitism, and the equally remarkable but unfounded superstitions which have collected about what is to many persons, its mysterious life. It is a common summer bird throughout Europe, retiring in winter to equatorial Africa, its southward migration beginning immediately after the close of the breeding season. During April, May, and June the loud «cuck-oo» of the males is one of the most familiar of country sounds; but it wanes with the breeding season. The eggs are invariably laid in the nests of other birds, the hedge sparrow (*Accentor modularis*) and other similar small species being the victims. The female cuckoo is said to deposit her egg on the ground, from which it is then conveyed in the beak to the nest selected, the rightful contents of which are often cast out. A curious circumstance, the reason for which is not fully understood, is that the cuckoo egg usually hatches before any eggs of its hosts which remain in the nest. The young cuckoo secures the exclusive attention of its foster parents by working itself beneath any eggs or other young birds in the nest, raising them on its back, and tumbling them over the edge of the nest.

The true cuckoos are represented in North America by three or four species of the genus *Coccygus,* of which two, the yellow-billed cuckoo (*C. americanus*) and the black-billed cuckoo (*C. erythrophthalmus*) are the best known and most widely distributed, the former ranging, with its western variety, throughout the United States, the West Indies, and much of the British provinces, the latter being chiefly eastern and migrating in winter far into South America. Both species have the bill strongly curved, stout and somewhat flattened at the base, the feet large, with very short metatarsi, the wings long and the tail long and wedge-shaped. Both are of a plain, uniform, bronzy olive-gray above and white, or nearly so, below. They are readily discriminated by the entirely blue-black bill and the absence of bold markings on the tail feathers of the one species, and the partly yellow bill and broad white margins of the tail of the other. In habits the two species differ but little, and except in the manner of deposition of their eggs, not much from the European cuckoo. Both build nests, which are mere loose platforms of twigs placed in thickets and trees, and lay a considerable but variable number of pale green eggs at long and irregular intervals, with the result that the same nest frequently contains freshly deposited eggs along with young birds. Besides the family taint, which the manner of nesting and oviposition suggest, both species occasionally fall into the parasitic habit and place an egg in another bird's nest; not infrequently the yellow-billed species, which is the chief offender, selects her black-billed relative as the recipient of these parental courtesies. In the northern States the cuckoos are late arrivals from the south, not appearing until the fully leaved trees and bushes afford them the concealment which their retiring tastes demand. Their presence is soon known by the oft-repeated loud cow-cow-cow, etc., the frequent utterance of which, upon the approach of storms, has gained for them the name of rain-crow. As destroyers of hairy caterpillars, which most birds pass untouched, the cuckoos deserve the esteem of horticulturists. Though subsisting largely on caterpillars they also eat other insects and occasionally fruits. The ground cuckoo or chaparral cock (q.v.) and the anis or Savannah blackbird (q.v.) are also American. The number of exotic species of cuckoo is very great, and many of them are interesting and handsome birds which are frequently exhibited in zoological gardens. See CUCULIDÆ.

Cuckoo Bee, a commensal (q.v.) of the *Andrena, Halictus,* and other solitary bees, which burrows in the ground. In their slender, smooth, and gaily colored bodies they resemble wasps. The females do not sting severely. Although their eggs are laid in the cells of their hosts, and the larvæ feed upon the pollen stored for the young of their hosts, they are quite different in shape, the head being smaller, and the body more cylindrical. The young as well as the adults of both host and commensal live together harmoniously, the adults of both kinds reaching maturity at the same time. *Nomada imbricata* and *N. pulchella* reside in the nests of *Andrena vicina,* and the former in nests of *Halictus parallelus.* Species of *Stelis* find lodging and board with *Osmia.*

Cuckoo Flies, a species of the hymenopterous family *Chrysididæ,* which, cuckoo-like, live at the expense of various solitary bees and wasps, but, unlike the cuckoo bees (q.v.), actually devour the young of their hosts. They may be seen in hot days briskly flying about and alighting on posts and trees, darting their ovipositor into holes in search of the cells or nests of other *Hymenoptera,* in which to lay their eggs. They feed on the pollen stored up by the host when hatching as maggots. More often they are known to fasten on the back of the larva of their host, suck its blood and thus destroy it; they also appear to destroy the eggs of their host. Although the chrysis lays from 6 to 10 eggs, all but one shrivel up. Chapman has noticed the young larva seize with its mouth-parts a fold of the skin of the helpless larva of the wasp (*Odynerus*) and suck it, without inflicting any visible wound. It spins its cocoon inside that of its host, remaining there until the following spring. The species of

Cleptes is supposed to prey on saw-flies, probably laying their eggs in the cocoons of the latter.

Cuckoo-flower, or **Lady's-smock** (*Cardamine pratensis*), a common and pretty meadow-plant, order *Cruciferæ,* with pale lilac or white flowers. *C. pratensis* is found in swamps and wet meadows from Labrador to northern New Jersey, in Minnesota, and west to the Pacific coast of British America. It is common in England, and throughout northern Europe and Asia. It blossoms in April or May, presenting a very pleasing appearance. It possesses anti-scorbutic properties. The name is also given to the ragged-robin (*Lychnis flos-cuculi*) of the pink family.

Cuckoo-spit, a froth found on plants. It is a secretion of the larvæ of small homopterous insects, of which one of the commonest is the little green *Aphrophora spumaria,* which is very partial to willows. Another closely related green species (*Tettigonia viridis*) is common on meadow plants.

Cucujo, or **Cucuyo,** a luminous beetle of the click-beetle (q.v.) family *Elateridæ,* which, in the West Indies, Mexico, and northern South America, is often used as an ornament in the hair or upon the dress of women. The Indians capture them by waving about in the air a stick to which they have attached a coal, to the light of which the beetles are attracted, when they may be caught in nets. The Indians keep them in cages of wire-netting, feed them each evening upon pieces of crushed sugarcane, and bathe them twice daily in tepid water. In this condition they are offered for sale in large numbers in the shops and street-markets of Vera Cruz and other tropical cities. The principal species (*Pyrophorus noctilucus*) is from one and three quarters to two inches in length, and has no beauty by daylight, being rusty brown or blackish; but when belted and attached to a pin in the hair by a delicate chain it glows at night like an immense gem. See FIREFLY.

Cuculidæ, kū-kū'lĭ-dē, the cuckoo family, the typical one of the order *Coccygomorphæ* (q.v.). The toes are paired, the first and fourth being directed backward, and the second and third forward; the metatarsi are scutellate and the palate is desmognathous; the wings are variable in size and have 10 primary quill feathers; the tail is usually long and wedge-shaped, with 10, or rarely 8, quill feathers. The family is a large one and comprises upward of 40 genera and nearly 200 species, which are especially numerous in Africa and India. Much uncertainty prevails among ornithologists in regard to the number and arrangement of the sub-families. Shelly, in the British Museum Catalogue, recognizes six: *Cuculinæ,* containing the typical tree cuckoos; *Centropodinæ,* semi-terrestrial birds of Africa, India, etc., commonly known as coucals; *Phœnicophaïnæ,* also mostly of semi-terrestrial habits and including the curious genus *Coua,* peculiar to Madagascar, some similar genera of the Indian and Indo-Malayan region, and the so-called rain birds (q.v.) of the West Indies; *Neomorphinæ* or *Saurotherinæ,* the true ground cuckoos, comprising the American chaparral cocks (q.v.), and related East Indian forms; *Diplopterinæ* comprising a few little-known birds of South America, and finally the *Crotophaginæ,* a small group of remarkable typical American cuckoos, represented by the Savannah blackbird (q.v.). Sometimes the American tree cuckoos are separated as a distinct sub-family, the *Coccyginæ.* See CUCKOO; COCCYGOMORPHÆ.

Cucumber (*Cucumis sativus*), an annual trailing or climbing vine of the natural order *Cucurbitaceæ,* cultivated for its unripe fruits which are used as a salad and for making pickles. The plant is a native of southern Asia where it has been cultivated since early historic time, as also in Egypt (Num. xi. 5). The vine is more or less prickly, bears three-lobed or angled leaves which closely resemble those of the muskmelon, and generally spiny fruits which may become smooth as they mature. The fruits are solid, and contain numerous boat-shaped flattened seeds imbedded in a somewhat watery pulp, which in the immature fruits is the part esteemed. Small-fruited varieties and little fruits of large varieties are popularly known as gherkins and are generally preferred for pickles. They are covered with strong brine until needed for use, when, after soaking in pure water to remove the salt, they are put in vinegar, which they soon absorb. There is a great range in size of fruits in the various varieties, some being only about two inches long, and others more than 12 inches by three in diameter. Perhaps the most popular group of varieties is the white spine.

Cucumbers thrive best in warm soils well exposed to the sun. They do not produce well upon heavy clays or very light sands. The land must be well drained, in good tilth, and fairly rich. For earliest crop the seeds are often sown in hotbeds on inverted sods, and the plants set in the field as soon as danger of frost has passed, a sowing of seed being made about the same time to serve as a second crop. Usually only two or three plants are allowed to remain in the hills which are made about four by six feet apart. Since the cucumber-beetle is very actively destructive while the plants are small, six or eight plants should be allowed to remain in the hills until the vines are able to resist attack. Cultivation should be very thorough until the plants begin to run, when it should be confined to the space not occupied by vines. Often, in making the hills, a forkful of well-rotted manure is mixed with the soil to give the plants a little start.

Of the numerous diseases that attack the plants the one usually seen earliest in the season is damping-off (*Pythium debaryanum*), which appears while the seedlings are small. Infested plants quickly become yellow, and wilt and die. It may be prevented by early spraying with a standard fungicide (q.v.) which should be applied to the whole hill and to the under sides of the leaves. Wilt disease caused by *Bacillus tracheiphilus,* is an internal trouble that cannot be combated. The bacteria are spread by insects which inoculate healthy vines by biting or puncturing them. The bacteria multiply in the water-vessels of the vines and impede or stop the flow of water, the leaves wilt and finally shrivel, and the plant dies. It is believed that prevention of the attacks of insects by covering the plants with wire netting until they begin to run will postpone the time of the attack of the bacillus, so that a partial crop may be obtained. Usually the vines die just before the crop is ready to gather, the whole field being

attacked. In greenhouses the most common disease is powdery mildew (*Erysiphe cichoracearum*). It appears as white patches on the leaves which become yellow, brown, then die. Often the whole plant is involved. Evaporated (not burned) sulphur and spraying as above will control this pest.

The most important insect enemies of the cucumber are the cucumber-beetles (*Diabrotica*) and the squash-bug (*Anasa tristis*). The beetles are striped or spotted yellow and black, or green and black, are about a third of an inch long, very active in taking flight, and feed mostly upon the under sides of the leaves and the soft stems of seedlings. The larvæ burrow in the roots, and if numerous, they often kill the plants. During the heat of the day the adults generally hide below the surface of the hill. A liberal use of tobacco-dust upon the hills as soon as the plants peep through the soil is the popular remedy. But since remedies are not entirely satisfactory, the plants are frequently covered with netting until they are about to begin running.

The squash-bug is a dull-gray insect about three quarters of an inch long. It sucks the juices of the plants. There is no known satisfactory remedy for it, but the destruction of the vines as soon as they have fruited, or plowing them under, is helpful toward its extermination. Hand-picking is sometimes resorted to, as is also the destruction of the eggs, which are conspicuously laid on the under sides of the leaves. The cucumber is frequently grown in greenhouses, especially in spring after the main winter crops are out. The plants are started in pots, transplanted to the benches when well established, trained on trellises close to the roof, kept at a rather high temperature, and allowed to suffer no check. The white-spine class is most popular for this purpose in America, but the long English forcing varieties are by many considered superior in quality. Consult: Bailey, 'The Forcing-Book' (1897).

Cucumber Beetle. See MELON INSECTS.

Cucumber-tree, a popular name for two trees which bear cucumber-like fruits. One of these is *Averrhoa bilimbi,* known also as blimbing and bilimbi, which belongs to the natural order *Geraniaceæ*. It attains a height of 8 to 15 feet, has pinnate leaves, red flowers in long racemes, and green fruits with acid pulp. It is a native of India and China, is sometimes grown under glass for ornament, and is widely cultivated for food in the warm parts of South America. The other tree is *Magnolia acuminata* of the natural order *Magnoliaceæ*. It is found from New York to Illinois and southward to Arkansas and the Gulf States. It often attains a height of 90 feet, bears oval or oblong leaves, greenish-yellow flowers two or three inches long in late spring, and cylindrical pink, bitter fruits three or four inches long. The timber is useful for boat-building. *M. macrophylla* is often called large-leaved cucumber-tree. It is smaller than the preceding, more spreading, has fragrant flowers, and broader and pinker fruits.

Cucurbitaceæ, the gourd or melon family of plants. They are large herbaceous plants, annual or perennial, with alternate leaves palmately veined and scabrous, and unsexual flowers. The corolla is monopetalous, regular, and with five lobes, often planted longitudinally; and the petals, usually either yellow, white, or green, are deeply veined. The fruit is fleshy and more or less succulent. The general habit is climbing or trailing, by means of tendrils. The order contains at least 90 genera and some 600 species, and abounds in useful or remarkable plants, including the melon, cucumber, colocynth, etc. They are natives of both hemispheres, chiefly within the tropics. The annuals, however, easily submit to the summer of colder climates, and hence are common in northern gardens. Eight genera, comprising about 65 species, are found in America. The principal American genera are *Cucurbita micrampelis, Cyclanthera,* and *Sicyos*.

Cúcuta, koo'koo tä, or **San José de Cúcuta,** Colombia, a city of the department of Santander, near the Venezuelan frontier. It is a place of recent origin which had begun to grow very rapidly when it was destroyed by an earthquake 18 May 1875. Rebuilt soon afterward, it is to-day the handsomest, and commercially the most active town in the department. A railway connects it with the Zulia River, which is navigable by small steamers. Pop. about 20,000.

Cudbear. See ARCHIL.

Cuddapah, kŭd'dạ-pä, India, a district and town in the presidency of Madras. The district has an area of 8,722 square miles, and is transversed north to south by the Eastern Ghauts, and watered by the Pennar and its affluents. The heat is intense in April and May. Soda is found in the hills to the southwest, and is used by the natives in place of soap. Salt and saltpetre likewise abound, and are easily procurable. On the plain round Cuddapah hæmatite and fusiform iron ores are found. On the banks of the Pennar, about seven miles northeast of the town of Cuddapah, are diamond mines, which have been worked for several hundred years, and in which gems of considerable value have been found. The mines have not recently proved profitable. Nearly a fifth of the district is under grain cultivation. Cotton is likewise grown. The town lies on a small river of same name, an affluent of the Pennar, 140 miles northwest of Madras. It exports indigo and cotton, and manufactures a kind of coarse cloth. Cuddapah was formerly the capital of an independent state. Pop. 17,200. Pop. of the district 1,354,291.

Cudjo's Cave, an anti-slavery novel by J. T. Trowbridge, published in 1863. The scene of the story is eastern Tennessee, at the outbreak of the Civil War. The State, though seceding, contained many Unionists; and their struggles against the persecution of their Confederate neighbors, slave-holders, and poor whites, form the plot of the book.

Cudlip, Annie Thomas, English novelist: b. Aldborough, Suffolk, 25 Oct. 1838. She is the wife of a clergyman, Rev. Pender Cudlip, and in 1862 began her literary career by publishing 'Sir Victor's Choice.' This was followed by 'Dennis Doune' (1862); 'The Cross of Honor' (1863); and nearly 100 novels. Among the latest of these are 'Comrades True' (1900); 'The Diva' (1901); 'The Cleavers of Cleaver' (1902).

Cudweed, one of the popular names of many small weeds of the genera *Gnaphalium* and *Anaphalis*, of the thistle family. The leaves and stems are covered with a white cottony

down, and the flowers are composed of dry scales, and may be kept for a long time. They are also known as everlasting flowers. The genus *Gnaphalium* has about 120 widely distributed species, and the cudweeds belong properly to this genus alone. *G. polycephalum*, common in old fields and open woods, blossoming in October and November, has some repute in household medicine.

Cudworth, Ralph, English clergyman and philosopher: b. Aller, Somerset, 1617; d. Cambridge 26 June 1688. He was educated at Emmanuel College, Cambridge, and became so eminent as a tutor, that the number of his pupils exceeded all precedent. He was subsequently appointed rector of North Cadbury, Somerset, and in 1642 published a 'Discourse Concerning the True Nature of the Lord's Supper,' and 'The Union of Christ and the Church Shadowed, or in a Shadow.' The first of these productions, which maintained that the Lord's Supper is a feast upon a sacrifice, produced considerable controversy long after the author's death. In 1644 he was chosen master of Clare Hall, and in the following year was made regius professor of Hebrew. In 1654 he was chosen master of Christ's College, Cambridge, where he spent the remainder of his days. In 1678 he published his grand work, entitled 'The True Intellectual System of the Universe, the First Part, Wherein All the Reason and Philosophy of Atheism is Confuted, and Its Impossibility Demonstrated.' It is a work of great power and erudition, although the attachment of the author to the Platonism of the Alexandrian school has led him to advance some opinions which border on incomprehensibility and mysticism.

Cuenca, koo-ĕn'kä, Ecuador, capital of the province of Azuay, and in size the third city of the republic, Quito being first and Guayaquil second. It is situated in the canton of Cuenca, 8,640 feet above the level of the sea; the mean annual temperature is one degree higher than that of the national capital, though it lies 189 miles farther toward the south. As a centre of literary and artistic life, and the birthplace of celebrated authors, it is called "the Athens of Ecuador." Civil, military, and ecclesiastical authorities are: The governor, town council, bishop, commanding-general of the district, superior court of justice, judge of commerce, and chief of police. Principal institutions, etc.: The town hall, cathedral, seven churches, and several convents, orphan asylum, hospital, prison, library, parks, the university (with faculties of law, medicine, philosophy, and science), lyceum for younger scholars, atheneum, and a school of fine arts, giving instruction in drawing, painting, architecture, music, and the history of the arts. The chief industries of the region are: Agriculture, cattle-raising, (gold) mining, embroidering, and lace-making. Peruvian bark is an important product. Pop. 30,000.

Cuenca (anciently CONCA), Spain, a city in New Castile, capital of a province of same name, 85 miles east-southeast of Madrid; pop. (1887) 9,747. It is a bishop's see, and contains a fine Gothic cathedral. It was built by the Moors, and stands on a high and craggy hill, about 3,400 feet above sea-level, between the rivers Jucar and Huescar, which makes it naturally strong. Here the painter, Salmeron, and the famous Jesuit, Molina, were born. The north and east part of the province is mountainous, and fit only for sheep pasture; the other parts are fertile, producing corn, hemp, fruit, etc. Pop. about 10,000.

Cuenca, Sierra de, a chain of mountains, a section of the Iberian range, which runs through the Spanish province of the same name.

Cuernavaca, kwär-nä-vä'kä, Mexico, the capital city of the state of Morelos and the chief town of the district of Cuernavaca. It is situated on the river Tepeyte, about 46 miles from the city of Mexico. The Palace of Cortés, where the state legislature meets, is one of its noteworthy buildings; also the meteorological observatory and the public library. Both the city and district have a large trade in the products of the region. Pop. of the city 8,747; of the district 40,014. See MORELOS.

Cuervo-Marquez, Luis, loo-ēs kwär'vō mär'kēs, Colombian diplomat and physician: b. Bogota, Colombia, 1864. He was educated in Bogota and Paris, France, graduating from the Escuela de Medicina of Bogota and the Faculté de Médecine of Paris. He has been in the diplomatic service of his country since 1888, serving a part of the time as *charge d'affaires ad interim* in the United States. He has written numerous articles in the literary and professional journals of South America, and published: 'La Fiebre Amarilla' (1891); 'Paludisme' (1893).

Cueva, Juan de la, hoo-än' dā lā kwā'vä, Spanish poet: b. Seville about 1550; d. about 1608. A poet attempting all forms, he excelled most as a dramatist, and is one of the founders of Spanish national drama. In a volume of 'Works' (1582), he published a number of lyric poems, sonnets, songs, and elegies, including the 'Lament of Venus Over Adonis.' His greatest epic is 'The Conquest of Betica' (1603). He wrote four tragedies, one of them on 'The Sack of Rome' by the Constable Bourbon; and 10 comedies, one of the best being 'The Aged Lover.'

Cuffee, Paul, American negro sailor and philanthropist: b. Westport, Mass., 1759; d. 7 Sept. 1818. His father was an African-born Massachusetts slave, who purchased his freedom, bought a farm of 100 acres, and brought up in respectability a family of 10 children; his mother, a Nantucket Indian. At 16 he was a sailor on a whaling vessel, and in 1806 an experienced navigator, owning considerable landed property, houses, stores, a ship, two brigs, and several smaller craft. He built a school-house, hired a teacher, and opened at his own expense the only public school in the neighborhood of his native town. In 1811 he sailed for Sierra Leone in his ship, the Traveler, with a colored crew, won favor there with both whites and blacks, and instituted the Friendly Society of Sierra Leone. In London he was warmly received by Wilberforce and Clarkson, and commissioned by the African Institution to carry goods to Sierra Leone. He died while carrying out his plans for colonizing that country.

Cufic Writing, the written characters of which the Arabians now make use, and with which we meet in printed works, namely, the Neskhi characters, are an invention of the 4th century of the Hegira. Before this time the Cufic characters, so called from the town of Cufa, or Kufa, where they are said to have been in-

vented, were in use. These old characters have so much resemblance to the ancient Syriac writing, the Estrangelo, that it hardly admits of a doubt that the Arabians borrowed them from the inhabitants of Syria. Historical traditions confirm this supposition. The Cufic characters, and perhaps others at an earlier date which essentially resembled them, were probably first introduced among the Arabians a short time before Mohammed. Although we are at present ignorant of the characters which were previously in use among them, and although the imperfect accounts of the Mussulman writers throw very little light upon the subject, yet it is scarcely credible that the Arabians remained destitute of a written character until the 6th century of the Christian era. We find the transition of the Cufic to the Neskhi on the ruins of Chilminar. The influence which the school of Cufa exerted on Islamism caused the use of the character which proceeded from it; and when the others had fallen into oblivion, Cufic writing was the name commonly applied to all kinds of Arabic writing previous to the change made by Ebn Mokla. A knowledge of it is important on account of the many monuments in which it is preserved; especially the coins inscribed with Cufic characters and made in the first centuries of the Hegira.

In connection with these coins are to be considered the small pieces of glass which were introduced, particularly in Sicily, under the dominion of the Mohammedans, instead of money, or perhaps under the sanction of public authority obtained currency as standards of the weight of coins.

Cuir-bouilly, kwēr-boo-lyi, leather softened by boiling, then impressed with ornaments, used for shields, girdles, sword sheaths, coffers, purses, shoes, and many other articles. In the 16th century it was also employed for hangings for rooms gilded and painted, and, when heightened by gold or silver, it was known as cuir doré or cuir argenté.

Cuirass, a breastplate; a covering for the breast; originally, as the name denotes, of leather, also of quilted linen, cloth, etc. The cuirass of plate armor succeeded the hauberk and hacqueton of mail, about the reign of Edward III.; and from that period the surcoat, jupon, etc., which were usually worn over the coat of mail, began to be laid aside. It was again employed by some of Napoleon's regiments, and it is now, in most European services, worn by some regiments of heavy cavalry.

Cuirassier, a cavalryman wearing the cuirass and helmet. The cuirassier represents the horse soldiers of the 16th and 17th centuries, who wore similar armor. The French and German armies have each 12 regiments of cuirassiers, and the Russian army four. Napoleon III.'s bodyguard, called *Les Cent-Gardes,* wore cuirasses of aluminum.

Cuitlalmatzin, or **Citlalmatzin,** Aztec ruler: b. 1470; d. October 1520. He was the younger brother of Montezuma, and after the latter's death, succeeded to the throne, but lived only a few weeks. He was a prisoner in the hands of the Spaniards with his brother, but succeeded in escaping or was released. He organized an active resistance to the invaders and in one of the attacks upon them, Montezuma was killed. The warfare he instituted resulted in the defeat of the Spaniards for the time being, and their retreat to the coast.

Cujas, Jacques, zhāk kü-zhäs (Latin *Cujacius),* French jurist: b. Toulouse 1522; d. Bourges, France, 4 Oct. 1590. He was long professor of law at Bourges, and owed his reputation to the light shed by him on Roman law. He was the founder of the historic legal school, if not of scientific jurisprudence. His works have often been reprinted. Consult Bernardi, 'Éloge de Cujas' (1775); Spangenberg, 'Cujas and seine Zeitgenossen' (1822).

Culasi, coo-läs'sē, or **Colasi,** Philippines, a town of the province of Antique, on the western coast of the Island of Panay, 47 miles north of San Jose de Buenavista. Pop. 10,553.

Culdees, kool'dēz, members of an order of monks or an imitation of such an order, in the British Isles and particularly in Gælic Scotland, of which mention begins to occur in mediæval annals and other writings in the 11th century. The name Culdee, in the Scots Gælic, *Cuilteach,* believed to be equivalent to *gille-Dé* in that dialect and to *ceile-Dé* in the Gælic of Ireland, is by some philologers derived from the Latin *Cultor Dei;* all three words, Scots, Irish, and Latin, meaning servant, or worshipper of God. The Culdees seem to have been immediate successors or continuators of the communities of monks established among the Picts and Scots of North Britain and the Western Isles by Irish missionaries in the 6th century. Like the monks of the Highlands and the Hebrides, the Culdees preserved their clan affiliations and relationships; a community of Culdees — always comprising a few members only — would consist of men all of the same clan and related to each other by kinship. In the course of time the headship or priorate of a community of Culdees, like the headship of a clan, became hereditary, descending from father to son; for these monks, each little priory being autonomous, and not subject to any general superior at Rome or elsewhere, had little respect for their monastic rule or for monastic celibacy; and with the dignity of the prior descended the lordship of the monastic estates. Before they lost entirely the status of a religious order they were in some parts of Scotland recognized as canons regular and as such served cathedral churches. The principal places or convents of the Culdees in their best days were at St. Andrews, Dunkeld, Lochleven, Abernethy, and Brechin. History and trustworthy tradition are curiously scanty regarding them; yet for a long time there was current among some historians of the Church a fabulous history of these obscure little bodies of ignorant monks, according to which they were a remnant of the pure primitive Church surviving through the "dark ages."

Culebra (koo-lā'brä) **Island,** subject to the jurisdiction of the government of Porto Rico, and assigned to the department of Humaco, Vieques district. It lies in the passage between Porto Rico and the Virgin group; the name Islas de Pasaje has therefore been given to it and the island of Vieques. Water is supplied by a public cistern. Pop. (1900) 704. See VIRGIN ISLANDS.

Culiacan, koo-lē-ä-kän', Mexico, one of the 10 districts of the state of Sinaloa. Pop. 37,803. See CULIACAN ROSALES, and SINALOA.

Culiacán Rosales, rō-zäl'ēs, Mexico, capital of the state of Sinaloa, and chief town of the district of Culiacán. It is situated about 887 miles from the city of Mexico, and is an important commercial centre, with fine public buildings, including a cathedral, government palace, and mint. A railroad 37 miles long connects it with the seaport town of Altata. It has cotton-mills and other industrial establishments. Pop. 10,487.

Culicidæ, kū-lis'i-dē, a sub-family of dipterous insects of the family *Tipulidæ*. The genus *Culex* comprehends the common gnat and the mosquito (q.v.).

Culil'awan Bark, the aromatic pungent bark of the *Cinnamomum culilawan,* a tree of the Moluccas; useful in indigestion, diarrhœa, etc. Called also clove-bark.

Culin, Stewart, American anthropologist: b. Philadelphia, Pa., 13 July 1858. He is curator of the Museum of Science and Art of the University of Pennsylvania, and one of the foremost anthropologists of America. Besides many minor papers, he has written two very able monographs, 'Korean Games' (1896); and 'Chess and Playing Cards' (in Report of the United States National Museum 1896); also an essay on 'Mancala, the National Game of Africa' (in Report of the United States National Museum 1894).

Culinary. See COOKERY.

Cullen, Paul, Irish Roman Catholic prelate: b. near Ballytore, County Kildare, 27 April 1803; d. Dublin 24 Oct. 1878. He was ordained priest in 1829, and filled in succession the offices of vice-rector and rector of the Irish College in Rome, and rector of the Propaganda College. During the period of Mazzini's power in Rome in 1848, Cullen saved the property of his college by placing it under American protection. At the close of 1849 he unexpectedly found himself nominated to the archbishopric of Armagh and primacy of Ireland. His vigorous denunciations of Fenianism made him many enemies. At the Synod of Thurles in 1851, principally by Cullen's persuasion, the establishment of a Roman Catholic university in Ireland was recommended. Translated to Dublin in 1852, he was created a cardinal priest in 1866, the first Irishman who had reached that rank. One of the majority at the Vatican council, he long enjoyed the familiar friendship of Pope Pius IX.

Cullera, kōl-yā'rä, Spain, a fortified town in the province of Valencia, and 25 miles south by east of Valencia, on the Jucar River. Its natural position makes it a place of military importance, and though its fortifications have been repeatedly dismantled, they are now in an efficient state. Pop. 12,000.

Cullo'den Moor, a heath in Scotland, four miles east of Inverness. It is celebrated for a victory obtained 27 April 1746, by the Duke of Cumberland over Prince Charles Edward Stuart (the Pretender) and his adherents. The battle of Culloden was the last battle fought on British soil, and the termination of the attempts of the Stuart family to recover the throne of England. A monumental cairn and green mounds have been raised where the fiercest of the fight raged, and where many of the slain are buried.

Cullom, Shelby Moore, American senator: b. Wayne County, Ky., 22 Nov. 1829. In 1853 he went to Springfield, Ill., to study law, was admitted to the bar, and settled in practice there. He was in the Illinois House of Representatives 1856, 1860, 1872, 1874, and its speaker in 1861 and 1873. He was elected to Congress 1865–71. At the Republican national convention, 1872, he nominated Gen. U. S. Grant. He was governor of Illinois 1877–83, when he succeeded David Davis in the United States Senate, and has been thrice re-elected. He was chairman of the senate committee which reported the Interstate Commerce Bill, and a member of the commission appointed to prepare a system of laws for the Hawaiian Islands. His report on the regulation of railroad corporations by national legislation, presented to the Senate, 18 Jan. 1886, has taken its place as a permanent contribution to economic literature.

Cullum, George Washington, American military officer: b. New York 25 Feb. 1809; d. there 28 Feb. 1892. He was graduated from West Point in 1833; and was engaged for the next 28 years in engineering labors and in instructing at West Point in practical military engineering. During the Civil War he was chief of staff to the general-in-chief 1861–4, and superintendent of the military academy 1864–6. From that time he was a member of the board of engineers for fortifications, until he was placed on the retired list in 1874. At the time of his retirement he was colonel and brevet major-general in the regular army. Besides numerous military memoirs and reports, he published: 'Military Bridges with India-rubber Pontoons' (1849); 'Register of Officers of the U. S. Military Academy from 1802 to 1850' (1850); a translation of Duparc's 'Elements of Military Art and History,' with notes, etc. (1863); a 'Biographical Register of the Officers and Graduates of the U. S. Military Academy' (1868) (revised edition 1879); 'Campaigns of the War of 1812 Criticised' (1880). He bequeathed $250,000 for the erection of a memorial hall on the grounds of the military academy, and $40,000 for furnishing it with military busts, paintings, and other appropriate objects.

Culm, a term used in the United States to designate waste anthracite coal. At one time disposal of the culm heaps surrounding the shafts of the mines in Pennsylvania, became a serious problem, until its use as fuel was made possible, either by burning it in special grates, or by pressing it into briquettes (q.v.). In England the culm is sometimes made up into balls, with one third of its bulk of wet clay. This mixture burns without flame, and gives a steady heat suitable for cooking. In botany culm is the straw or hollow stem of the grasses.

Culmina'tion, an astronomical term, signifying the passage of a star across the meridian. The star is then at the highest point (*culmen*) of its course; hence the name. The sun culminates at mid-day, or 12 o'clock, apparent solar time — which seldom agrees exactly with mean time, as shown by a watch or clock. The full moon culminates at midnight. The term is interchangeable with transit.

Culpepper, John, English colonial leader in the provinces of North and South Carolina. He was a refugee from the southern or Clarendon colony, and in 1678 was the head of an

insurrection in the northern or Albermarle colony in favor of popular liberty. Under his direction, the people deposed the president and deputies of the proprietaries, seized the public funds, appointed new magistrates and judges, called a parliament, and took all the functions of government into their own hands. The insurgents sent Culpepper to England to negotiate a compromise. He was indicted for high treason, but through the influence of Shaftesbury was acquitted on the ground that no regular government had existed in Albemarle. He returned to Carolina, and in 1680 laid out the city of Charleston, reducing the paths, streets, and squares to comparative regularity, and enclosing the town site with a line of fortifications.

Culpepper, or **Colepeper, Thomas,** American royal governor: b. England; d. there 1719. He was one of King Charles II.'s favorites, who received from that monarch a grant of the entire territory of Virginia for a period of 31 years from 1673, a grant so astounding in character, that, in the opinion of at least one historian, nothing but the very deed itself, still extant, could be accepted as evidence of the fact. He was governor of Virginia 1682–3, and two years later relinquished most of his Virginia grant, retaining only a portion called Northern Neck, and securing, instead of the remainder, an annual pension of £600 for 20 years. His whole career was actuated by the meanest rapacity, an example of which may be seen in his trying to swindle the colonists by paying the public wages in light coin, on which he had himself put an arbitrary value. Consult Doyle, 'English Colonies in America,' Vol. I. (1882).

Culper, a local name for the burrowing perch, a fish of uncertain relationship, which inhabits some of the rivers of the Zambesi valley in Africa. During droughts it escapes destruction by burying itself in the mud. It is dug out by the natives and by animals, who use it for food. The white colonists use it only in case of famine.

Culprit Fay, The, a poem by Joseph Rodman Drake (q.v.). It relates the love of a fairy for a mortal, and the punishment of the offense.

Cumana, koo-mä-nä', Venezuela, capital of the new state of Sucre, which formerly constituted a section of the state of Bermúdez. It was founded by Gonzáles Ocampo in 1520, and is situated on the banks of the Manzanares River, one mile from the southern coast of the Gulf of Cariaco. The city is celebrated as being the first permanent settlement of Europeans on that coast, and also because it was the birthplace of the grand marshal of Ayacucho (q.v.), Antonio José de Sucre, who, after the campaign in Peru, became the first president of the republic of Bolivia. Being situated on ground of volcanic formation, the city is subject to frequent earthquakes. The surrounding country is fertile, producing especially fine grapes, pineapples, and other fruits, and such tropical plants as coffee and cacao. A railroad connects the city with the gulf; the port has a flourishing foreign commerce. Pop. about 10,000.

Cumarin. See COUMARIN.

Cumberland, Richard, English dramatist and essayist: b. Cambridge 19 Feb. 1732; d. Tunbridge Wells 7 May 1811. His comedies, 'The West Indian'; 'The Wheel of Fortune'; 'The Jew'; and 'The Fashionable Lover,' are an epitome of the culture of the time; as are his essays, collected under the title of 'The Observer.' He wrote novels, tracts, religious, and didactic poems, not now important; 'Anecdotes of Eminent Painters in Spain'; 'Memoirs' (1806).

Cumberland, Md., a city and the county-seat of Allegany County; 150 miles southeast of Pittsburg, Pa., 178 miles northwest of Baltimore, and 152 miles northwest of Washington, D. C. It is picturesquely located on the Potomac River, about 700 feet above tide-water. It is also on the Baltimore & Ohio, the Pennsylvania, and other railways; and on the Chesapeake & Ohio Canal, which extends thence to Georgetown, D. C.

Industries, etc.— Cumberland is situated at the edge of the Chesapeake & Ohio Canal coal region, the carrying of coal being the principal business of that waterway. It is the shipping-point for the large quantities of the semi-bituminous variety mined in that section. Its manufactures also are considerable. They include cement-works, glass-works, brick-works, flour-mills, tanneries, steel-works, iron-foundries, and numerous other enterprises. Here are located further large rolling-mills for the manufacture of rails, bars, and other materials of railway supply, as well as railway car and repair shops. A large capital is invested in the mercantile interests.

History, Government, etc.— Fort Cumberland was built in the winter of the years 1754–5, at the beginning of the French and Indian war. On the site of the fort, Cumberland was laid out in 1785. It was incorporated in 1815, and became a city in 1850. The government of Cumberland is directed by a mayor, who is biennially elected, and a city council, the members of which are chosen in part by wards and to some extent at large. The admirable system of water-works, which is operated on the Holly plan, is owned and managed by the municipality, as is also the electric-light works. The mayor nominates to the various boards of administration, his nominations being subject to the approval of the council. Pop. (1890) 12,729; (1900) 17,128.

Cumberland, R. I., a town in Providence County, a few miles north of the city of Providence, on the New York, New Haven & Hartford Railroad. It has extensive manufactures of cotton goods, and iron wares. Pop. (1900) 8,925.

Cumberland, Army of the, in the American Civil War; a name applied to one of the principal Federal armies, which prior to 30 Oct. 1862, had been known as the Army of the Ohio. On this date Gen. W. S. Rosecrans assumed command and a new army of the Ohio was formed. The Army of the Cumberland continued under the command of Gen. Rosecrans until October 1863, when Gen. George H. Thomas became commander.

Cumberland, Fort, built 1754–5 by Braddock (q.v.) as a basis for his expedition against Fort Duquesne. Cumberland, Md., occupies the site of what was once Fort Cumberland. It was left in command of Col. James Innes, and the remnant of the expedition returned to it. Washington afterward commanded it. The

name was also given by the English in 1755 to Fort Beauséjour in Maine, captured from the French who had built it the year before.

Cumberland, a river which rises in the Cumberland Mountains, Virginia, and runs through Kentucky and Tennessee into the Ohio, 60 miles from the Mississippi, having a course of about 600 miles. It is navigable for steamboats to Nashville, nearly 200 miles, and for boats of 15 tons 300 miles farther. At certain seasons vessels of 400 tons may descend 400 miles to the Ohio.

Cumberland Gap, a passage through the Cumberland Mountains, on the line between Kentucky and Tennessee and at the western extremity of Virginia. It is noted for many incidents connected with the Civil War.

Cumberland Gap, on the dividing line of Virginia and Kentucky on the north, and Tennessee on the south, is the main gateway of the Cumberland Mountains, between eastern Kentucky and East Tennessee. Early in the Civil War it was occupied by the Confederates and remained in their possession until 18 June 1862, when, in view of a concentration of the Confederates at Chattanooga, which was threatened by the advance of Gen. O. M. Mitchell from Huntsville and Bridgeport, Ala., it was evacuated, and was occupied by Gen. Geo. W. Morgan, who, with a division of 8,000 men, had been operating against it for nearly two months. Morgan fortified it, established magazines and an arsenal, from which thousands of arms, with ammunition, were distributed to the Union men of East Tennessee, and remained in possession until 17 Sept. 1862. Then Gen. E. Kirby Smith, having crossed the mountains south and defeated Gen. Nelson at Richmond, Ky. (29 and 30 August), thus cutting off communication from the north, while Gen. C. L. Stevenson with a division of 9,000 men was pressing him in front, Morgan, short of provisions and forage, and not prepared for a siege, blew up his arsenal and magazines, set fire to his storehouses, and at night, 17 September, started on a march of 200 miles through an almost unbroken wilderness to Greenup, on the Ohio river. He reached there 3 October without the loss of a gun or a wagon, and with the loss of only 80 men, although pursued some distance by Stevenson, and harassed much of the way by Morgan's cavalry. Bragg retreated through the Gap, after the failure of his Kentucky campaign, and it remained in Confederate possession a year. Gen. Burnside entered Knoxville 3 Sept. 1863, and finding the Gap occupied by Gen. John W. Frazer, with a brigade of 2,300 men, ordered Gen. Shackleford with a cavalry brigade to approach it from the south and co-operate with Col. De Courcy, who, with a division of new troops, had been ordered to march on it from the north. Shackleford reached the south end of the Gap on the 7th and communicated with De Courcy, who had arrived on the north side, and both summoned Frazer to surrender, who refused. Burnside led an infantry brigade from Knoxville, joined Shackleford on the morning of the 9th and at his demand Frazer surrendered his force of over 2,000 men, with 12 guns and a large supply of ammunition. The Gap remained in Union possession to the close of the War. Consult: 'Official Records,' Vol. XXX.; The Century Company's 'Battles and Leaders of the Civil War,' Vol. III. E. A. CARMAN.

Cumberland Island, now thought to be a peninsula of Baffin Land, extending into Davis Strait.

Cumberland Mountains, that portion of the Appalachian group which ranges along the southwest border of Virginia and the southeast of Kentucky, and passes across the State of Tennessee into the northeastern part of Alabama. It spreads over a width of about 50 miles, parallel ridges alternating with longitudinal valleys. The ridges rarely exceed 2,000 feet high. They are rocky and little cultivated, but the valleys are fertile. These mountains lie west of the range of the granite and metamorphic rocks, which compose the mountains on the western borders of North Carolina and the northern part of Georgia. They are upon the range of the great coal formation of the Middle States, and essentially composed of the same groups of stratified rocks as those of the Alleghany Mountains, Chestnut Ridge, and Laurel Hill in Pennsylvania. The Tennessee River and its branches drain a portion of the eastern slope.

Cumberland Presbyterians. See PRESBYTERIANISM.

Cumberland Road, The, or **Great National Pike,** originally, a road planned from the Maryland frontier at Cumberland, Md., to connect with the State roads and run to St. Louis (then just fallen into United States hands by the Louisiana Purchase); to open up the West to immigrants, and provide for military and postal transportation. It was to be built at national expense from the sales of public lands, as a fair counterpoise to the seaboard States' ability to pay their expenses by levying customs duties; and pushed forward by sections as settlement advanced. Henry Clay was its most conspicuous projector and advocate, and a monument to commemorate his services to it has been erected on its course near Wheeling, W. Va. The bill for the first section passed Congress 29 March 1806; it authorized the President (Jefferson) to appoint three commissioners to lay out the road from Cumberland to the Ohio River (Wheeling), and appropriated $30,000 for expenses. At the same time another was passed to lay out one through Georgia, on the New Orleans route; and others followed in swift succession for two decades. This policy of roads, soon supplemented by canals, became the great battle-ground for the strict-construction party, who fought the whole policy of internal improvements as unconstitutional; and the Cumberland Road with its constant call for improvements and repairs aroused ever fresh resistance. Finally in 1822, Monroe, although he had signed two annual bills of the kind, vetoed a third; and for the time the improvements and new roads came to a standstill. With John Quincy Adams, who was in thorough sympathy with Clay's policy, as with every other to increase the national wealth and power, the system started up afresh; and the Cumberland Road was pushed forward through Ohio and Indiana. On the accession of Jackson, a strict-constructionist, the vetoes began and the roads stopped; with Van Buren the latter commenced again, and by 1840 the road had advanced to Vandalia, Ill. By this time the railroads had become so decisively the coming transportation system that no more was built; the last act in its favor was passed 25

May 1838. It was admirably constructed, macadamized, with stone bridges, and iron mileposts and toll-gates; and the total amount expended on it by the United States was $6,821,246. The name "Cumberland Road" in current use was extended to take in the section from Cumberland through Frederick to Baltimore, built largely by Maryland banks, which were rechartered in 1816 on condition of completing it. It was a most profitable speculation, the tolls yielding them sometimes as high as 20 per cent, though finally sinking to 2 or 3 per cent. The portion built by the national government was acquired in 1878 by the counties of Alleghany and Garrett, which made it a free road. The whole road from Baltimore to Vandalia is about 800 miles long. Consult: Hulbert, 'The Cumberland Road' (1903); Rideing, 'The Old National Pike' ('Harper's Magazine,' Vol. LIX., 1879).

Cumberland University, located at Lebanon, Tenn. The history of higher education in the Cumberland Presbyterian Church begins with the year 1826, when Cumberland College was established at Princeton, Ky. From the beginning the college was seriously embarrassed by a small debt and a too meager income; and so year by year the situation grew worse, as the burden resting on the General Assembly grew heavier. Finally, in 1842, after fruitless efforts to lift the debt and endow the college, the General Assembly "appointed a committee to select a suitable location for the establishment of a new institution." After investigation the committee decided on Lebanon, Tenn. For a few years it was called Cumberland College, but in 1844 the name was changed to Cumberland University. The University was first chartered 30 Dec. 1843, which charter has been several times amended. The board of trustees is local and self-perpetuating. The election of new members, however, must be confirmed by the General Assembly of the Cumberland Presbyterian Church. The Law School was opened in 1847. Its growth from the beginning was remarkable, and in 1856 it was considered the second in size among the law schools in the country. By the concurrent action of the General Assembly and the board of trustees the Theological School was established in 1852. The School of Engineering was also established in 1852. When the Civil War began, the value of buildings and apparatus belonging to the University was very creditable. Moreover the University was in a very prosperous condition, the number of students in 1858 — the most successful year before the war — being 481. During the war the University suffered a fate like that of many other Southern schools. The buildings were burned, apparatus and library destroyed, the endowment was rendered worthless, and many of the trustees and friends lost all hope of reorganization. Notwithstanding all this, a few faithful ones determined to attempt the seemingly impossible, and in January, 1866, the University was reopened without buildings, endowment or apparatus. Since the "resurgence from ashes" the University has had a steady growth. Its buildings are new, large and commodious, its libraries, general and departmental, number more than 20,000 volumes; its apparatus is valued at many thousand dollars, and its influence reaches far and wide through the Union.

The University has had five presidents all of whom have done noble work. In 1902 David E. Mitchell was elected to the presidency of the institution. He is the youngest college president in the United States. His administration has revolutionized the University. Two new departments have been added: The School of Oratory and the Conservatory of Music. A magnificent new dormitory has been erected on the campus. The equipment has been very much improved; the student body greatly increased. Total enrollment, 1903–4, 648. The University has two splendid training schools, one for boys, the other for girls, in Lebanon. The institution is coeducational.

P. MARION SIMMS,
Registrar of Cumberland University.

Cumbrian Mountains, a range of hills, England, occupying part of the counties of Cumberland, Westmoreland, and North Lancashire. The mountains rise with steep acclivities, enclosing in some parts narrow but well-cultivated valleys, with numerous picturesque lakes, this being the English "Lake Country," so much frequented by tourists.

Cumin, kŭm'ĭn, **Oil of,** the expressed product of a long-known umbelliferous plant, grown in Egypt and Ethiopia, and largely cultivated in Sicily and Malta, whence it is brought to this country. Cumin seeds, when distilled with water, yield a pale-yellow limpid oil of disagreeable odor and harsh taste, consisting of an oil called cuminol, hydride of cumyl, or cuminic aldehyde ($C_{10}H_{12}O$), and cymene or cymol ($C_{10}H_{14}$). Cuminol and cymol can only be partially separated by distillation, cymol being the more volatile, but cuminol is better removed by causing it to combine with hydropotassic sulphite. When pure, cuminol is a colorless liquid, lighter than water, boiling about 430° F. The other constituent, cymol ($C_{10}H_{14}$), is a colorless, strongly refracting, lemon-smelling fluid, which has a specific gravity of 0.85, and boils about 350° F. It is insoluble in water, but dissolves in alcohol, ether, and oils.

Cuminum, the fruit of *Cuminum cyminum*, a close relative of caraway, with which it is allied in properties and uses. See CUMIN, OIL OF.

Cumming, Alfred, American territorial governor: b. 1802; d. 1873. When the Mormons under Brigham Young disputed the authority of the Federal government, President Buchanan, in 1857, sent Cumming to Utah as governor, with a force of 2,500 men. He at once declared the territory to be in a state of revolt, to which Young replied by a proclamation forbidding the army to enter the territory. It was not until 1858 that Cumming regularly assumed office, in which he was supported by the troops for nearly two years. Cumming held the position until 1861. See UTAH.

Cummings, Amos Jay, American journalist: b. Conkling, N. Y., 15 May 1841; d. Baltimore, Md., 2 May 1902. At the age of 12 he entered a printing office as an apprentice, and was accustomed to say that he had set type in nearly every State in the Union. He was with Walker in the last invasion of Nicaragua; was a sergeant-major in the 26th New Jersey Infantry during the Civil War; and received

the congressional medal of honor for gallantry on the battlefield. In 1863 he entered the service of the New York *Tribune* under Greeley, and later was on the staff of the New York *Express* and the *Sun* successively. From 1887 until his death he was a Democratic representative in Congress from New York city districts.

Cummings, Charles Amos, American architect: b. Boston, 26 June 1833. He was educated in the Boston schools and at the Rensselaer Polytechnic Institute, Troy, N. Y., and till his retirement, some years since, practised his profession in his native city. He published a valuable 'History of Architecture in Italy from the Time of Constantine to the Dawn of the Renaissance' (1901), and collaborated with W. P. P. Longfellow (q.v.) in 'A Cyclopædia of Works of Architecture in Greece, Italy, and the Levant' (1897).

Cummings, Edward, American Unitarian clergyman: b. Colebrook, N. H., 20 April 1861. He was graduated at Harvard 1883, and from its Divinity School 1885, and was the first incumbent of the Robert Treat Paine fellowship in Social Science 1888–91; studying in England, France, Italy, and Germany. He was instructor in sociology at Harvard 1891–3, and associate professor 1893–1900, when he became associate pastor of the South Congregational Church, Boston, Mass.

Cummings, Joseph, American educator: b. Falmouth, Me., 3 March 1817; d. Evanston, Ill., 7 May 1890. He graduated at Wesleyan University, Middletown, Conn., 1840; entered the Methodist ministry 1846, and held pastorates at Malden, Chelsea, and Boston, Mass., 1846–53. He was president of Genesee College, Lima, N. Y., 1854–7; president of Wesleyan University, 1857–75; professor of mental philosophy and political economy there 1877–9; and president of Northwestern University from 1881 until his death.

Cummings, Thomas Seir, American artist: b. England 1804; d. Hackensack, N. J., 24 Sept. 1894. He studied chiefly under Henry Inman, and worked mostly at miniature painting. He was a founder of the National Academy of the Arts of Design 16 Jan. 1826, an organization of 15 members who each chose another.

Cummins, Albert Baird, American lawyer and governor: b. Carmichaels, Pa., 15 Feb. 1850. He received an academic education at Waynesburg, Pa., was admitted to the bar, and settled in practice at Des Moines, Ia. From 1896 to 1900 he was a member of the Republican National Committee, in 1901 was elected governor of Iowa, and in 1903 was nominated for the term of 1904–6.

Cummins, George David, American clergyman: b. Kent County, Del., 11 Dec. 1822; d. Lutherville, Md., 26 June 1876. He was graduated at Dickinson College, Pa., 1841; ordained to the Episcopal ministry 6 July 1847, and was successively rector at Norfolk, Va., Richmond, Va., Washington, D. C., Baltimore, Md., and Chicago, Ill., until consecrated assistant bishop of Kentucky 15 Nov. 1866. In November 1873 he resigned his office and withdrew from the Church, preliminary to taking steps to form a new sect, «The Reformed Episcopal Church,» of which he was made the presiding bishop December 1873. (See REFORMED EPISCOPAL CHURCH.) He was formally deposed from the Protestant Episcopal ministry 24 June 1874.

Cummins, Maria Susanna, American novelist: b. Salem, Mass., 9 April 1827; d. Dorchester, Mass., 1 Oct. 1866. Her novel, 'The Lamplighter' (1853) had enormous success and was translated into foreign languages; it is still remembered for the idyllic charm and tenderness of its first few chapters, but the rest is commonplace. Her other books are: 'Mabel Vaughn' (1857); 'El Fureidis' (1860); 'Haunted Hearts' (1863).

Cumnor Hall, a ruined manor house near Oxford, England, the «Cumnor Place» of Scott's 'Kenilworth.' Meikle's musical ballad of 'Cumnor Hall,' a lament for Amy Robsart, furnished Scott, as is supposed, with the motive of 'Kenilworth.'

Cumulative Voting, the system by which every voter is entitled to as many votes as there are persons to be elected, and may give them all to one candidate, or may distribute them among the candidates, as he thinks fit. The practice was first introduced into Great Britain in 1870, and used in the election of school boards, and later in parliamentary elections. Although the general adoption of the system has been urged as a desirable reform it has not had much success. The States of Illinois and Michigan have used the method in some elections, and its legality was questioned. The supreme court of the latter State declared it constitutional.

Cumyn, Comyn, or **Cumming,** a family whose name appears frequently in the early history of England and Scotland. It had its possessions near the town of Comines, and from one of the branches sprang the historian Philip de Comines (q.v.). The English Comyns came over with the Conqueror, and in the middle of the 13th century the family counted among its members 4 Scottish earls, 1 lord, and 32 belted knights. In the beginning of the 14th century it was almost annihilated by its rival competitor for the Scottish crown, Robert Bruce. Such of the Cumyns as contrived to escape made their way to the English court, and by their talents secured considerable influence in the sister kingdom. The name is still fairly well represented in Scotland, but generally in the forms Cumming or Cumine.

Cunard', Sir Samuel, English ship-owner; b. Halifax, Nova Scotia, 21 Nov. 1787; d. London 28 April 1865. Becoming early a successful merchant and ship-owner, he went to England in 1838, and joined with George Burns and David M'Iver in founding (1839) the British and North American Royal Mail Steam Packet Company. The first passage was that of the Britannia in 1840. From its small but successful beginning, Cunard's undertaking soon developed into one of the most influential private commercial enterprises. He was knighted in 1859.

Cunaxa, kū-năks'a, Mesopotamia, east of the Euphrates, about 60 miles north of the site of the ancient city of Babylon.

Cundall, Frank, English librarian: b. 1858. He has been librarian of the Institute of Jamaica at Kingstown from 1891, and is the author of 'Reminiscences of the Colonial and Indian Exhibition'; 'The Landscape and Pastoral Painters of Holland'; 'Story of the Life of Columbus and the Discovery of Jamaica'; 'Bibliotheca

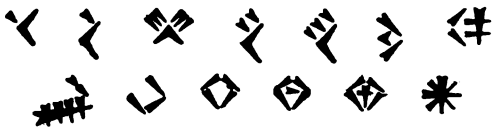
Jamaicensis'; 'Studies in Jamaica History'; 'Jamaica' in 'British Empire Series'; 'Hans Holbein.'

Cundinamarca, koon-dē-nä-mär'kä, Colombia, a department bounded on the north by Venezuela and the departments of Boyacá and Santander, on the east by Venezuela, on the south by the department of Cauca, and on the west by the departments of Antioquia and Tolima. Area 79,810 square miles. Its capital, Bogotá, is also the capital of the republic. (See BOGOTÁ and COLOMBIA.) The eastern Cordillera of the Andes traverses the department from south to north, separating into various branches. On the west lies the valley of the Magdalena River, above which rise the highest mountains, the Nevado of Sumapaz, Cruz-Verde, the "páramos" of Chamizal, Pasquilla, El Hato, and Choachi. On the east is a great plain, fertile and abounding in cattle. There innumerable streams form the Meta and Guayabero rivers, which belong to the Orinoco system; the more important of these tributaries being the Cabuyaro, the Guatiquia, Rio Negro, the Guayuriba, the Chichimene, the Gumal, and the Pajure. Rivers of the western region, belonging to the Magdalena system, are the Fusagasugá, the Seco, the Bogotá (which in its upper reaches, above the splendid falls of Taquendama, is called the "Funza"), etc. In the centre of the department are the elevated plains of Bogotá, Ubaté, and Simijaca. Pop. 569,000.

Cundurango, kŭn-dŭ-răn'gō, the bark and wood of a vine growing in Ecuador, South America, supposed at one time to be a specific for cancer.

Cuneiform Writing is so called because its characters consist of strokes of the shape of a wedge (Latin, *cuneus*); and for a like reason it is also known as arrow-headed: it is a mode of writing widely used in early times, and till the downfall of the Babylonian and Assyrian empires, in the region of the Euphrates and Tigris and in contiguous countries lying northward and eastward of those empires, as Armenia, Persia, Media, Susiana. This manner of writing was an outgrowth of a primitive hieroglyphy most probably originating among the peoples of that part of western Asia and not derived from Egypt. For an account of the archæological researches in Babylonia and Assyria see the article BABYLONIA, where the invention of cuneiform writing is credited to the Accadian population of Chaldæa, from whom it passed to a Semitic people, their conquerors, later known as Babylonians and Assyrians. Before the conquest the cuneiform writing of the Accadians had been adapted by them not only to ideographic representation — representation of objects or notions, as the sign $ denotes dollar or as in astronomy the trident ♆ stands for the planet Neptune — but also to representation of sounds. This was a step in the direction of alphabetic writing, but the cuneiform system never reached that ulterior development, and its highest achievement was the production of a syllabary — a catalogue of the syllables of the language. The transition from the ideographic to the phonetic use was a long step toward perfection as it immensely simplified the problem of writing by reducing to a comparatively small number of different characters the infinity of emblems required for ideographic representation. It was as though a sign, as  , originally, let us suppose, the ideograph for tree, were made to stand for the syllable ta, to, etc.: in that case all words beginning with the syllable ta or to would be represented by a form of expression having that sign for its first element, and not by an independent arbitrary form.

The cuneiform writings found among the ruins of the Assyrian, Babylonian and other ancient cities of Western Asia were either impressed with a stylus on tablets of moist clay which was then kiln-baked or they were incised with a chisel on monuments of stone. The wedge either stands upright, or inclined at an angle, or lies horizontal, or two wedges form an angle coming together at their points, or at their bases. A few examples will give an idea of the manner of combining them for the expression of ideas:



In its stage of highest development the cuneiform writing was exceedingly complex and clumsy, and the fact that it was made to serve so well as it did the needs of the Babylonians and Assyrians as a means of literary expression, as the vehicle of laws and as a means of historical record, gives striking demonstration of man's invincible effort to develop his intellectual and moral powers. It was a very simple thing to make the ideograph speak to the ear as well as to the eye — to represent, for example, the sun (utu) by an ideograph and then to make that symbol stand for the syllable ut in all situations; but it was a beginning, and out of it was constructed as efficient a mechanism as was allowed by the refractoriness of the material of construction. But the cuneiform writing never gave any indications of a tendency toward an alphabetic system.

The results of archæological exploration in those countries of western Asia are justly regarded as among the most valuable of modern historical research. They put us in possession of much of the literature and much of the early history of peoples whose record seemed already lost past recovery as far back as the time of Herodotus (5th century B.C.) or at least of Berosus (3d century B.C.) of whose writings only some fragments have come down to us: our knowledge of the history of those great empires, beyond a few incidental notices in the Bible, was drawn mainly or wholly from those two historians; but now, thanks to the researches of our contemporaries, we have with regard to many points of Assyrian and Babylonian history fuller and more authentic information than we possess regarding the history of ancient Greece and Rome.

No one document of the thousands that have been unearthed in the course of those explorations surpasses or even equals in interest the code of King Khammurabi (the Amraphel of Genesis xiv. 9, "King of Shinar" or Elam, called also in the Scripture Shushan, and by the Greeks and Latins Susiana, from the name of the capital city Susa). This code, discovered at

the site of ancient Susa in 1901, afterward translated by the Dominican friar Schiel, who was the Assyriologist of Monsieur de Morgan's exploring expedition, and published in 1903 by order of the French minister of public instruction, is inscribed on a great monolith of granite; it dates from 2200 B.C. It consisted originally of about 3,000 lines of writing in 49 columns, five of which are effaced; but the rest of the inscription, being of a very beautiful type, is still plainly legible. The code begins with a law relating to witchcraft or sorcery, and touches all grades of social and domestic life, even determining the wages of workmen and laborers from the lowest to the highest. Very curious is the law regarding enchantments or sorcery. The person on whom the spell of enchantment has been laid must plunge into the Euphrates: if he sinks and drowns, his house goes to the sorcerer; but if he floats the sorcerer forfeits his life and his house. Proof of the general use of writing in Khammurabi's dominions is seen in the requirement of written testimony in lawsuits and in business transactions. The code commands that land be kept in cultivation; uncultivated and unimproved land is taxed at the same rate as neighboring cultivated land. The farmer whose crop is seriously damaged by storm is excused from paying interest on money loaned him. He through whose neglect the irrigation canals and ditches cause damage must make good the loss. The wine-shop keeper — usually, it would appear, a woman — is required to "seize and drive to the palace" riotous persons who resort to her place: failing to do this she incurs the penalty of death. The defamer of an honest woman, be she wife or "votary," is to be branded on the forehead. A man was permitted to divorce his childless wife. If a man divorces his wife without cause he must allow her alimony and custody of her children, also a share in his estate equal to a son's portion. Here are some points at which Khammurabi's code touches matters which were afterward made the subject of Hebrew legislation. Says the Elamite king: "If a man strike another in a quarrel and cause him a wound and he shall swear 'I did not strike him knowingly' he shall answer for the doctor." The Hebrew law (Deut. xxi. 19) prescribes as penalty for one who smites another with stone or fist so that the injured man keepeth his bed, that the smiter shall "pay for the loss of his time and shall cause him to be thoroughly healed." The Hebrew law punished with death "him that smiteth his father or his mother"; the punishment decreed by Khammurabi for the same offense was loss of the hands.

JOSEPH FITZGERALD,
Author of 'Word and Phrase.'

Cunene, koo-nā'nĕ, a river of South Africa, rising in about lat. 13° S. and entering the Atlantic in lat. 170° 18′ S. It flows at first in a southerly direction and afterward in a westerly direction. In its lower course it forms the boundary between the Portuguese and German territories in that region. At the mouth are sandbanks, and farther up several cataracts.

Cunner, or **Chogset** (*Ctenolabrus adspersus*), one of the commonest of shore fishes on rocky ledges along the New England coast, and found from Virginia to Newfoundland. It rarely attains a length of one foot, and is of a brownish-blue color with yellowish reflections; the teeth are strong and sharp. Although an excellent panfish and a great favorite with the boy angler, its great numbers and its boldness render it a great pest to the professional fisherman, whose bait it continually strips from the hooks.

Cunningham, Allan, Scottish poet and miscellaneous writer: b. Keir, Dumfriesshire, 7 Dec. 1784; d. London 30 Oct. 1842. When a youth he served as an apprentice to a stonemason; but later became a reporter in London, and wrote: 'Sir Marmaduke Maxwell,' a dramatic poem, and 'Lord Roldan' and 'Paul Jones,' interesting but rather theatrical romances. Other works are: 'Traditional Tales of the Peasantry' (1822); 'The Songs of Scotland, Ancient and Modern' (1825); 'Lives of the Most Eminent Painters, Sculptors, and Architects' (1829–33). He will be longest remembered for his song, 'A Wet Sheet and a Flowing Sea.'

Cunningham, John F., Roman Catholic bishop; b. Irremore, county Kerry, Ireland, July 1842. He was graduated at St. Benedict's College, Atchison, Kan., 1860; studied theology in Milwaukee, Wis., and was ordained priest at Leavenworth, Kan., 1865. He was pastor at Fort Scott, Kan., 1865–8; Lawrence 1868–76; Topeka 1876–82; rector of Leavenworth Cathedral 1882–98, and was consecrated bishop of Concordia, Kan., 21 Sept. 1898.

Cunningham, William, English historical writer and clergyman: b. Edinburgh 29 Dec. 1849. He was educated at Edinburgh and Cambridge and took orders in the Anglican Church in 1873. He was chaplain of Trinity College, Cambridge 1880-91, and lecturer there from 1891; was professor of economics at King's College, London, 1891–7, and was lecturer on economic history at Harvard University in 1899. He has published: 'Growth of English Industry and Commerce'; 'Outlines of English Industrial History'; 'Western Civilization'; 'Modern Civilization in Economic Aspects'; 'Use and Abuse of Money'; 'Alien Immigrants to England.'

Cunninghame-Graham, Robert Bontine, Scottish writer: b. 1852. He was educated at Harrow and sat in the House of Commons for North Lanarkshire 1886-92. He has published: 'Notes on the District of Menteith' (1895); 'Father Archangel of Scotland and other Essays' (1896); 'Aurora la Cujini' (1898); 'Journey in Morocco' (1898); 'The Ipane' (1899); 'Thirteen Stories' (1900); 'A Vanished Arcadia' (1901).

Cunningham'ia, a genus of the *Coniferæ,* so named in honor of the botanists and travelers I. and A. Cunningham. The single species of the genus *C. sinensis* is a tall and handsome tree, native of China and Cochin-China, with leathery leaves somewhat resembling those of the *Araucaria* (q.v.). It is too tender for the ordinary temperate climate, but is used in favorable localities as an ornamental tree, though never seen in its full beauty except in its native country, as the transplanted specimens must be small enough to be protected from the slightest frost. It is therefore known generally as a house-plant.

Cup, a name for a refreshing beverage, made usually of wine, soda-water, ice, and flavoring ingredients, such as claret cup, champagne cup, etc.

Cup-and-saucer Limpet, shells of the gastropod genera *Calyptræa* and *Crucibulum,* so called from having in the middle of the inside of the shell a cup-like process, the shell proper constituting the "saucer." *Hipponyx* is another form. *Crucibulum striatum* occurs off shore on our coast.

Cup, Divination by, a mode of foretelling events, in use among the ancient Egyptians, and still surviving in some of the rural districts of England and Scotland. In the East, one method was to put small pieces of gold, silver, and precious stones engraved with mystic characters into a cup of water, then to invoke the infernal powers, who replied by some signs in the cup. By the modern method, a person's fortune is foretold by the disposition of the sediment in his teacup after pouring out the last of the liquid.

Cup-sponge. The cup-sponge of Turkey (*Spongia adriatica*), also called the Levant toilet-sponge, is one of the finest sponges brought from the Mediterranean Sea. See SPONGE.

Çupay, soo-pā, or **Supay** ("the shadow"), the Peruvian god of the dead, the Pluto of their pantheon, corresponding to the Mictla of the Mexicans. He was supposed to rule the land of shades in the centre of the earth. To him went all souls not worthy to become the sun god's associates.

Cupel, kū'pĕl or kŭp'ĕl, a shallow earthen vessel, made of bone ashes, and extremely porous, used in assays to separate the precious metals from their alloys. The process of cupellation consists in fusing an alloy of a precious metal, along with a quantity of lead, in a cupel. The lead is easily oxidized, and at the same time promotes the oxidation of other metals, and vitrifies with their oxides. The foreign metals are thus removed; the vitrified matter is absorbed by the cupel, or is driven off by the blast of the bellows as it collects on the surface; and the precious metal at length remains pure. The cupel is described in terms almost identical with those of the present time in one of the oldest extant mediæval works on chemistry.

Cupid, in Roman mythology, the god of love, similar to the Greek Eros, the son of Mercury and Venus. He is usually represented as a winged infant, naked, armed with a bow, and a quiver full of arrows. Sometimes he was represented with a helmet, a spear, and a buckler, intimating that even Mars himself owns the superiority of love. His power was generally shown by his riding on the back of a lion, or on a dolphin, or breaking to pieces the thunderbolts of Jupiter.

Cupola, in architecture, a hemispherical semi-elliptical roof, built of stone, timber, metal, or glass. The ancient cupolas were hemispherical, and were used with great effect by the Romans. The greater part of modern cupolas are semi-elliptical, cut through their shortest diameter. Of ancient cupolas, the finest is that of the Rotunda or Pantheon at Rome, erected under Augustus, and still perfect; of modern construction, some of the handsomest are those of Saint Peter's at Rome, of Saint Paul's, London, the Hotel des Invalides, Paris, Santa Maria da Fiori at Florence, Saint Sophia at Constantinople, and the national capital at Washington, D. C. The term is also applied to any small structure rising above the roof, not necessarily spherical, but of any shape.

Cupping, the process of applying small cups to the skin for the purpose of causing local irritation or local abstraction of blood. The cups that are ordinarily employed are small glass half-spheres, connected with a rubber bulb by means of which the air may be exhausted and the cup applied. This results in drawing up into the cup a certain amount of skin area, which subsequently becomes filled with blood. The local abstraction of blood, however, does not explain the physiological action of the cups. The action is really that of an irritant, which, affecting the skin area, causes a reflex effect on a related visceral area somewhere in the body. The cups are termed dry cups or wet cups according to whether the skin is punctured or unpunctured. With wet cups the blood is drawn from the skin directly. Cups are useful in the early stages of acute congestion such as occurs in the lungs, or they may be applied to other organs. Cupping may also be performed by the ordinary tumbler in which a small amount of alcohol is permitted to burn. This heats the air and thus causes, on cooling, a partial vacuum when the cup is applied to the skin.

Cupples, George, Scottish sketch and story writer: b. Legewood, 2 Aug. 1822; d. 7 Oct. 1891. His best known work is 'The Green Hand,' a stirring tale of the sea.

Cupples, Samuel, American manufacturer: b. Harrisburg, Pa., 13 Sept. 1831. At the age of 12 he was employed in a grocery store in Pittsburg, but removed to Cincinnati in 1846, where he entered a wooden-ware establishment. In 1851 he was sent to Saint Louis to establish a branch house there, which as the house of Samuel Cupples & Company became widely known. In 1883 this was recognized as the Samuel Cupples Woodware Company, of which its original founder is still president. It is the largest business of its kind in the world, its trade equaling in amount that of all other wooden-ware houses in the United States. He has taken a warm interest in education and has done very much to sustain the school system of Missouri. He was the original promoter of the Saint Louis Manual Training School and his gifts to educational institutions have amounted to several millions. See CUPPLES STATION.

Cupples Station, a railway junction in Saint Louis established by Samuel Cupples (q.v.) and others. Here has been erected an extensive system of railroad warehouses whose basements are traversed by railroad tracks. Merchants are thus enabled to receive and re-ship goods with the expense of handling them reduced to a minimum, the expense and delay of cartage being eliminated from the problem. This vast property has recently been presented by Samuel Cupples and his partner R. S. Brookings, to Washington University, this institution collecting all rentals therefrom.

Cuprite, kū'-prīt, native cuprous oxide, Cu_2O. It is the richest of the copper ores and occurs earthy, massive and granular, and also

in beautiful isometric crystals which in the variety chalcotrichite are elongated into capillary crystals. Usually it is translucent, of adamantine luster and very dark cochineal-red color. Its hardness is 3.5 to 4 and specific gravity about 6. Among its many important localities are Chessy in France, Cornwall in England, South Australia and Chile, and in the United States at Bisbee and Morenci in Arizona.

Cur, a dog of any kind not highly valued, and in this way often particularly appropriated to dogs of mongrel breed. Naturalists use the term cur as the common designation of many races, of which the terrier may be considered as the type.

Cura, koo'rä, also **Ciudad de Cura,** Venezuela, a city situated 56 miles west of Caracas and a short distance from Lake Valencia, in the old state of Miranda (now separated into the states of Rivas, Guárico, and Miranda). It was founded in 1730 by Juan Bolivar y Villegas. The site of Cura is 1,600 feet above sea-level at the foot of a steep hill; an extensive valley, watered by two streams, outspreads before it. A record of its temperature shows as the maximum 87° F.; minimum 72°; mean annual 79° F. Owing to its proximity to the savannas of the Guárico, and the surrounding agricultural and grazing districts, with their plantations of sugar-cane, coffee, cacao, cotton, indigo, etc., as well as herds of cattle, Cura is a thriving little place. Pop. somewhat more than 10,000.

Curaçao, koo-rä-sä'ō or kū'ra-sō, an island, one of the Dutch West Indies, in the Caribbean Sea; 46 miles north of the coast of Venezuela; between lat. 12° 3′ and 12° 24′ N., and lon. 68° 47′ and 69° 16′ W.; stretching northwest to southeast; 36 miles long and 8 miles broad; capital Wilhelmstad. The chief minerals are iron and copper (but the mines are not developed), and salt. The cocoa-palm, banana, and three varieties of the orange — from one of which varieties the far-famed Curaçao liqueur is made — grow abundantly. Curaçao was settled by the Spaniards early in the 16th century; it was taken in 1632 by the Dutch; and was captured by the British in 1798, but restored at the Peace of Amiens. It was taken again by the British in 1806, and finally ceded to Holland at the general peace in 1814. Pop. (1900) 30,642; including the dependencies, 51,943.

Curaçao, or **Curaçoa,** the genuine Dutch liqueur of this name, so much esteemed for its taste and aroma, is prepared from a peculiar kind of bitter oranges growing in Curaçao, which fall from the tree before they are ripe, and which have an extremely persistent aromatic odor and taste. The rind of the orange is macerated, the white pulpy matter scraped off, and the yellow part, along with yellow fresh oranges, steeped in strong alcohol for 24 hours. The liquor is distilled and rectified, about half being collected, and this is mixed with a syrup made of fine white sugar. To this is added a certain quantity of curaçao infusion, which is a stronger alcoholic extract of the peel containing sugar, and then a certain proportion of water. The fluid is clarified and allowed to settle. The finest quality has a deep yellow color, which is sometimes improved by a few drops of tartaric acid.

Curari, koo-rä'rĭ, **Curare, Ourari,** etc., an arrow poison widely used by the natives of South America. Its exact composition is unknown, but it is certain that the juice of some species of *Strychnos* is always present. No species of *Strychnos* that is now known, however, has the same physiological action that curari has. Its method of preparation is kept secret and it is probably true that each tribe has its own method of preparing the poison. The physiological action of curari is unique. It is a type of pure motor paralysant, affecting the motor end organs in voluntary muscles. In death by poisoning from curari, the muscles of respiration becoming paralyzed, asphyxia results. Therapeutically, curari is of secondary service. Its varying composition and uncertain strength make it dangerous, and theoretically it would be indicated only in motor disorders of the voluntary muscles such as convulsive tics, torticollis, hydrophobia, etc. In the treatment of poisoning, artificial respiration is the best procedure.

Curassow, kū-răs'ō, a bird of the subfamily *Cracinæ* and family *Cracidæ,* related to the guan (q.v.) and mound-bird (q.v.), and with these occupying the border between the *Columbæ* and *Gallinæ,* and most often grouped with the latter, but resembling the former in having the hallux on the same level as the other toes. The name is derived from the supposed origin of those first known to Europeans from the island of Curaçao. The curassows are exclusively birds of tropical America and are especially abundant in the forests east of the Andes. They are large, sometimes equaling the turkey in size, with handsome plumage and in some varieties crested head. Usually the trachea of the males forms a loop within the sternum, as in certain cranes, and renders possible the clear ringing voices of these birds. They are chiefly arboreal, but also scratch on the ground for their food, which consists largely of nuts, berries, and tender leaves. Most species also nest in trees and, as the young are precocial, a curious sight is presented by their scrambling among the branches while still in the down. Being highly prized for food, some of the species have been domesticated and are said to hybridize readily with the common barnyard fowl. The genera are *Crax,* with a soft cere and crested head; and about 10 species in Central and South America. The *Nothocrax* has no cere, and the lores, or spaces between the eyes and beak, are naked. *Mutua* is similar, but the lores are feathered; *M. mitu* is a beautiful blue-black species of Brazil and adjoining countries to the north. *Pauxi* contains the well-known *P. galeata* of zoological gardens, in which the frontal region of the head bears a large, deep blue knob. It is a native of the extreme northern parts of South America. Interesting accounts of these birds will be found in Bates, 'Naturalist on the River Amazon' (1863).

Cura'tor (Lat. "care-taker"), in civil law, a term signifying the guardian of a minor who has attained the age of 14. Before that time minors are under a tutor. The guardianship of persons under various disabilities, and of the estate of deceased or absent persons and insolvents, is also committed to a curator. In learned institutions the person who has charge of the library or collections of natural history, etc., is often called a curator.

Curb, a disease in horses consisting of strain of the straight ligament which runs down the back of the hock. It is most common in animals with straight small hocks and sickle hams. Like other strains it occurs from sudden and violent exertion, often proceeding in the lighter breeds from leaping or galloping in heavy ground, and in the heavier, from the effort of keeping back a load while going down a steep incline. Swelling appears on the outer and back part of the joint, about five or six inches below the point of the hock, generally causing lameness, most apparent in trotting, and, in slight cases, usually decreases after the animal has been out for 10 minutes. Fomentations must first be used to allay the irritation and inflammation, and a high-heeled shoe put in. When heat and tenderness disappear, cold applications will be advisable; after which, the enlargement still continuing, a blister may be necessary. From the first all work must be forbidden.

Curbina. See DRUM.

Curculio, kėr-kū'lĭ-ō, an insect-enemy of the plum. See paragraph *Insects,* under PLUM.

Curculionidæ, kėr-kū-lĭ-ŏn'ĭ-dē, the snout-beetles, or weevils (q.v.). One of the most extensive families of coleopterous insects. They belong to the section *Tetramera,* and all the species have a curious snout-like head.

Curcuma, kėr'kū-mą, a genus of the gingerwort and cardamom order. The corm is about as thick as the thumb, and is divided into several parts. The leaves which are about a foot long are lanceolate in form and sheathing. *Curcuma longa* is a turmeric plant, the tuberous rhizomes of which furnish the substance called turmeric (q.v.). This plant is extensively cultivated in southern Asia. *C. amada,* a native of Bengal, is the mango-ginger, which has qualities resembling ginger. From the colorless rhizomes of *C. leucorhiza* is prepared a kind of arrowroot. *C. zedoaria* yields a tonic medicine, and is also used as a food.

Curd. See CHEESE.

Cures, kū'rēz, an ancient town of the Sabines, 25 miles northeast of Rome, whence the Romans, after the people of Cures united with them, came to be called Quirites.

Curfew, kėr'fū, also **Curfeu,** from the French *couvrir,* to cover, and *feu,* fire. The ringing of a bell at nightfall, originally designed as a signal to the inhabitants to cover their fires, extinguish lights, and retire to rest. The practice is said to have been instituted by William the Conqueror, in all probability as a safeguard against fire, but the English in early days regarded the curfew as a badge of servitude. Originally the hour set for the ringing of the curfew bell was 8 o'clock, but it was also rung at 9 o'clock. The bell in each village or community which tolled the curfew became known as the curfew-bell. In certain parts of rural England the custom is still kept of ringing a bill at 9 o'clock.

The curfew bell was introduced into the United States early in the century, but without regularity of practice. About 1880 Col. Alexander Hogeland, who has been called "the father of the curfew-law," introduced an ordinance in Omaha, Neb., compelling youths to absent themselves from steamboat landings, railroad stations, and low variety shows. The curfew ordinance, somewhat changed and modified, was adopted in 1894 at Lincoln, Neb. The term curfew-law has since been given to all laws intended to keep young people off the streets after a certain hour, generally 9 o'clock at night. In 1894 at the National Convention of the Boys' and Girls' Home Employment Association in Indianapolis, the adoption of curfew ordinances was urged in view of the great increase in crime among children. Since that time the law has been generally enforced in over 3,000 cities and towns in this country. The officials of many of these towns report a decrease of 80 per cent in the arrest of boys and young men, under the provisions of the law, and former objections to the curfew have ceased. In 1898, a consensus of opinion was taken in 300 towns where the curfew law was in operation and all reports showed that there was a decided improvement in the youth morally and socially.

The curfew law, in general use, provides that all children under 15 years of age shall not be on the streets at night after 9 P.M. in summer and 8 P.M. in winter, without the written consent of their parents or guardians. The law has been endorsed by city officials, commercial associations, school boards and boards of trade in various sections of the country. The enforcement of the law has largely reduced the number of commitments to reform schools as is illustrated at the State Reform School at Boonville, Mo. During two years prior to the adoption of the curfew ordinance at Kansas City, Mo., 47 boys were sent to the reform school while for two years after the adoption of the law only 17 boys were committed from Kansas City. The ordinance has been recognized as a crime-reducer, child protector, and home builder. Benjamin Harrison called the curfew-law, "the most important municipal regulation for the protection of the children of American homes, from the vices of the street, of the present century."

Curi-cancha, koo-rē-kän'chä, the splendid Temple of the Sun, built by the Incas in Cuzco, Peru, on the site now occupied by the church of San Domingo. See CUZCO.

Cu'ria, a certain political division of the Roman people, said to have been established by Romulus; also the place of assembly for each of these divisions. According to Livy, Romulus divided Rome in 30 curiæ, and assigned to each a separate place of meeting. In early times only the members of the curiæ were in possession of the full citizenship of Rome.

Curia Roma'na, the body of officials who under the Pope administer the government of the Roman Catholic Church, or in a wider sense the entire court of the Pope. The relations of the Roman see to the secular powers are conducted through the cardinal secretary of state; under him are nuncios and other diplomatic agents of the Holy See. The Pope acts as the supreme judge in the Church, either through special delegated judges or through regular tribunals, the Rota and Segnatura for causes in the *forum externum* and the Penitentiaria for those in the *forum internum.* In the Roman Chancery are drafted and expedited the bulls and briefs by which the mind of the pontiff is made known to Christendom or to

individuals. The Rota and the Segnatura are tribunals for determination of questions of canon and ecclesiastical law whether in the first instance or on final appeal.

For the different congregations of the College of Cardinals, or the standing committees, see CONGREGATIONS, ROMAN.

Curiatii. See HORATII.

Curicó, koo-rē-kō′, Chile, a province lying between Colchagua and Talca. Area 2,915 square miles. It is divided into the departments of Curicó and Vichiquen. Its capital city, also called Curicó, has two commercial banks, several tanneries, and other industrial establishments. The port of Llico is on the Lake of Vichiquen. Numerous irrigating canals are derived from the Teno and Lontue, which unite to form the Mataquito River. Cereals, vegetables, wine, cattle, timber, and fruits are among the products; there are also a few copper, silver, and gold mines in the Cordillera and the coast range of hills, and the annual output of salt from the estuaries of the lakes of Vichiquen, Boyeruca, and Bucalemu exceeds 25,000 tons. The urban property has been appraised at $6,000,000, and the rural at $32,000,000. Total revenue of the municipalities in 1899 was $180,000. The State Central Railroad crosses the province. Pop. 115,000. Curicó is the capital of the province. Pop. 15,000.

Curiosities of Literature, a work of reference by Isaac D'Israeli in three parts, of which the first was published anonymously in 1791, the second two years later, the third in 1817. From every field the author has gathered interesting and recondite facts and anecdotes on diverse literary and historical topics, and has grouped them under headings totally without sequence. The subjects include the source of the extraordinary legends of the saints, the true story of the printer Faust, the Venetian origin of newspapers, etc.

Curitibá, koo-rē-tē-bā′, Brazil, the capital of the state of Paraná, situated on a plateau 2,890 feet above sea-level. It is about 80 miles west of the port of Paranaguá. A wagon-road and a railroad, the latter built in 1885, connect the city with the ocean. The railroad encircles Mount Morumby, and descends by a series of cuts, tunnels, and viaducts; the grade being so steep that the maximum speed of trains is 12 miles an hour. A line of steamships running directly between Paranaguá and Hamburg, Germany, is subsidized by the state. From Paranaguá and the neighboring port of Antonina are exported woods, maté, sugar, and cereals. A large foreign element (chiefly Germans and Poles) is found in the country west of Curitibá, as well as in the capital itself. Pop. about 15,000. See also PARANÁ, the state.

Curlew, kėr′lū, shore birds of the genus *Numenius,* belonging to the snipe family (*Scolopacidæ,* q.v.). In this genus the bill is long, slender, and arcuate, and the toes are rather short, thick, and margined. Most of the species are of large size for the family, and about 15 are found throughout the world. During the migrations most of the species frequent the shores in flocks, when they are much sought by the gunner and, on account of their wariness, often tax his skill to the utmost. When breeding they retire to the barren upland plains, prairies, or similar haunts.

The long-billed curlew (*N. longirostris*) is the largest species, its total length sometimes exceeding two feet. It is found throughout temperate North America, but is rare in the New England States. In the interior it is common throughout the Mississippi valley, where, as well as in the south Atlantic States, it breeds, laying three or four eggs on the ground in meadows or prairies. Like other species its principal food consists of worms, crustaceans, and insects, but vegetable matter is also eaten. The Hudsonian curlew (*N. hudsonicus*) is smaller, with the bill scarcely more than one half as long and the color of a less rufous tone than the last. It is more a bird of the North, breeding in the Arctic regions, and migrating through the United States. The common curlew, Eskimo curlew, or dough-bird of gunners, (*N. borealis*) is still smaller, having a total length of 12 to 15 inches, and a bill of only 2 or 3 inches. This bird is remarkable for its extensive migratory movements in the spring and fall. Like the Hudsonian curlew it breeds in high northern latitudes, but winters still farther south in tropical America. During the migrations it abounds along the eastern seaboard of the United States, where its peculiar mode of flight in flocks and its wild cry are well known to every lover of out-of-door life. Great numbers are killed by gunners. Closely similar species of curlews are found in Europe, two of which, together with the peculiar Asiatic bristle-thighed curlew, occasionally wander to our shores. Consult: Elliot, 'North American Shore Birds' (1895).

Curling, a Scottish game played on the ice, with large smooth stones of a hemispherical form, with an iron or wooden handle at the top, which the players slide from one mark to another. The space within which the stones move is called the "rink," and the hole or mark at each end the "tee." The number of players upon a rink is 8 or 16—8 when the players use 2 stones each, and 16 when they use 1 stone each. The object of the player is to lay his stone as near to the mark as possible, to guard that of his partner which has been well laid before, or to strike off that of his antagonist. When the stones on both sides have been all played the stone nearest the tee counts one, and if the second, third, fourth, belong to the same side, each counts one more.

Curly-grass, a common name for a fern (*Schizæa pusilla*), the typical genus of the climbing fern family. The plant is rare, being occasionally found in wet soil in the pine barrens of New Jersey and in Nova Scotia. The climbing fern family has 16 genera, of wide geographical distribution, the 2 American genera being *Schizæa,* as above, and *Lygodium,* represented by the Hartford fern (q.v.).

Curran, Charles Courtney, American artist: b. Hartford, Ky., 13 Feb. 1861. He studied art in Cincinnati, the New York Art Students' League, and the Académie Julien in Paris, France, receiving an honorable mention in the Salon of 1890. He has been awarded several of the prizes of the National Academy of Design, and received medals at the World's Columbian Exposition and the Cotton States International Exposition.

Curran, John Philpot, Irish orator: b. Newmarket, near Cork, 24 July 1750; d. Lon-

don 14 Oct. 1817. He was educated at Trinity College, Dublin, after which he went to London and studied at one of the inns of court. In 1784 he was chosen a member of the Irish House of Commons. His abilities now displayed themselves to advantage, and he became the most popular advocate of his age and country.

Curran possessed talents of the highest order: his wit, his drollery, his eloquence, his pathos, were irresistible; and the splendid and daring style of his oratory formed a striking contrast with his personal appearance, which was mean and diminutive. See Davis, 'Life of Curran' (1846); Phillips, 'Curran and His Contemporaries' (1850).

Currant, originally, the small black, seedless raisins popularly used in cookery, and so named from the Greek city of Corinth, where they first became commercially important; by extension, various species of the genus *Ribes* and their fruits. The former belongs to the genus *Vitis* (see GRAPE) of the natural order *Vitaceæ* or *Ampelideæ;* the latter to the *Saxifragaceæ*. Only the thornless species of the latter genus which bear grape-like clusters of smooth fruits are called currants; the spiny species are known as gooseberries.

The most widely cultivated species is unquestionably the red currant (*R. rubrum*) which has developed several white horticultural varieties as well as numerous red ones which are commercially important, both in the fresh state and when manufactured into jelly. The black currant (*R. nigrum*) is next in importance as a fruit but is less popular in America because of its peculiar flavor, less prolific habit, and smaller range of usefulness. The first is a native of the north temperate zone, the second, of Europe and Siberia. The American black currant (*R. floridum* or *americanum*) resembles the common black currant but, though sometimes found in gardens, is little esteemed. The flowering currant (*R. aureum*), an American species, has produced several horticultural varieties but is not cultivated for its fruit, which ripens very unevenly, but for its bright yellow sweet-scented flowers which appear in the spring. Several other species are grown for ornament, the most notable of which is the red-flowered currant (*R. sanguineum*) which is found on the Pacific coast from British Columbia to South America. It has developed several varieties which are all attractive in flower but which bear rather dry, bitter berries, erroneously reputed poisonous. Only the first three species are economically important, and that only in the North or in the higher altitudes of the South, where the hot summers injure the bushes. In the dry plains region they succeed only under specially favorable conditions such as irrigation and partial shade, etc. Several unrelated species of plants are called currant, but compared with the above are unimportant.

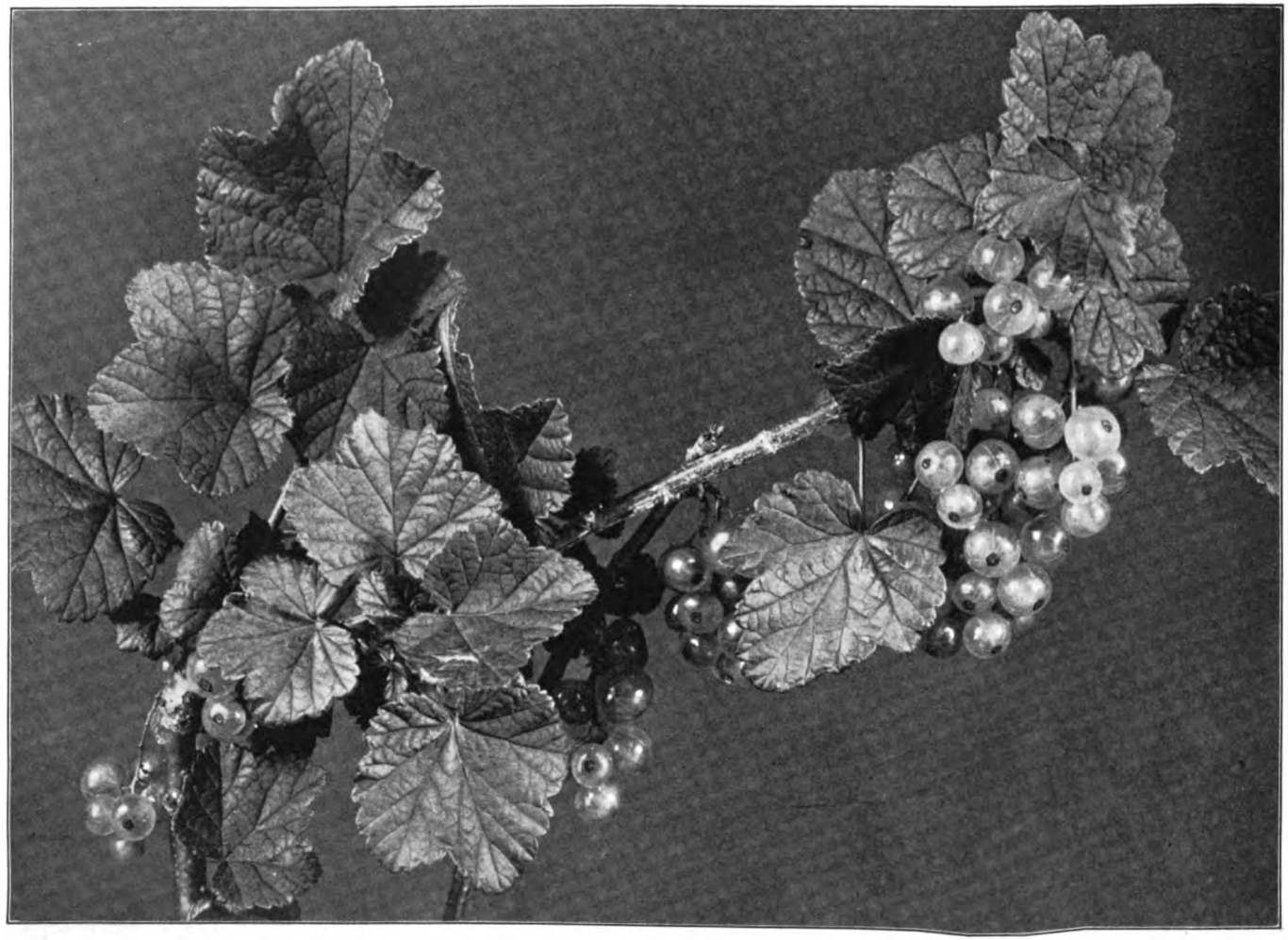
The currant thrives best in cool, rather humid climates, upon well-drained but moist strong clayey loams, and with less attention to cultivation, pruning, etc., than any other small fruit. However, it will respond liberally to good treatment, and deserves better attention than it usually receives. The plants are generally propagated by means of hard wood cuttings which are transplanted to the field when one or two years old. The usual distances for planting are four by six feet, upon land well prepared by plowing and harrowing. The bushes are cultivated until mid-summer, when a cover crop is sown to be plowed under the following spring. Annually, two or three new stems should be allowed to grow, preferably from below ground, at the centre of the bush, and when this wood has borne fruit twice (that is, when three years old) should be cut out, since younger wood is more productive and less likely to become infested with insects and disease. On this account, training to the tree form is not recommended. A plantation should continue to be commercially profitable for 6 or 10 years after coming into bearing and should yield 100 bushels an acre if properly cared for. Yields of 250 bushels have been reported. Individual plants in gardens should produce from two to four pounds.

Of the many insects that attack the plant, the currant sawfly or currant worm (*Nematus ribesii*) is the best known. It is a European four-winged fly somewhat larger than a large housefly, which lays its eggs upon the midribs of the under sides of the leaves, particularly those near the ground, in early spring. The green, black-dotted worms frequently do considerable damage before their presence is suspected. Spraying with arsenites or hellebore as soon as the leaves appear and at intervals of about a week is a positive remedy. As a result of neglect, however, the bushes are frequently defoliated. A long-horned beetle (*Psenocorus supernotatus*) lays its eggs upon the shoots and branches into which the larvæ burrow and emerge as adults during late spring of the following year. When troublesome the bushes should be heavily pruned during the winter and the prunings burned. This treatment will also destroy another species of borer, the adult of which is a moth (*Sesia tipuliformis*). No practicable remedy has been discovered for the currant fly (*Epochra canadensis*) which sometimes is seriously troublesome, since it attacks the fruit, which ripens prematurely from the presence of larvæ beneath the skin.

All leaf diseases of the currant, the best known of which are anthracnose (*Glœosporium ribis*) and leaf spot (*Septoria ribis*), may be controlled by thorough spraying with a standard fungicide (q.v.). The former of these diseases is characterized by small black spots on the upper surfaces of the leaves and white ones beneath; the latter has black-centred white spots. The leaves fall prematurely in each case. The currant tubercle, a disease which attacks the whole plant, has become locally destructive in some of the Eastern States. The leaves wilt, the fruit colors prematurely, the clusters become small and few, and both foliage and fruit shrivel and fall. The plant soon dies. No remedy is known except prompt digging and burning. No diseased plants should be used for propagation because the disease seems to permeate the whole plant.

Consult: Card, 'Bush Fruits' (1898); Bailey, 'Cyclopedia of American Horticulture' (1900–02).

Currant Insect-pests. The worst pests of currants (and of gooseberries) are the larvæ of two sawflies (q.v.). The most destructive of these is *Nematus ventricosus*, imported into this country about 1860, and since become very widespread. The female, which is bright honey



CURRANTS.

yellow with the head black, lays her cylindrical, transparent, whitish eggs in May in regular rows along the rims of the leaves on the under side. The embryo escapes from the egg within four days, and in the form of a pale-green worm which begins to eat out holes in the leaves, grows rapidly and after a few days drops to the ground, burrows among the roots, forms a cocoon and pupates. Two broods are raised. There are some 50 species of this genus in the United States, all of which are harmful. Another sawfly (*Pristiphora grossulariæ*) does great damage in the North and West. This female is shining black, with the head and legs yellow. It is later than the other; its worms, which are pale-green, with a black head and a brown side-stripe, appear late in June. Next to these the caterpillars of the yellowish, dark-spotted phalænid moth, *Eufitchia ribearia,* is probably the worst of our "currant worms," and in Great Britain is a noted pest of the gooseberries. They defoliate the bushes as soon as the leaves begin to expand. Another moth, *Ægeria tipuliformis,* of the family *Zygænidæ,* is called the "currant-borer" because its larva bores into the stems in order to pupate, and thus blasts the life of the stem. It is an agile, dark-blue moth less than an inch in expanse, and flies about in the July sunshine. It is an imported pest, and damages the gooseberries and currants of both continents. Another destructive borer is the grub of a small black long-horned beetle (*Psenocerus supernotatus*), which tunnels and kills the branches. To combat these pests, use handpicking and hellebore for the leaf-eaters; trim away in winter all dead and dying twigs, which may contain borers; and in transplanting, free the roots from all possible cocoons.

Cur'rency, any medium of exchange facilitating trade. Originally all exchanges must have been directly by barter. In barter, however, very often it would be difficult to find two persons whose disposable goods suited each other's needs. So some special commodities in general esteem and demand were chosen as a medium of exchange and common measure of value, the selection varying with the conditions of social life. In the hunting state furs and skins have been employed by many nations; in the pastoral state sheep and cattle are the chief negotiable property. Articles of ornament, corn, nuts, olive-oil, and other vegetable products, cotton cloth, straw mats, salt, cubes of gum, bees'-wax etc., at various times have been employed to facilitate exchange. These were not entirely satisfactory, for any suitable medium not only must possess utility and value, but be portable, not easily destructible, homogeneous, readiiy divisible, stable in value, and cognizable without great difficulty. The metals commend themselves as best satisfying these requirements, and in all historic ages gold, silver copper, tin, lead, and iron have been frequent materials of currency. The primitive method of circulating them appears to have consisted simply in buying and selling them against other commodities by a rough estimation of the weight or size of the portions of metal. Sometimes the metal was in its native state, at others in bars or spikes. The earliest money was stamped on one side only, and rather of the nature of stamped ingots than coins as we know them. The need of preventing counterfeiting, and any fraudulent subtraction of metal from the coin, of removing as far as possible anything likely to occasion loss of metal in the wear and tear of usage, and striving after an artistic and historical monument of the state issuing the coin brought about elaboration of designs to cover the whole of a given portion of metal, and nicer determination of quality, size, degree of relief, inscription, etc. While, however, metallic money of a guaranteed standard value was at an early period found to facilitate in a high degree the mechanism of exchange, it was speedily discovered that it was possible in large part to replace the standard gold or silver or copper coins by various forms of currency of a representative character. Standard money depended solely for its value in exchange upon the value of the material of which it was composed; its metallic value and its nominal value were coincident; representative money derived its value from a theoretic convertibility at will into the standard coin. Gradually a series of devices came to be employed to further the interchange of commodities with the least friction and the least possible actual use of the coinage except as a standard and common denominator of value in terms of which exchanges were made. The use of actual specie was found to involve a loss of interest and a risk of more serious loss, and a paper currency based upon credit offered the readiest solution of the difficulty. In this way bank-notes, bills of exchange, and checks — warrants or representative documents convertible, if desired, into standard coin — took their place alongside the metallic currency, partly displacing it, partly extending and supplementing it.

The requisites of circulation are that monetary issues, whether of coin or paper, be from a recognized or official source, and that they admit of being freely returned when necessary to that source. The certification of the fineness of the masses of metal circulating in a community, and the protection from adulteration and fraud, clearly falls among the necessary acts of police. It is still argued, as by Herbert Spencer in his 'Social Statics,' that the coinage should be left to the ordinary competition of manufacturers and traders; but where this occurs currency uniformly becomes debased, and it is generally held, in accordance with the maxims of civil and constitutional law, that the right of coining is a prerogative of the state. In the matter of state supervision two precautions are necessary; that standard coins shall be issued as nearly as possible of the standard weight, and that all coin worn below the least legal weight shall be withdrawn from circulation. The ground for these precautions is to be found in the broad general principle relating to the circulation of money, and known as Gresham's Law (q.v.) that bad money invariably drives good money out of circulation, the heaviest coins being selected for exporting, hoarding, melting, conversion into jewelry, gold-leaf, etc. The law holds good with regard to coins in one kind of metal, and to all kinds of money in the same circulation, the relatively cheaper medium of exchange being retained in circulation, while the other disappears. Of the various systems of metallic currency the first adopted was that known as the single-legal-tender system, in which the state issued certified coins in one metal only. It was

found, however, that in such cases the people invariably circulated for convenience coins of other metals, and there naturally arose out of this the adoption of a double or multiple legal tender system, in which coins were issued in different metals at a fixed rate of exchange. To obviate difficulties arising from the possession of two or more metals as concurrent standards of value, with the constant tendency of one or other to become more valuable as metal than as currency, a third system, the composite-legal-tender, came into existence, in which coins of one metal were adopted as the standard of value, and token coins only issued in the other metals for the payment of small amounts. The last system is that now prevalent in the United States, but the double-legal-tender system, to which the French have long adhered, has been revived in a more philosophic form by economists, and has found an increasing number of advocates for its universal adoption. See BIMETALLISM.

The circulation of representative money differs from that of standard metallic money in that it only circulates within the district or country where it is legally or habitually current. In the payment of debts to foreign merchants the only money which can be exported is standard metallic money. Hence Gresham's law holds with regard to paper-money, which is, like light and debased coins, capable of driving out standard money. Examples of this are to be found in the suspension of specie payments by the Bank of England between 1797 and 1819, and in the history of the French assignats at the time of the Revolution. The various methods by which the issue of paper-money may be conducted are exceedingly numerous and a matter of interminable debate. The state may constitute itself the sole issuer of representative money on the same lines as it constitutes itself sole issuer of metallic money, or it may allow corporations, companies, or private individuals to issue representative money under legislative control.

The question as to the duty of a government in this respect has been much obscured by the want of a clear apprehension of the distinction between a real and a nominal currency. The doctrine of orthodox writers on the currency of the absolute convertibility of the bank-note, by which is intended a convertibility provided for by the action of government, is held by some writers to proceed on an altogether exaggerated and inaccurate notion of the functions of a government. Another idea, that the issue of paper-money ought to be wholly controlled by government, or ought to rest entirely upon government credit, places a high degree of faith in the trustworthiness of governments, and is held by many to misconceive the nature and objects of a paper currency. The tendency has been to regard the issue of notes not so much as allied to the commercial operation of drawing bills, but as analogous to the state function of coinage. In Scotland, on the other hand, a perfectly sound currency was furnished by banks acting, until 1845, on their own unrestricted discretion, and the prevailing tendency is still toward a maximum of freedom in the issue of representative paper-money.

Credit Currency.—Asset currency and credit currency are two things that mean the same thing. An asset or credit currency would, in this country, be the issue of notes by the national banks, these notes to be based upon the general assets of the banks, that is to say, their resources in specie and United States notes, their loans and discounts, their holdings of bonds and other securities, and their real estate, to which should be added their capital and surplus, and possibly the personal liabilities of the stockholders. Capital is usually called a liability by banks, though it is in reality an asset so far as the depositors are concerned. It is a liability of the bank only in its relations to its stockholders. Asset currency is, therefore, a currency based upon the credit of a bank as measured by its capital and resources, and its reputation for honest and efficient management. The present bank-note circulation of the United States is a bond-secured currency, and in a strict sense, might be termed a credit currency, for notes thus issued are promises to pay secured by bonds, which are promises to pay. But it is needless to say that the government's promise to pay is the highest form of security. So that neither it nor the bank-note is in practice credit currency.

The national banking system was an outgrowth of the Civil War, and at least one of the motives for securing note circulation by deposits of bonds was to insure a market for the bonds issued by the government to defray the cost of the Civil War. But, with the establishment of peace and the rapid development of the country in wealth and power, the credit of the nation has increased, and there is no longer any need of creating a market for government bonds, though, of course, if the law was changed so that they were no longer required to secure circulation and government deposits, their price would decline. But, the motive for a bond-secured circulation no longer exists. Our government could sell its bonds even if they were not required by the banks. The public debt, notwithstanding the bonds issued in the second Cleveland administration to keep the government on a gold basis, and those issued by the McKinley administration to defray the cost of the Cuban war, has been greatly reduced since the civil conflict. It is the settled policy of the treasury to reduce the public debt by at least $50,000,000 a year. But regardless of the motive for securing bank-note circulation by deposits of bonds, the result has been to create an absolutely safe currency. A national bank-note is always sure of redemption. The failure of a bank does not impair the security of its outstanding notes. These have behind them the power, the wealth, the credit of the whole country.

But, security is not the only essential of a currency. It must have another quality, namely, elasticity. The advocates of a credit currency claim that it would be as safe as a bond-secured circulation, and at the same time have the quality of elasticity which the present bank-note circulation has not. There are times when an expansion in note circulation is desired, as for instance, when the crops are being harvested and moved to the markets. But when this demand for currency is passed, the door should be open for a speedy retirement of bank-notes. Any note circulation in excess of actual needs would have the demoralizing effect of inflation. There must be every facility for quick expansion and equally quick contraction. The latter is fully

as important as the other. If necessary it might be made compulsory by making the tax upon circulation so large that the moment the demand for notes ceased it would be unprofitable for the banks to attempt to force them into circulation, and they would thus be reduced in lawful money and retired. It is scarcely necessary to say that a redeemable bank-note circulation absolutely sure, and perfectly elastic, so as to conform to the varying needs of the country, constitutes an ideal currency. One of its merits raising it, even above gold coin in actual use, is the economy and safety the bank-notes secure in transportation. They can be sent long distances with small expense, and are a most convenient form of money. Even if not made a legal tender in payment of debts they would be universally accepted for such a purpose because of the confidence felt in them. See BANKS AND BANKING; BILLS; COINAGE; DOLLARS; GOLD; MONEY.

Currency Bill of 1900 (15 February), the culmination of the many years' struggle between United States parties over the standard of value; ending in the complete victory of the gold party, 46 to 29 in the Senate on the adoption of the bill. The provisions are: The unit of value to be the gold dollar of 25.8 grains, 9-10 fine; all United States money to be maintained at a parity with it, and all government paper-money to be redeemable in gold. A redemption fund of $150,000,000 to be set apart not to fall below $100,000,000, and if necessary replenished by sale of bonds at not over 3 per cent. As fast as silver dollars are coined, an equal amount of treasury notes to be replaced by silver certificates; gold certificates on certain conditions to be issued against the gold in the treasury. No United States or treasury notes to be of less than $10, nor silver certificates of more than $10. The bonded debt may be refunded in 30-year 2 per cent gold bonds, at not less than par. Any national bank may issue circulating notes up to its paid-up capital, by depositing an equal amount of national bonds.

Current, a flow or stream of a body of water, more or less rapid, by which vessels are compelled to alter or modify their course or velocity, or both, according to the set or drift of the current. Rivers have currents varying in strength, chiefly according to the inclination of the bed down which they flow.

There are currents in the sea vastly broader than any existing even in the largest rivers, while the length is indefinite, for each is so connected with all the rest that the whole surface waters of the ocean resemble a very much curved and contorted chain, which, notwithstanding the excessive irregularity of its figure, so moves as perpetually to return into itself. In the Atlantic the chief currents were long held to be, first, the Gulf Stream, from the Gulf of Mexico in a northeast direction, a branch ultimately reaching the Azores and another the British Islands. This current was counterbalanced by a Polar one moving southwest and carrying escaped icebergs in the direction of America. The Gulf Stream was partly fed by the Equatorial current, running from the coast of Africa to the Caribbean Sea. Dr. Carpenter has shown that not merely the Gulf Stream, but a great part of the surface of the Atlantic, is moving north. An Antarctic drift current originates a great Equatorial current in the Pacific Ocean, which flows north around the west shores of South America, and then west through the Pacific, filling the entire tropics. Strong land currents sweep from it round east Australia, through the China seas, and by the coast of Japan.

The movement of currents from warmer or colder regions, or *vice versa,* modifies the temperature of the several regions through which they pass. Thus the Equatorial current which crosses from Africa to Brazil and the Caribbean Sea, being 3° or 4° cooler than the ocean at the equator, diminishes the heat at the latter region. The Gulf Stream, on the contrary, brings with it heat, the temperature of the Mexican Sea being 7° above that of the Atlantic in the same latitude. Among the causes of currents on a greater or less scale may be enumerated the winds, the tides, the evaporation produced by solar heat in certain places, and the expansion and contraction of water by heat and cold.

The technical language in which the flow of water and its channels are known and described is as follows: The bed is the water-course, having a bottom, and two sides or shores. When the latter are described as right- or left-hand, going down stream is assumed. The transverse section is a vertical plane at right angles to the course of the current. The perimeter is the length of this section in the bed. The longitudinal section or profile is a vertical plane parallel to the course of the flowing water. The slope or declivity is the mean angle of inclination of the surface of the water to the horizon. The fall is the difference in the height at any two points of determinate distance apart, as, for instance, eight inches to the mile. The line of current is the direction of maximum velocity. The mid-channel is the deepest part of the bed. The velocity is greater at the surface than at the bed. The surface is higher in the current than at the shore when the river is rising, lower than at shore when the river is falling. The direction is the set of the current; the rate is the drift of the current. For electric current, see ELECTRICITY.

Current River, a river of Missouri, rising among the Ozark Mountains in the southern central part of the State, flowing southeast and south into the Black River in Arkansas; length 250 miles. It is navigable for the greater part of its length.

Currents, Ocean, are phenomena of the highest importance in practical navigation. They are streams or rivers of the ocean, and, like the rivers of the land, accelerate or retard the course of the mariner according as the vessel's course is with or against the direction of the stream. With extended navigation of the most distant waters of the globe, increasing attention has naturally been bestowed on the subject of currents, with a view not merely to map down their various courses, but also to elucidate the causes to which they owe their origin. Their recognized influence upon the climates of maritime regions — an influence which extends far inland — gives them additional interest as belonging to the subject of physical geography, of which study, indeed, they constitute one of the most important chapters.

Of the various theories which have been framed with a view to account for the existence

of currents, the axial motion of the earth, and the varying densities of the sea under different parallels, have in nearly all cases formed a part. The theory of a circuit maintained between the equatorial and polar waters, due to their varying density, is distinctly stated by Lyell ('Principles of Geology') and by Maury ('Physical Geography of the Sea'). This theory has within a recent period engaged renewed attention, and has undoubtedly received additional strength from the interesting researches of Dr. Carpenter, who, with great ingenuity and by exceedingly simple means, has given experimental confirmation of its sufficiency as a vera causa. Other causes — among them the earth's axial movement from west to east, and the perennial winds of tropical latitudes, combined with the shape of the continents — also operate in the production of the ocean streams, and give special direction to their movements.

Sea water, unlike fresh water, which has its maximum density at a temperature of 39° or 40° F., continues to increase in density down to its freezing-point, about 25° F. The waters within two extensive areas of the globe, that is, the polar regions of either hemisphere, owing to their generally low temperature (which during a large portion of the year exhibits an intensity of cold of which it is difficult to realize an adequate conception, but of which the polar ice and the huge icebergs derived thence are the unfailing evidence), have a density many degrees in excess of that belonging to the waters of the tropical belt. This difference, though subject to some amount of seasonal modification, is yet permanent, since the brief summer heat of high latitudes penetrates but a little way below the surface, and can scarcely affect the mean temperature of the water at even a moderate depth. There is thus, in either hemisphere, an area within which the waters of the ocean are colder, and hence, by many degrees, denser than within the belt of the tropics. The natural result is a tendency of the colder and heavier water to sink, and to diffuse itself over the lower portion of the ocean-bed, and a movement of the warmer and lighter water in the direction of the surface, over which it tends to become diffused. In other words, the colder waters will move beneath the surface in the direction of the equator; and the warmer waters will flow along the surface in the direction of either pole. Hence, in either half of the globe, two great and opposite currents — a cold current flowing from the pole toward the equator, and a warm current flowing from the equator in the direction of the pole. The means by which Dr. Carpenter illustrates this natural movement on the part of fluids, or portions of the same fluid, of various densities, in contact with one another, and with free movement between their various parts, consists simply in placing at one end of a narrow trough of glass, filled with water, a lump of ice, and at the other end a bar of iron, heated by the flame of a spirit lamp. If a few drops of blue coloring liquid be introduced into the colder end of the vessel, and a like quantity of red-colored liquid similarly introduced into the other or warmth-receiving end, so as to render any movement of the water visible, it will be seen that a circuit is gradually produced. The colder and heavier water sinks to the bottom and spreads over it, the warmer and lighter water rises, and diffuses itself over the surface. A circuit or double current is thus formed, which lasts as long as the causes to which the difference of density is due are maintained in operation. This, on a small scale, is exactly what is maintained within the ocean bed of either hemisphere upon a large scale — the heated bar of metal representing the perennial warmth of tropical latitudes, and the lump of ice taking the place of the vast ice-fields and icebergs of polar waters. It is the intense cold by which the latter are occasioned that we must regard as, in the main, the originating cause of currents, though other influences, some of them of high importance, require to be taken into account. Among the latter, the influence exerted by the axial rotation of the globe takes the first place.

The axial rotation of the earth is an eastwardly motion. In virtue of it, everything on the surface of the globe is constantly moving to the eastward. The maximum rapidity of this motion is of course found under the equator, a circle which measures 25,000 miles, and the complete rotation of which within 24 hours is equivalent, in the case of any particular spot, to a rate of above 1,000 miles an hour. The actual rate of eastwardly motion becomes continually diminished with the diminishing magnitude of the successive parallels of latitude. Under the parallel of 60°, for example, a circle of only 12,000 miles, or half the measure of the equator, is carried round within the same period of 24 hours — giving to any particular spot on it a rate of only 500 miles per hour. At the pole itself axial motion vanishes. But persistence in motion is a well-known law of nature. Velocity of motion in any given direction is only gradually lost, as any increase in its amount is capable only of gradual acquisition. The maximum of eastwardly tendency proper to the waters of tropical seas is maintained, or but gradually lessened, in the course of their advance in the direction of the pole, and the result must be, in the case of the northern hemisphere, a northeastwardly direction; in the southern half of the globe, a southeastwardly direction. That is, the movement of tropical waters toward the pole, which, were the earth at rest, would be a movement, in the one hemisphere, from south to north, in the other from north to south, is deflected to the eastward of the meridian. In other words, the warm current which advances from the tropical belt in the direction of the pole only gradually loses its excess of eastwardly motion; hence, deflected to the eastward of the meridian, it becomes in the northern hemisphere a northeastwardly current, and as such is directed toward the western shores of Europe, and to the western shores of the New World within similar latitudes. In the southern hemisphere the like condition produces a southeastwardly current, instead of one flowing due south.

Under the operation of the same laws the streams that set out from polar latitudes in the direction of the equator, failing to acquire, or only gradually acquiring, the increasing rate of axial or eastwardly motion which belongs to the lower parallels toward which they are advancing, continually fall to the westward of the meridian. The actual direction of their movement is hence, in the northern hemisphere, to the westward of south — that is, the polar current becomes a southwesterly current, and meets the easterly shores of the continent toward which it is directed — the shores, namely,

of eastern Asia and the eastern side of the American continent. In the southern hemisphere the correspondent stream becomes a northwesterly instead of a northerly current. Proof that such is the actual direction of the great ocean streams is afforded by the fact of the productions of the torrid zone (tropical fruits, etc.) being continually thrown upon the coasts of western Europe, and by the vast icebergs — the produce of glaciers which overhang the waters of Baffin Bay and the Greenland Sea — carried toward the Atlantic coasts of the New World. The deep-sea currents of either ocean may thus, with great probability, be traced to an origin in polar or tropical waters respectively, and are to be classed under the head of cold or warm current accordingly. But the varying depths of the ocean-bed, and yet more the shapes of the land, materially modify, in many cases, the direction of their streams.

A distinction, however, must be drawn between deep-sea currents and surface or drift currents. It is probable that the latter owe their origin chiefly, if not wholly, to the action of the winds, which, within certain well-defined areas, are either perennial or seasonal. The belts of the Atlantic and Pacific over which the trade-winds blow are also those within which the westward-going or equatorial currents of those oceans are experienced. It is to the constant drift of surface-water to the westward, under the influence of the trade-wind, that the Equatorial Current of the Atlantic, and the similar Equatorial Current of the Pacific Ocean, are due. Within that portion of the Indian Ocean over which a perennial wind, correspondent in direction to the trade-winds of the Atlantic and Pacific, is experienced, that is, to the southward of the parallel of 5° or 6° south latitude, a like westward-setting current is found. In the northwardly half of the same basin — that is, within the monsoon-area of the Indian Ocean, and also within the like area of the China and adjacent seas — the currents undergo a like change of direction to the monsoons themselves.

The equatorial currents, with the counter-streams to which, under the influence of obstructions presented by the land, they give origin, are among the most important phenomena of the globe's surface. In the case of the Atlantic Ocean, the western limit of which is formed by a continuous mainland, unbroken through 110° of the meridian (from the entrance of Hudson Bay to the Strait of Magellan), or upward of 7,000 miles, the obstacle to further westwardly progress of the intra-tropical waters gives origin, there can be little doubt, to the Gulf Stream within its northwardly half, and to the Brazil current under its more southern parallels. The westward moving waters, encountering the eastward extension of the South American mainland, become of necessity divided into two streams, the one of which sets to the southward along the eastern coasts of Brazil, while the other advances along the more northwardly portions of the South American terra firma, past the outlets of the Amazons and the Orinoco, and thence into the Caribbean Sea. From the latter land-enclosed basin its course is necessarily into the similarly shut-in basin of the Mexican Gulf, whence it finally emerges through the narrow channel of Florida as the well-known Gulf Stream. The origin thus attributed to this famous current is in harmony with recognized laws relating to the movement of fluids acted on by a persistent force (such as the trade-winds supply), and under the influence of any opposing obstacle to farther advance in a given direction. In the case of the Pacific Ocean there exists no such complete obstruction to the westwardly progress of the equatorial waters, since the islands of the Malay Archipelago take the place which within correspondent parallels of the Atlantic is occupied by an unbroken line of coast. A portion of its equatorial stream, however, is deflected to the northward toward the coasts of Japan (where it forms the well-known Japan Stream, setting to the northeastward, past the Kuriles, in the direction of the Aleutian Islands), while another portion turns southwardly in the direction of Australia and New Zealand. In like manner, that portion of the Indian Ocean where alone a westwardly motion is constant — that is, the southern half of its basin — gives origin to a stream which, setting along the eastern shores of Madagascar and past the entrance of the Mozambique Channel, forms the initial portion of the Lagullas or Agulhas current. This latter sets in part round the headland whence its name is derived, carrying some of the waters of the Indian Ocean into the Atlantic; but a large portion of its waters (probably the larger), deflected by the extensive submarine elevation of the Agulhas Bank, returns into the Indian Ocean, forming part of a general eastwardly drift, within higher latitudes, in the direction of Australia.

Geographers were long led to entertain (and some still entertain) what seems to us a very exaggerated estimate of the results due to the one of them to which reference is most frequently made, namely, the "Gulf Stream." Recent observation and measurement have materially diminished this estimate. As a local current, however, the Gulf Stream is undoubtedly of high importance, and within certain limits it is one of the most powerful of currents. The initial portion of its stream has been already traced. From its issue through the Florida Channel the course of the Gulf Stream is to the north and eastward, in a direction parallel to the coast-line of the United States, past Cape Hatteras (lat. 35° 13′), and along the southern edge of the "great banks" of Nantucket and Newfoundland (between the meridians of 48° and 60° west of Greenwich), beyond which its existence as a distinct current cannot be traced, the farther course of its waters being absorbed in the general northeastwardly movement of the Atlantic, as described above.

Throughout the earlier portion of its course, and especially within its narrowest section, between the mainland of Florida and the little group of the Bemini Islands (lat. 25° 40′; lon. 75° 15′), the Gulf Stream constitutes a well-defined channel, the water of which is distinguished from that of the ocean upon either side, alike by its higher temperature and by its deep blue color. The difference of temperature is more marked by comparison with the coast-water — that is, the channel lying between the Gulf Stream itself and the shore line of the United States — than with the open sea to the eastward of its course; a consequence of the fact that a belt of cold water, derived from

the Polar or Baffin Bay current, and setting in the opposite direction to the Gulf Stream itself, flows side by side with the warmer current immediately along the mainland. The difference of temperature between the water of the Gulf Stream and that of the adjacent cold current on its inland side amounts at some seasons to as much as 20° (or even 30°) F. This maximum difference of temperature, however, is perceptibly lessened after the current has passed the parallel of Cape Hatteras, and is gradually diminished in its farther course to the northeastward. The warm waters of the Gulf Stream and the cold waters of the Greenland or Baffin Bay current, interlace off the "great bank" of Newfoundland, before reaching which the former has already so greatly diminished in depth as to have again become, what we regard it as having been in its origin, a mere surface-drift.

The velocity of the Gulf Stream is naturally greatest within the earlier and narrower portion of its course, that is, within the Strait of Florida, where it is equivalent to a mean of about 65 miles per day. This diminishes to 56 miles off Charleston, 36 to 46 miles off Nantucket, and 28 miles to the south of the Newfoundland Banks. The high temperature of its waters, even within its narrower and more strongly marked portion, is not maintained to the bottom of its channel, but is proved to give place at less than half its total depth to a much lower temperature. The observed temperature of the sea at the bottom of Florida Channel — that is, within the most powerful portion of the Gulf Stream — is only 34°, while the surface temperature varies between 80° and 84°! So greatly has popular belief, based upon scientific theories formed in the absence of observation, exaggerated the distinguishing conditions of this famous current. The Gulf Stream is undoubtedly of great importance as a local current, and plays its part in the general circuit of the North Atlantic waters. A general surface-drift to the eastward, in the direction of the African continent, is traceable between the parallels of 30° and 35°, its limits undergoing some variation with the seasons. This constitutes a return or counter movement to the westwardly drift of the equatorial Atlantic, and, combined with a southwardly set of the waters off the western coast of Africa, involves a general circuit of waters round a vast area of the North Atlantic Ocean, within which area are found the masses of floating weed known as the sargasso or gulf-weed. As to the supposed direct influence of the Gulf Stream upon the climate of western Europe, it may, we conceive, be safely dismissed as belonging to the realm of fancy. Indirectly, the warmth-giving influence of this famous current, such as it is, harmonizes with the more extended results due to the general set of the tropical waters in the direction of Europe. But the supposition that a narrow (and at the same time shallow) current, such as the Gulf Stream is proved, by direct observation, to be, can impart any appreciable warmth to the shores of western and northwestern Europe — nay, even (as the advocates of such a theory insist to be the case) to the waters that wash the shores of Nova Zembla and the Arctic coasts of Europe and Asia, and that after a course of some thousands of miles across an open expanse of ocean — seems to us quite at variance with probability, besides its inconsistency with known laws respecting the temperature of fluids in motion. The few degrees of superior heat that belong to the Gulf Stream after it has passed Cape Hatteras must be lost long before the mid-ocean is reached.

In the attempt to frame a theory which accounts satisfactorily for the existence and general movements of ocean currents, the many local conditions which affect particular parts of the sea can receive but the briefest reference. Tidal currents, due to the local ebb and flow, as experienced in narrow seas, are of distinct origin. See OCEAN.

Cur'rie, Lady Mary Montgomerie Lamb Singleton ("VIOLET FANE"), English poet and miscellaneous writer. She was married in 1864 to Henry Sydenham Singleton, who died in 1893, and in 1894 to the 1st Baron Currie. Her books, published under the pseudonym of "Violet Fane," are: 'From Dawn to Noon' (1872); 'Denzil Place' (1875); 'The Queen of the Fairies' (1877); 'The Edwin and Angelina Papers' (1878); 'Collected Verses' (1880); 'Sophy, or the Adventures of a Savage' (1881); 'Thro' Love and War' (1886); 'Autumn Songs' (1889); 'The Story of Helen Davenant' (1889); 'Memoirs of Marguerite de Valois, Queen of Navarre' (1892); 'Under Cross and Crescent' (1896); 'Betwixt the Seas' (1899); 'Two Moods of a Man' (1901); 'Constance's Fate.'

Cur'rier, Charles Warren, American Roman Catholic clergyman: b. St. Thomas, West Indies, 22 March 1857. He studied in Holland chiefly philosophy and theology 1871–80; was ordained in 1880; lived in Surinam as a missionary 1881–2; and became pastor of St. Mary's, Washington, D. C., 1900. His published works are: 'Carmel in America' (1890); 'History of Religious Orders' (1894); 'Church and Saints' (1897); 'The Divinity of Christ' (1898); 'The Mass' (1899); and several historical romances.

Curry, Daniel, American Methodist clergyman: b. near Peekskill, N. Y., 26 Nov. 1809; d. New York 17 Aug. 1887. He was graduated at Wesleyan University in 1837, and after holding various pastorates and professorships, was chosen president of Indiana Asbury University in 1854. Ten years later he became editor of 'The Christian Advocate,' and in 1884 editor of the 'Quarterly Review.' He published 'Life of Wiclif' (1846); 'Platform Papers' (1880), etc.

Curry, Jabez Lamar Monroe, American educator and diplomat: b. Lincoln County, Ga., 5 June 1825; d. Asheville, N. C., 12 Feb. 1903. He was graduated at the University of Georgia in 1843 and at Harvard Law School in 1845. He became a Baptist minister, served in the Confederate army; was president of Howard College 1866–8; and in 1881 was appointed general agent of the Peabody Educational Fund and later also of the Slater Educational Funds. He was minister to Spain 1885–9, and special ambassador from the United States at the coronation of King Alfonso XIII. of Spain, 17 May 1902. He published: 'Constitutional Government in Spain' (1889); 'William Ewart Gladstone: a Study' (1891).

Curry, Samuel Silas, American educator: b. Chatata, Tenn., 1847. He was graduated at

Grant University 1872; has attained a wide reputation as a teacher of oratory and elocution, and has been connected in a teaching capacity with Boston University, Newton Theological Seminary, Harvard Divinity School, and the Yale Divinity School. He founded and is the head of a school of expression in Boston, Mass. His publications are: 'Province of Expression' (1891); 'Lessons in Vocal Expression' (1895); 'Imagination and Dramatic Instinct' (1896).

Curry Powder, an Eastern condiment, composed of cayenne pepper, coriander, ginger, turmeric, and other strong spices. The curry paste has a large proportion of tamarind.

Cursor, Lucius Papirius, Roman general. He commanded the Roman legion in the second Samnite war, near the end of the 4th century B.C.; was on two occasions made dictator, and was consul five times.

Cursores, kẽr'sō-rēz, or **Runners,** an order of birds, which includes the ostrich, rhea, emu, cassowary, and apteryx. The birds of this order are distinguished by the rudimentary character of their wings, which are too short to be of use for flight, and by the length and strength of their legs. The breastbone is destitute of the ridge or keel which it possesses in most birds. The hind toe is wanting in all except the apteryx, in which it is rudimentary; the anterior toes are two or three in number. The barbs of the feathers are disconnected, and present a considerable resemblance to hairs. The order has been divided into the two families — *Struthionidæ* and *Apterygidæ,* the latter of which includes only the apteryx of New Zealand. Some gigantic members of this order, such as the dinornis, lived on the earth in former times, and their remains have been found in a fossil state.

Curtin, Andrew Gregg, American politician: b. Bellefonte, Pa., 22 April 1815; d. there 7 Oct. 1894. He studied law at Dickinson College, and was admitted to the bar in 1839. Entering politics, he became secretary of the commonwealth of Pennsylvania in 1854, governor in 1860, and again in 1863, being one of the most noted "war governors" of the Civil War period. In 1869 he was appointed minister to Russia. In 1873 he left the Republican party, and from 1881 to 1887 sat in Congress as a Democrat.

Curtin, Jeremiah, American linguist and antiquarian: b. Milwaukee, Wis., 1838. He has written: 'Myths and Folklore of Ireland'; 'Tales of the Fairies and the Ghost World'; 'Myths and Folk-Tales of the Russians, Western Slavs, and Magyars'; 'Hero Tales of Ireland'; etc. He has translated much from Russian and Polish, and is widely known by his translations from the latter language of the novels of Sienkiewicz.

Curtis, Benjamin Robbins, American jurist: b. Watertown, Mass., 4 Nov. 1809; d. Newport, R. I., 15 Sept. 1874. He was graduated at Harvard 1829; was admitted to the bar 1832, and rose rapidly to the height of his profession in Boston, Mass. He was appointed to the United States Supreme Court 1851, and in the famous Dred Scott case made a powerful argument dissenting from the court's decision. Resigning in 1857 he was a member of the State legislature for two years; and in 1868 one of the counsel for the defense in the impeachment trial of Andrew Johnson. His writings include: 'Reports of Cases in the Circuit Courts of the United States' (1854); 'Decisions of the Supreme Court of the United States, with notes and a digest'; 'Jurisdiction, Practice, and Peculiar Jurisdiction of the Courts of the United States' (1880). Consult 'Memoir and Writings' (1880).

Curtis, Caroline Gardiner Cary ("CARROLL WINCHESTER"), American novelist: b. New York 1827. She has written: 'From Madge to Margaret' (1880); 'The Love of a Lifetime' (1883).

Curtis, Edward, American medical scientist: b. Providence, R. I., 4 June 1838. He is a brother of G. W. Curtis (q.v.). He was graduated at Harvard in 1859, and took his medical degree at the University of Pennsylvania in 1864. He was an army surgeon during the Civil War and since 1866 has been a member of the faculty of the College of Physicians and Surgeons in New York. He has made a specialty of microscopic study and the camera in connection with diagnosis, and has published a 'Manual of General Medicinal Technology' (1883).

Curtis, George Ticknor, American lawyer: b. Watertown, Mass., 28 Nov. 1812; d. New York 28 March 1894. He was a brother of B. R. Curtis (q.v.). In addition to his eminence at the New York bar he was noted as the author of an authoritative 'History of the Constitution of the United States.' He published likewise: 'Digest of English and American Admiralty Decisions'; 'American Conveyancer'; 'Life of James Buchanan'; 'Life of Daniel Webster'; 'Creation or Evolution'; and 'John Charaxes,' a novel.

Curtis, George William, American essayist and journalist: b. Providence, R. I., 24 Feb. 1824; d. New Brighton, Staten Island, N. Y., 31 Aug. 1892. At 18 he spent some months at Brook Farm (q.v.), and a few years later visited the Old World, the results of his travels appearing in 'Nile Notes of a Howadji' (1851); and 'The Howadji in Syria' (1852). He was an early sympathizer with the abolition movement and as the editor of 'Harper's Weekly' for nearly a generation, exercised a measurable influence over the more thoughtful of his countrymen. At an earlier period he was editor of 'Putnam's Magazine,' which did not prove a financial success, and for many years thereafter he devoted the proceeds of his lecture tours to paying off the obligations incurred in relation to that enterprise. From 1854, till not long before his death, he edited the "Easy Chair" department of 'Harper's Magazine,' and it is by his "Easy Chair" essays that he is likely to be longest remembered. In these are displayed a gentle persuasiveness of argument, and a fund of humor which made them very attractive reading, while the style was at all times polished and graceful. In them he touched upon the varied topics of the day, the lighter as well as the more serious, and since his death several small volumes of selections from them have been published. He was one of the leaders of the Republican party at its outset and in his later years was conspicuous as an advocate of civil service reform and of independent action in politics. As a lecturer and orator he was

very popular, and several of his political speeches and orations upon special occasions take high rank among specimens of American oratory. Beside the volumes already named he published: 'Lotus Eating' (1852); 'The Potiphar Papers' (1853); 'Prue and I' (1856); 'Trumps' (1862). These are more or less ephemeral in their nature, 'Prue and I' being the only work among them which interests the present generation. His 'Orations and Addresses,' edited by C. E. Norton, appeared (1893–4). Consult Cary, 'George William Curtis' (1894).

Curtis, Mattoon Monroe, American educator: b. Rome, N. Y., 19 Oct. 1858. He was graduated at Hamilton College, N. Y., 1880, and from the Union Theological Seminary 1883. He was pastor of a Presbyterian church at Cleveland, Ohio, 1885–8, and in 1891 was elected Handy professor of philosophy in the Western Reserve University. He has published: 'Locke's Ethics'; 'Philosophy and Physical Science'; 'Philosophy in America'; etc.

Curtis, Samuel Ryan, American soldier: b. near Champlain, N. Y., 3 Feb. 1807; d. Council Bluffs, Iowa, 26 Dec. 1866. He was graduated at West Point 1831; served as colonel in the Mexican war, and was a Republican congressman from his State 1857–61. He was commissioned a brigadier-general 17 May 1861; defeated Gens. Price and McCulloch in a decisive engagement at Pea Ridge, Ark., and was promoted major-general 21 March 1862.

Curtis, William Eleroy, American journalist: b. Akron, Ohio, 5 Nov. 1850. He has written: 'Children of the Sun' (1882); 'Capitals of Spanish America' (1888); 'The Land of the Nihilist' (1888); 'Japan Sketches'; 'Venezuela' (1891); 'Life of Zachariah Chandler'; 'The Yankees of the East' (1896); 'To-day in France and Germany' (1897); 'Between the Andes and the Ocean' (1900); etc. He was director of the Bureau of American Republics 1890–3, and chief of the Latin-American department and historical section of the World's Columbian Exposition 1891–3.

Curtiss, Samuel Ives, American Congregational clergyman: b. Union, Conn., 5 Feb. 1844. He was graduated at Amherst College 1867, and the Union Theological Seminary 1870; and was pastor of the American chapel in Leipsic 1874–8. In 1878 he was appointed professor of biblical literature in Chicago Theological Seminary, but changed later to the chair of Old Testament literature and interpretation. His publications include: A translation of Bickell's 'Outlines of Hebrew Grammar' (1877); 'The Levitical Priests' (1877); translations of Delitzsch's 'Messianic Prophecies' (1880; 1891); and of his 'Old Testament History of Redemption' (1881); 'Franz Delitzsch' (1890); 'Ezekiel and His Times' (in 'The Bible as Literature' 1896); etc.

Curtius, koor'tsē-oos, **Ernst,** German Hellenist: b. Lübeck 2 Sept. 1814; d. Berlin 12 July 1896. He was educated at Göttingen, Bonn, and Berlin, and in 1856 succeeded Hermann as professor at Göttingen, and in 1868 was called to Berlin University. He made several journeys to places of archæological interest in Greece and Asia Minor. Of his works, which mostly relate to Greek antiquities, the best known is his 'History of Greece' (1857–61), translated into English by A. W. Ward (1868–73). Other works by him are: 'De Portibus Athenarum' (1842); 'Klassische Studien' (1840); 'Inscriptiones Atticæ XII.' (1848); 'Olympia' (1852); 'Die Ionier' (1855); 'Peloponnesos' (1851–2). A series of lectures was published by him under the title of 'Altertum und Gegenwart.'

Curtius, Georg, gā'ōrg, German philologist: b. Lübeck 16 April 1820; d. Hermsdorf 12 Aug. 1885. He was a brother of Ernst Curtius (q.v.), and in 1849 went to Prague as professor of classical philology, removing five years later to the corresponding chair at Kiel. In 1861 he became professor in Leipsic University, and held this post till his death. His earliest work was 'De Nominum Græcorum Formatione' (1842); and among many important later ones are: 'Grundzüge der Griechischen Etymologie' (1858–62), his *chef d'œuvre* translated into English by Wilkins and England; 'Zur Chronologie der Indogermanischen Sprachforschung' (1867); 'Das Verbum der Griechischen Sprache' (1873 and 1876); and 'Griechische Schulgrammatik' (1852), the last two having been translated for English students.

Curtius, kėr'shĭ ŭs, **Marcus,** Roman legendary hero, who, according to tradition, sacrificed himself for the good of his country. In 362 B.C. it is said a chasm opened in the Roman forum, from which issued pestilential vapors. The oracle declared that the chasm would close whenever that which constituted the glory of Rome should be thrown into it. Curtius asked if anything in Rome was more precious than arms and valor; and being answered in the negative, arrayed himself in armor, mounted a horse splendidly equipped, solemnly devoted himself to death in presence of the Roman people, and sprang into the abyss, which instantly closed over him.

Curtius, Rufus Quintus, Roman historian. He wrote the history of Alexander the Great in 10 books, the first two of which are lost. The exact period in which he flourished is not known; for though his style would indicate that he lived in one of the best periods of the Latin language, no writer of any earlier date than the 12th century has made any mention of his work.

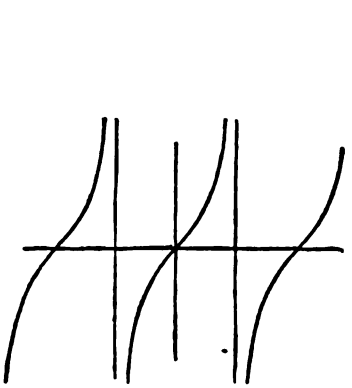
Curtius, Theodor, tā'ō-dōr koor'tsē-oos, German chemist: b. Duisberg 27 May 1857. He studied at Leipsic, Heidelberg, and Munich; in 1886 was lecturer at the University of Erlangen; in 1889 became professor of chemistry at Kiel, and in 1897 at the University of Heidelberg. He investigated the diazo- compounds of the fats, and discovered hydrazine and hydrazoic acid, both compounds of nitrogen.

Curule Magistrates were the highest dignitaries of the Roman state, and distinguished from all others by enjoying the privilege of sitting on ivory chairs (*sellæ curules*) when engaged in their public functions. The curule magistrates were the consuls, prætors, censors, and chief ædiles, who, to distinguish them from the plebeian ædiles, were curule.

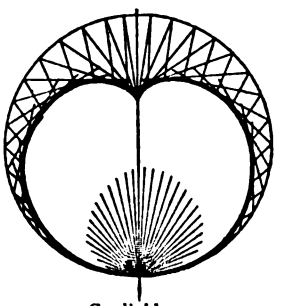
Curves, lines formed by a moving point which continually changes its direction in contradistinction to a straight line. A curve which lies wholly in a plane is called a plane curve or curve of simple curvature; but when a curve lies partially outside of a plane it is called a curve of double curvature or a skew, tortuous or twisted curve. Ordinary curves

can be defined as geometrical loci, by a prescribed kinematic movement of a point or a line, according to the methods of analytic geometry, by an equation between co-ordinates, as the intersection of a plane by an irregular surface. The ellipse for example can be represented in all four of these methods: as the geometrical locus of all points for which the sum of the distances of two given points — the foci — is constant. Kinematically by an ellipsograph or oval; by an equation of the second rank, and by the section of a cone by a plane.

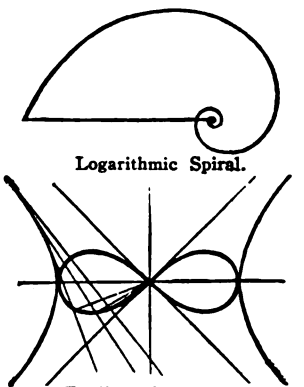
The consideration of curves as geometrical loci is based on the principles of the geometry of Euclid and is the most ancient method of studying curves and discovering new kinds. Far more fruitful and speedy in their results are the methods of analytical geometry, the science of which was established by Descartes in 1637, especially through the use of the differential and integral calculus. In this way the peculiarities of curves may be investigated on purely mathematical methods, and on the other hand the analytical geometry of the theory of functions offers a means of establishing the functions as curves and thereby giving a clear image of their course. According to the nature of the equation on which they are based, curves are called algebraic, containing powers of x and y, or transcendental, where they involve logarithms. Algebraic curves are distinguished according to the rank or order of the equation. Thus, we have curves of the second rank or conic sections, of the third rank or cubic curves, of which there are many varieties, including Newton's foliate or 41st species, and the fourth rank or quartic, and so on. The analytic investigation of a curve is especially directed toward the characteristics of its tangents and normals, toward its point of osculation as well as toward its asymptotes and its peculiar points or singularities. Curves can be likewise defined according as one prescribes their tangents or normals or the characteristics of their curvation from which the equation of the curve is deduced. A frequently recurrent condition of curves is that they are regarded as inclusive of their tangents whereby, for example, the caustic curve, the trajectories and tractories are found. Also through investigation of the nadircurves and the evolutes arise many forms of curves and relations among well-known kinds. The number of points in which a curve of any order in general is drawn is called its rank; the number of tangents which in general may be drawn from any given point to a curve is called its class. Be-



Curve of Tangents.

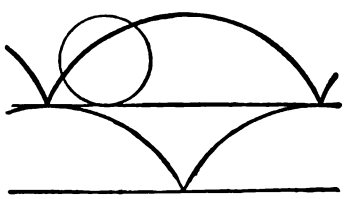


Cardioide.

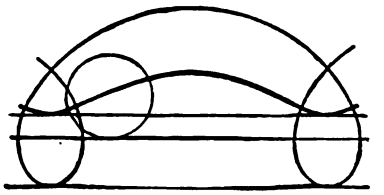


Logarithmic Spiral.

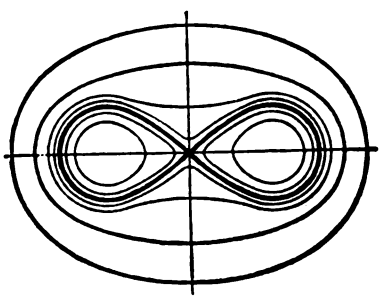
Equilateral Curves.



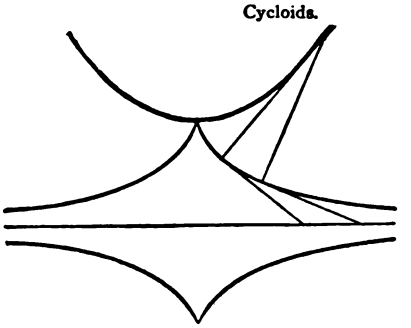
Cycloid.



Cycloids.

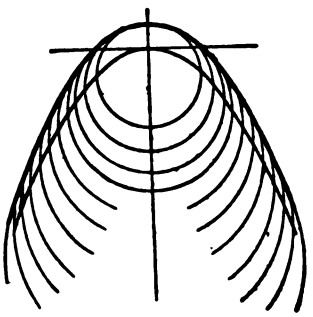


Cassinian Oval.

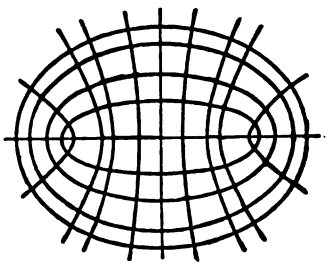


Tractrix.

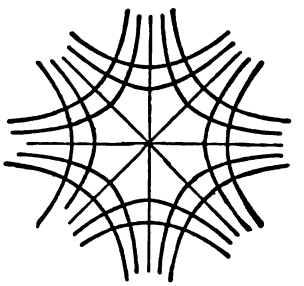
tween rank, class, and the number of their distinguished points and tangents, double points, return points, double tangents, periodic tangents, come a series of continuously valid relations, the Plücker's Formulas. For example, every curve of the third rank without double point is of the sixth class, with double point is of the 4th class, with return point of the third class. Besides the analytical methods for the investigation of curves there are the more recent synthetic methods devised especially by Poncelet, Steiner, and Staudt. Projection



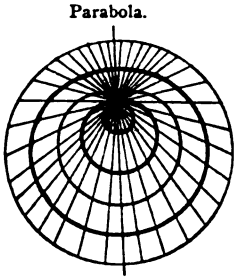
Parabola.



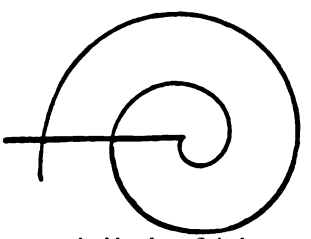
Confocal Curves.



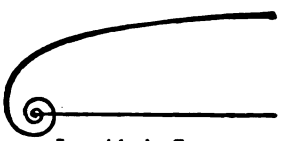
Trajectory.



Pascal's Volute.

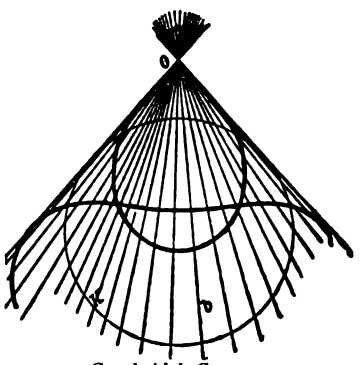


Archimedean Spiral.



Logarithmic Curve.

Lituus.



Conchoidal Curves.

Conchoidal Curves.

geometry has proved of great use in the investigation of cones. For description and illustration of the principal curves, see their respective titles.

GEORGE ALBERT WENTWORTH,
Prof. Mathematics, Phillips-Exeter Academy.

Curves, Magnetic. The lines in which iron-filings arrange themselves under the influence of magnetism are called magnetic curves. To exhibit them a sheet of smooth paper is stretched over the magnet or magnets to be employed, and fine iron-filings are carefully and uniformly scattered over it. It is then gently tapped, so as to toss the iron-filings a little from place to place, and the filings will be seen to arrange themselves in beautiful curves, which indicate the direction of the lines of magnetic force. The study of these curves is interesting and instructive. It is the easiest and simplest way of exhibiting lines of force to the eye. The curves may be made permanent by forming them on paper glazed with a thin coating of gum or other soluble size, and when the filings have taken their proper positions, exposing them to the steam of a kettle so as to dissolve the gum and allow the filings to sink into it.

Curwen, kėr'wĕn, **John,** English musical educator: b. Heckmondwike, Yorkshire, 14 Nov. 1816; d. Heaton, Mersey, England, 26 May 1880. He became a minister of the Independent body, being in 1844 elected pastor at Plaistow, Essex. Here he developed and promoted the Tonic Sol-fa method, and brought the system still more before public attention by the publication of his 'Grammar of Music' and 'Lessons in Music' in 'Cassell's Popular Educator.'

In 1853 he established the Tonic Sol-fa Association, and in 1862 the Tonic Sol-fa College. He published, among other works connected with the system, the 'Child's Own Hymn-Book'; 'The Standard Course of the Tonic Sol-fa Method'; 'How to Observe Harmony.'

Curwen, John Spencer, English musical writer: b. Plaistow, Essex, 30 Sept. 1847. He is a son of John Curwen (q.v.), and has been editor of the 'Musical Herald' from 1866. He was educated at the Royal Academy of Music, becoming president of the Tonic Sol-fa College in 1880, and has traveled much in Europe and America investigating the subject of music in schools. He has published: 'Studies in Worship Music'; 'Memorials of John Curwen'; 'The Boy's Voice'; 'School Music Abroad'; 'Music at the Queen's Accession.'

Curzola, koor'dzō-lä, Austria, the most beautiful of the Dalmatian islands, in the Adriatic, stretching west to east about 25 miles, with an average breadth of four miles; area, 85 square miles. It is covered in many places with magnificent timber. The fisheries are very productive.

Curzon, George Nathaniel (BARON CURZON OF KEDLESTON), English viceroy in India: b. Kedleston 11 Jan. 1859. He was educated at Eton and Balliol College, Oxford; became assistant private secretary to the Marquis of Salisbury in 1885, and next year was elected member of Parliament for the Southport division of Lancashire, which he represented till 1898. He was under-secretary for India in 1892, and in 1895 became under-secretary of state for foreign affairs. In 1898 he was appointed viceroy of India, and at the same time created a peer (in the Irish peerage) by the style of Baron Curzon of Kedleston. He married in 1895, Miss Mary Leiter of Chicago. His published works are: 'Russia in Central Asia in 1889 and the Anglo-Russian Question' (1889); 'Persia and the Persian Question' (1892); 'Problems of the Far East; Japan — Corea — China' (1894). As viceroy his aim throughout has been to get rid of red tape and reduce to a minimum the minute and report writing, and run the railways, the post and telegraph services and other large government monopolies in accord with the needs and spirit of the age.

Cusa, koo'sä, or **Cusanus, Nikolaus** (originally **Nikolas Chrypffs,** or **Krebs**), German ecclesiastic: b. Kues, near Treves, 1401; d. Todi, Umbria, Italy, 11 Aug. 1464. As archdeacon of Liège he took the anti-papal side at the Council of Basel; but was ultimately bishop of Brixen in Tyrol, cardinal, and papal legate to Constantinople. He exposed the false Isidorian decretals, denounced perverted scholasticism in 'De Docta Ignorantia,' taught that the earth went round the sun, and in the pantheistic tendencies of his philosophy was a precursor of Giordano Bruno.

Cusack, Mary Frances, Irish writer: better known as the NUN OF KENMARE: b. Dublin 6 May 1820; d. 7 June 1899. Originally a Protestant she became a Roman Catholic, and joined the Poor Clares, one of the sisterhoods of Saint Francis, and for 23 years conducted a convent of the order at Kenmare. The object of the Poor Clares was the saving of poor and friendless girls, and making them self-supporting. Her success in this work made her known to the whole Christian world, and when in 1884 she established the Sisters of Peace, an order similar to the Poor Clares, but with a wider range, not only did Leo XIII. sanction the work, but she received the hearty support of Christians, both Catholic and Protestant. She visited the United States in 1886. Among her many published books are: 'Student's History of Ireland'; 'Woman's Work in Modern Society'; 'The Pilgrim's Way to Heaven'; 'Jesus and Jerusalem'; lives of Saint Patrick, Daniel O'Connell, etc.

Cuscatlán, Salvador, a department bounded on the north by the departments of Chalatenango and Cabañas, on the east by the same departments and San Vicente; on the south by San Vicente and La Paz, and on the west by the department of San Salvador. The greater part of its surface is covered by lofty mountain ranges separated by narrow valleys; toward the north and northeast, however, near the Cuezalapa and Lempa rivers, there are comparatively level districts. The department was formed in 1835, and was originally much more extensive than it is at present (that is, 1,078 square miles), including until 1855 all of the Chalatenango region, and until 1875 a portion of what is now Cabañas. It is an agricultural country, the chief products being coffee, sugar, indigo, rice, tobacco, starch, cheese, and cereals. Twice each year the people gather from all parts, in Cojutepeque at the Feast of Saint John, 29 August, and at Suchitoto, 8 December, to exchange native products for foreign merchandise. The capital, Cojutepeque (pop. about 8,000), is situated near the summit of an extinct volcano, 2,614 feet above sea-level. It was referred to as an "old town" in 1756. Its streets are narrow and crooked, but the suburbs are beautiful. It has a town-hall, hospital, public school, four churches, public baths, etc. There are 17 towns in the department, the more important being Suchitoto, San Pedro, Perulapán, Tenancingo, San Rafael, and Guayabal. Pop. (1901) 72,000.

Cusco-bark, or **Cuzco-bark,** the bark of *Cinchona pubescens,* which comes from Cuzco, in South America, and is exported from Arequipa. It contains a peculiar alkaloid called cusco-cinchonine, or cusconine, which resembles cinchonine in its physical qualities, but differs from it in its chemical properties. When applied medicinally it excites warmth in the system, and is therefore recommended in cold intermittents and low typhoid states.

Cuscus, kŭs'kŭs, a marsupial native to the islands of the Australian group and New Guinea. It is generally about the size of a house cat; has a small head, large eyes, and a dense coat of fur, often pure white irregularly flecked with black, though this is variable. It moves slowly, and is therefore easily caught by the natives, who eat its flesh. In these sparsely populated islands, man is not a dangerous foe, and protected by its dense pelt from predatory birds it is saved from extermination. There are several distinct species. The food of all seems to be generally leaves and fruit, together with birds and other small animals. They frequent only forests of large trees, often swinging themselves from bough to bough by their long prehensile tails. They belong to the family of the phalangers (q.v.); and the genus *Cuscus* embraces a number of species, differing in habi-

tat and color. The best-known species perhaps is *Cuscus orientalis.*

Cuscuta'ceæ. See DODDER.

Cush, kŭsh, in the Old Testament, the eldest son of Ham, also a country frequently mentioned. Cush, as a country, appears to be African in most passages, and it is generally believed that the country intended can be no other than the region in Africa, south of Egypt, in ancient times designated more or less loosely as Ethiopia, and corresponding to the modern Nubia and northern Abyssinia. That it adjoined Egypt is shown by the passage in Ezekiel which states that the desolation of Egypt is to extend "from the tower of Syene unto the border of Cush." In a number of passages, also Cush, or its inhabitants, is mentioned in connection with Egypt. Cushites, for example, came out of Egypt with Shishak against Jerusalem. In other places again it is evident that the name Cush must be understood as referring to some part of Arabia. That several localities should be called by the same name may be explained by the frequent migrations of the early nations, who would give their own name to the countries into which they successively arrived.

Cushew-bird, kŭsh'ō-bĕrd, another name for the galeate curassow. See CURASSOW.

Cushing, kŭsh'ĭng, **Caleb,** American jurist and diplomatist: b. Salisbury, Mass., 17 Jan. 1800; d. Newburyport, Mass., 2 Jan. 1879. His intellectual abilities manifested themselves early. He entered Harvard College at 13 and was graduated in 1817. He then studied law, was admitted to the bar at 22 and soon acquired an extensive practice, standing with Rufus Choate (q.v.) at the head of the Essex bar. He was a member of Congress 1835–43, and in the last-named year having left the Whig party, was appointed by President Tyler United States commissioner to China. He was an enthusiastic supporter of the Mexican war, raising a regiment and accompanying it to Mexico, for which he was promoted to the rank of brigadier-general. He was attorney-general of the United States 1853–7, and was president of the Democratic Convention in Charleston, S. C., in April 1860. During the Civil War period he was several times employed on confidential missions by President Lincoln and the heads of departments, and in 1868 was sent to Bogotá to settle a diplomatic difficulty, which he did successfully. In 1866 he was member of a commission to revise and codify the laws of Congress; he was appointed counsel before the Geneva Arbitration Tribune 1871–2; and was minister to Spain 1874–7. His legal decisions were distinguished both for sagacity and professional erudition. He filled a large place in the political history of his time, but the services which he performed for his country are scarcely remembered now. It should not be forgotten, however, that he negotiated the first American treaty with China, while as member of the Massachusetts legislature for several terms, and mayor of Newburyport, he did good service to his State and city. He published: 'Practical Principles of Political Economy' (1826); 'History of Newburyport' (1826); 'Historical and Political Review of the Late Revolution in France' (1833); 'Reminiscences of Spain' (1833); 'Growth and Territorial Progress of the United States' (1839); 'Life of William Henry Harrison' (1840).

Cushing, Frank Hamilton, American ethnologist: b. Northeast, Pa., 22 July 1857; d. Washington, D. C., 10 April, 1900. He became interested in Indian relics, and when 19 years old was made curator of the ethnological exhibit at the Centennial Exposition in Philadelphia. Accompanying Powell's New Mexico expedition, he settled among the Zuni Indians for the purpose of study. In 1881 he conducted excavations in Arizona, and in 1895 discovered archæological remains in Florida. In 1897 he became connected with the United States Bureau of Ethnology. Among his works are: 'The Nation of the Willows' (1882); 'My Adventures in Zuni' (1883); 'Manual Concepts' (1892); 'Zuni Folk Tales' (1902).

Cushing, Harry Alonzo, American educator: b. Lynn, Mass., 1870. He was graduated at Amherst College 1891, and took graduate studies at Columbia University 1894–6. He has published 'History of the Transition from Provincial to Commonwealth Government in Massachusetts' (1896). He is at present (1903) lecturer in history and constitutional law at Columbia.

Cushing, Luther Stearns, American lawyer: b. Lunenburg, Mass., 22 June 1803; d. Boston 22 June 1856. He was the only graduate of the Harvard Law School in 1826. He was clerk of the Massachusetts House of Representatives 1832–44, and reported the decisions of the State supreme court 1850–6, preparing 12 volumes of law reports for those years. He was lecturer on Roman law at the Harvard Law School 1848–56, but is best known for his 'Manual of Parliamentary Practice' (1844), which immediately became an authority in parliamentary assemblies throughout the English-speaking world, and remained so for half a century. Other of his works are: 'Treatise on Trustee Process' (1837); 'Treatise on Remedial Law' (1837); 'Reports of Controverted Election Cases in Massachusetts' (1852); 'Introduction to the Study of Roman Civil Law' (1854); 'Lex Parliamentaria Americana' (1856), and translations of several legal works from the French and German.

Cushing, Thomas, American statesman: b. Boston, Mass., 24 March 1725; d. there 28 Feb. 1788. He was graduated from Harvard 1744; was elected speaker of the Massachusetts Assembly 1766–74, and was a member of the first and second continental congresses 1774–5, being defeated for re-election because he opposed a declaration of independence. In 1783 he was lieutenant-governor of Massachusetts, and a member of the convention that ratified the Federal Constitution 1788. John Adams describes him as being exceedingly useful to the patriot leaders in obtaining valuable secret information. He was one of the founders of the American Academy of Arts and Sciences.

Cushing, William, American jurist: b. Scituate, Mass., 1 March 1732; d. there 13 Sept. 1810. He was graduated at Harvard in 1751, became judge of probate in Maine in 1768, judge of the Massachusetts superior court in 1772, and chief justice in 1777. Washington appointed him associate justice of the Supreme Court of the United States in 1789, and in 1796 offered him the post of chief justice, which he declined.

Cushing, William Barker, American naval officer: b. Delafield, Wis., 4 Nov. 1842; d. Washington, D. C., 17 Dec. 1874. He entered the navy as a volunteer officer in 1861, and was promoted to a lieutenancy in the following year. His greatest exploit performed was in October 1864. For some time previous nothing had been able to cope with the Confederate ram Albemarle. She had successfully encountered a strong fleet of Federal gunboats and fought for several hours without sustaining material damage. Cushing volunteered to destroy the ram, and on the night of 27 October accomplished the feat. For this he received the thanks of Congress, and was made a lieutenant-commander, becoming a commander in 1872. See PLYMOUTH, N. C., ENGAGEMENT AT.

Cushman, kŭsh'măn, **Charlotte Saunders,** American actress: b. Boston 23 July 1816; d. there 18 Feb. 1876. She appeared first in opera in 1834, and as Lady Macbeth in 1835. Miss Cushman played sometimes in high comedy, but her name is identified with tragic parts. In 1844 she accompanied Macready on a tour through the northern States, and afterward appeared in London, where she was well received in a range of characters that included Lady Macbeth, Rosalind, Meg Merrilies, and Romeo — her sister Susan (1822–59) playing Juliet. In later years she acted with great success in many cities in the United States and was also prominent as a dramatic reader. She retired from the stage in 1875.

Cushman, Robert, American colonist: b. Kent County, England, about 1580; d. England 1625. He was one of the Pilgrims who accompanied John Carver to Leyden in Holland. In 1617 he and Carver went to London and endeavored to secure a charter to settle in America and enjoy the privilege of absolute freedom of worship. King James refused to grant this concession, but promised not to molest them in the event of their settling in America. In 1619 Cushman and Elder Brewster made another application, and this time the king granted the charter and promised toleration as long as they remained faithful subjects to him. In 1620 Carver and Cushman returned to London, collected funds, made purchases of provisions, and arranged for vessels to transport the Pilgrim colony at Leyden to America. The Speedwell was chartered and sent to Delfthaven to bring the colonists to Southampton, where the Mayflower was engaged to meet them. Cushman and his family embarked on the Speedwell 5 Aug. 1620, and on the 15th both ships set out from Southampton for America. On the 23d leaks in the Speedwell obliged them to put into Dartmouth; they started again on the 31st, but further misfortunes to the Speedwell obliged them to return to Plymouth, where she was abandoned, and 18 passengers, including Cushman, gave up the voyage. He remained in England as the colonists' financial agent and to forward supplies. In July 1621 he sailed for America with his son Thomas, in the ship Fortune, and arrived at New Plymouth 21 November. He sailed for England again 13 December 1621, was captured by the French, but released after a short imprisonment. In 1622 he published an eloquent vindication of the Plymouth colonial enterprise and appealed for missions to the Indians. In 1623, with Edward Winslow, he obtained from Lord Sheffield a grant of territory on Cape Ann and with a new band of devout colonists made the first permanent settlement within the limits of Massachusetts Bay colony. During his brief visit to the Plymouth settlement in December 1621, he preached a sermon on "The Sin and the Danger of Self-love," the first sermon delivered in America that was printed (London 1622). The original edition is of great rarity, only three copies being known to exist. The Charles Deane copy sold at auction in 1898 for $1,000. Reprints of it were published at Boston in 1724, 1780, 1870; at Plymouth 1788 and New York 1858.

Cusins, kŭz'ĭnz, SIR **William George,** English composer: b. London 1835; d. 1893. As a lad of 10 he sang in the Royal Chapel, and developing musical abilities, he was sent to Brussels, where he studied under the leading masters. He secured one of the most valuable scholarships in the Royal Academy of Music before he was 16 years of age, at which time he became organist to the queen. At the age of 32 he took charge of the Philharmonic Society, succeeding Sterndale Bennett, and took important part in the musical development of England, being knighted for such service in 1892. His works include a Concerto in A Minor; a cantata; Gideon, an oratorio; and a number of songs.

Cusk, kŭsk, a fish belonging to the cod family or *Gadidæ* and to the genus *Brosmius* (Cuvier), characterized by an elongated body, a single dorsal fin extending the whole length of the back, fleshy ventral fins, and one barbel at the chin. The American cusk, which is considered specifically distinct from the European, is the *B. flavescens* (Lesueur); its color varies from brownish with yellowish sides to whitish with brownish patches, and the immature fish is of a uniform dark slate color, sometimes with transverse yellow bands; the dorsal, caudal, and anal fins are bordered with bluish black, and edged with white; the dorsal and anal are continued to the base of the tail. The length of the fish varies from two to three feet or more, a small one weighing about four pounds; it is taken generally on the middle bank, with the hook, by the deep water cod-fishers. In the spring it is seen in Boston market, when it is less esteemed than cod, but in the winter it commands a higher price; as a fresh fish it is considered a delicacy, and salted is generally preferred to cod. It is found along the shore of the British provinces, and even to high latitudes. The European species, *B. vulgaris* (Cuvier), called torsk or tusk, is also a northern fish, occurring plentifully among the Shetland Islands, where it forms a considerable article of trade; it is caught, salted, and dried in the same manner as cod; it is common on the coasts of Norway, Iceland, and the Faroe islands. It resembles very much the *B. flavescens*, and the two are considered by some as varieties of one species.

Cuspa'ria Bark, the bark of the *Galipea Cusparia*, and some other species, also called Angostura bark (q.v.).

Cusso, cŭs'ō, a small Abyssinian tree of the rose family (Rosaceæ), having alternate pinnate leaves and dicœcious flowers, which are imported into Europe and used as an anthelmintic.

Cust, kŭst, Arthur Perceval Purrey, English clergyman: b. 1828. He was educated at Brasenose College, Oxford, studied for the Anglican priesthood, was curate of North Church, Hertfordshire 1851–3; rector of Cheddington 1853–62; vicar of St. Mary's, Reading 1862–75; vicar of Aylesbury 1875–6; archdeacon of Buckingham 1875–80; and dean of York from 1880. He has published: 'The Heraldry of York Minster' (1890–6); 'Picturesque Old York' (1896); 'York Minster' (1897.)

Cust, Lionel, English art writer: b. London 25 Jan. 1859. He is the eldest son of Sir Reginald Cust (q.v.) and was educated at Eton and Trinity College, Cambridge. Since 1895 he has been director of the National Portrait Gallery. Among his published works are: 'Artists Represented in Department of Prints and Drawings in British Museum' (1893–6); 'Albrecht Dürer: a Study of his Life and Art' (1897); 'History of the Society of Dilettanti' (1898); 'The Master "E. S."' and the "Ars Moriendi"' (1898); 'History of Eton College' (1899); 'Sir Anthony Van Dyck' (1900); 'Van Dyck's "Chatsworth" Sketch Book' (1901).

Cust, Sir Reginald John, English writer: b. Shavington Hall, Shropshire, 25 Sept. 1828. He was educated at Eton, and Trinity College, Cambridge, and was assistant commissioner West Indian Encumbered Estates Court 1865–87, and chief commissioner 1887–92. He has published: 'Treatise on West Indian Encumbered Estates Acts' (1859); 'Marriage with a Deceased Wife's Sister Historically Considered' (1888); 'Early Poems' (1892). He was knighted in 1890.

Custard-apple, a common East Indian name for the fruit of certain species of the *Anonaceæ*, some of them the most delicious of the tropical fruits. The common custard-apple (*A. squamosa*), a native of tropical America, is a large greenish or dark-brown fruit. The tree grows to considerable size. The alligator-pear, sour-sop, and sweet-sop are members of the family. The chief North American representative is the papaw (*Asimina triloba*). This tree grows to a height of 45 feet in favorable locations, the stem being sometimes 10 inches in diameter. The wood is soft, light, and weak, weighing about 24 pounds to the cubic foot. The fruit is a fleshy berry, three to seven inches long, sweet, and edible when ripe, in October. The tree grows along streams from Ontario, through western New York and New Jersey near Pennsylvania, south to Florida and west to Texas and Michigan.

Custer, Elizabeth Bacon, American writer: b. Monroe, Mich., about 1844. In February 1864 she was married to George A. Custer (q.v.). She is author of 'Boots and Saddles, or Life in Dakota with General Custer' (1885); 'Tenting on the Plains, or General Custer in Kansas and Texas' (1887); 'Following the Guidon'; etc.

Custer, George Armstrong, American general: b. New Rumley, Ohio, 5 Dec. 1839; d. 25 June 1876. A West Pointer, graduating June 1861, his first day at the front was at Bull Run, on Kearny's staff; he then went on W. F. Smith's, in charge of balloon reconnaissances; then, for daring courage and endurance, was appointed on McClellan's, and captured the first colors taken by the Army of the Potomac. In 1863 he went on Pleasonton's staff; shortly after, for dashing gallantry, was appointed brigadier-general of volunteers, commanding a Michigan cavalry brigade. He made it famous, and foiled Stuart at Gettysburg, for which he was brevetted major in the regular army. In 1864 his brigade was assigned to Sheridan's corps, and he was noted as one of the most brilliant officers in the Virginia campaigns, winning steady promotions; brevet lieutenant-colonel for Yellow Tavern, brevet colonel for Winchester. On 9 October, in command of the Third Division, he won the splendid victory of Woodstock; on the 19th, at Cedar Creek, he contributed largely to the Confederate defeat made permanently familiar by "Sheridan's Ride," and was brevetted major-general of volunteers. In the spring of 1865 his division by itself won the battle of Waynesboro, capturing 1,600 prisoners and 11 guns; and followed it up by annihilating Early's command, and capturing all the rest of his artillery and his baggage. He fought at Five Forks and Dinwiddie Court-House, and was brevetted brigadier-general United States Army. After the surrender at Appomattox he was brevetted major-general United States Army, and appointed major-general of volunteers. Assigned to duty in Texas, then appointed chief of cavalry till mustered out of the volunteer service, he asked permission to accept Juarez's offer of the chief command of Mexican cavalry against Maximilian; refused leave of absence, he took the lieutenancy of the Seventh cavalry, and joined it at Fort Riley, Kan., November 1866, under Hancock, who was succeeded by Sheridan in the summer of 1867. Custer shortly after saw his first Indian service; and closed a campaign against the Cheyennes in 1868 by the crushing victory of the Washita (q.v.), where 103 Indian warriors were killed, and the tribe forced to return to their reservation. He was stationed in Kentucky 1871–3. In the spring of 1873 he was sent to Dakota to make head against an Indian insurrection of the first order, organized by Sitting Bull and Crazy Horse, and comprising not only the Sioux but a mass of other tribes in Dakota, Montana, Wyoming, etc. He fought a number of battles, and opened up the Black Hills country. In the spring of 1876 Sheridan made ready for a decisive blow, sending three divisions under Crook, Terry, and Gibbon to unite and crush Sitting Bull on the Yellowstone. Terry and Gibbon united without discovering the Indian army; Crook beat up Crazy Horse's band, and after a sharp skirmish the whole Indian force of 5,000 or 6,000 moved to the Little Big Horn. They were discovered by Terry's scouts, and Terry sent Custer in advance, with his cavalry regiment of 600 men in 11 companies, to bar their escape east; he was to wait for the main body at the junction of the Big Horn and Little Big Horn 26 June. Custer arrived there the night of the 24th; his scouts discovered the Indian village the next morning; from imperfect information he supposed that they were only the 1,200 or 1,500 Pawnees he had known were marching to join Sitting Bull, and he resolved to surround and capture them all. The Indians were on a ridge west of the Little Big Horn; Custer kept five companies, 260 men in all, for a direct attack on the centre, gave four to Major Reno to assail their left (south), and two to Capt. Benteen to make a southern detour of two miles

and come on their right rear, cutting off their retreat. The Indians had broken up their tents and were about to retreat, when they discovered how weak was the assailing force. The three divisions forded the river, and Custer rode for the heart of the Indian line. A rise across the stream masked the enemy, many hundreds of whom lay in a ravine between it and the higher ridge beyond; and as Custer swept down, the savages rode against him and swarmed around to his rear. Outnumbered 20 to 1, the heroic band still fought their way up to the ridge, and a small number with their general reached it; then a fresh band of 1,000 Cheyennes rose up, under Rain-in-the-Face, and not a soul was left alive. Meantime Reno had been repulsed and had taken refuge across the creek; and Benteen never reached the neighborhood of the fight; but rejoined Reno at a bluff on the east, where they held the Indians at bay till Terry arrived next morning. The bodies of the slain division were left as they lay, all horribly mutilated, except Custer's. Forty-two Indians were killed. The battlefield has been marked with a small marble monument where each man fell. Custer wrote 'My Life on the Plains' (1874). His life has been written by Whittaker (1876), and by the general's wife, Elizabeth A. Custer.

Custer Massacre. See CUSTER, GEORGE ARMSTRONG.

Custine, küs-tēn', **Astolphe, MARQUIS DE,** French novelist and writer of travels: b. Niederwiller, Meurthe, France, 18 March 1790; d. near Pau, France, 29 Sept. 1857. He traveled in the British Isles, Switzerland, and southern Italy (1811–22), and afterward in Spain and Russia. He published: 'Mémoires et Voyages' (1830); 'La Russie en 1839' (1843); a tragedy, 'Beatrice Cenci'; and some romances, among them 'Aloysius, or the Monk of St. Bernard'; 'Romuald, or the Vocation.' His 'Letters to Varnhagen von Ense and Rachel Varnhagen von Ense' appeared in 1870.

Custis, George Washington Parke, American writer: b. Mount Airy, Md., 30 April 1781; d. Arlington House, Fairfax County, Va., 10 Oct. 1857. He was the adopted son of George Washington, and wrote 'Recollections of George Washington,' and several plays and orations.

Custom, such a usage as by common consent and uniform practice has become the law of the place or of the subject-matter to which it has relation. General customs are such as constitute a part of the common law and extend to the whole country, while particular customs are those which are confined to a particular district. As a rule, when a contract is made in relation to another, about which there is a well established custom, it is presumed that such custom forms part of the contract and may be always referred to for the purpose of showing the intention of the parties in all those particulars which are not expressed in the contract. If, however, the meaning of the contract is certain and beyond doubt, no evidence of usage will be admitted to vary or contradict it. In order to give validity to a custom it must be certain, reasonable in itself, commencing from time immemorial, and continued without interruption. And a custom which is unreasonable, uncertain, and which savors too much of arbitrary power, is void; consequently where a custom is opposed to a well-settled rule of law, and is calculated and intended to violate such law, the custom will not be allowed to have any effect. The true office of a usage or custom with respect to contracts is to interpret the otherwise indeterminate intention of parties, and to ascertain the nature and extent of their engagements arising not from their express stipulation, but from mere implications and presumptions and acts of a doubtful or equivocal character, or to ascertain the true meaning of words in an instrument where those words have various senses; and custom or usage is sometimes admissible to add new terms not expressed in or covered by the writing.

Custom-house, an establishment where commodities are entered for importation or exportation; where duties, bounties, or drawbacks, payable or receivable upon such importation or exportation, are paid or received, and where ships are entered and cleared. The principal custom-house of the United States is in New York. See NEW YORK CUSTOM-HOUSE.

Customary Law. A usage cannot be sustained in opposition to well established principles of law. To sustain a usage under such circumstances would be extremely pernicious in its consequences, and would render vague and uncertain all the rules of law. A mere custom or usage is therefore without force in opposition to a positive law. Thus a usage for factors to pledge the goods of their principals is void, being against a general rule of law. So the usage for a master of a vessel to sell the cargo without necessity when the vessel is stranded; so of a custom, different from the law in a certain place, to re-enter for a forfeiture incurred by the non-payment of rent. And it is held that the custom and understanding of the merchants in a particular trade cannot be admitted to prove that the barter or exchange of a promissory note, indorsed without recourse, for cotton or any other species of merchandise, carries with it no implied warranty of the past or future solvency of the maker of the note. So where a transaction is within the statute against usury, the usage of trade as to such transaction cannot be received in evidence to show that it is not usurious. Known and settled usages, however, should be respected by courts and juries, unless such usages are against the laws or policy of the country. Usage is evidence of the construction given to the law, and when it is established and uniform it regulates the acts and duties of those who act within its limits. Usage is a matter of fact, and not of opinion. A usage of trade must therefore be proved by instances, and cannot be supported by evidence of opinion merely. It is proved by witnesses testifying of its existence and uniformity from their knowledge obtained by observation of what is practised by themselves and others in the trade to which it relates.

Customs Duties (customary taxes; in the constitutional struggles of mediæval England, so claimed by the sovereigns as of ancient usage and allowance), taxes on the exports and imports of a State or district. Apparently, they were at first port fees for the use of the government quays, warehouses, weights and measures, etc.; but in very ancient times they

became a general source of revenue, and used for sumptuary purposes. The constitutional prohibition of export duties leaves it applicable in the United States to imports alone. In countries of developed commerce these have always been the favorite means of taxation with governments and subjects alike, by a rare and significant harmony. The latter prefer them to direct taxes, as distributing the burden in small unperceived amounts on their daily income, in place of a few severe annual exactions. The former prefer them as making it possible not only to raise a far greater revenue with far less criticism, but actually to win popularity by increasing the burden, in most countries — a unique feature in administrative policy. Direct taxes have been the fertile parent of rebellions; customs duties have generally been popular in proportion to their magnitude. The latter fact is due to two other traits inherent in import taxes; that they furnish an apparent means of transferring the tax burden largely to the foreign producers, and of giving the native producer the monopoly of the "home market." It is obvious that the two are more or less self-contradictory — that the foreigner can share the payment only in proportion to his share of the market, and that if imports were annihilated all taxes would be direct; but the discussion of this subject belongs to the question of protective tariffs (see PROTECTION). Here it need only be said that it is not necessary for dutiable articles to be such as are produced within a country, for a tax to be "protective" in action: they may be high-grade articles needed in manufacturing, the charge upon which forces a resort to inferior native materials, or increases the price of the better goods. This increase is always much greater than the duty, as it includes interest on the extra capital needed to carry on business with the costlier articles, and a further charge for the restricted market due to heightened price.

Customs duties must belong to one of two classes: those charged on given units of weight or measure, as the pound, ton, yard, gallon, etc., called specific duties; and those charged by a percentage on the estimated value, called ad valorem duties. On many kinds of goods the two are combined in what are called compound duties; and a variant of the ad valorem system is what is called the minimum duty, under which all goods costing less than a certain sum are assumed to have cost that amount and are taxed upon it. In the old English disputes between king and Parliament specific duties were called "tonnage" (so much per ton); and ad valorem duties "poundage" (such a per cent on the estimated value in pounds sterling), though levied so as not to be purely ad valorem.

The merits of the two systems are not unanimously agreed upon; indeed, each has its special demerits and disadvantages, which are grave from the standpoint of national welfare. It is fair to say, however, that most of the difficulty of the specific duty lies in the attempt to use it for protective purposes, and that of the ad valorem duty in its enormous volume; that a specific duty for revenue only loses most of its objectionable features if levied on the proper articles, and that a low ad valorem duty would be free from most of the objections of a high one. This will be evident from a glance at each.

Specific duties are simple to calculate, easy to collect, do not require a high grade of official skill, and leave few loopholes for fraud. The great drawback is, that they produce immense inequality of duty from the variation in cost and quality, and that inequality in exactly the wrong direction. That is, a certain number of cents on a pound or yard of cheap material may be very high or even prohibitory, while on expensive material the same may be trivial. Now, if the goods are articles of direct consumption, this places nearly all the burden, or an entire deprivation of use, on the poor, and relieves the rich; if they are raw materials of manufacture, it acts as a bounty on the manufacture of coarser and cheaper goods at the expense of the better qualities, turns capital and labor in that direction, and makes it the interest of manufacturers to produce the cheapest goods possible to sell. On the other hand, if the duties are placed on articles not produced or manufactured in the country, while it will still favor the rich against the poor, at least the internal industries are not demoralized; and by restricting them to very few articles, and those without immense variation in price, the English government avoids the greater part of the former evil. Its duties are collected entirely from 26 articles; one of them, on coal, is an export duty. An objection to specific duties on the part of revenue reformers is, that it enables the government to deceive the people as to the amount they are taxed. These duties have always been the favorites of protectionists, the ad valorem duties being preferred by the revenue-tariff leaders; the United States duties are compound.

The ad valorem duty, theoretically the fairest of all, is full of practical difficulties as a revenue producer, and highly unsatisfactory as a protective system. In the former line, the difficulties of fixing the value, the opportunities for fraud and undervaluation, the temptation to officials to connive, and the expensive skilled officials needed to work it, all stand in the way of its usefulness to the government. The value is usually fixed at the point of export; but that involves minute knowledge by the official of a vast number of trades and manufactures, and the fluctuations of trade conditions; and moreover, the market may have changed materially from the time the duty is assessed to the time the importer pays it, which shifts the burden from the government to the merchant. Furthermore, the plenary powers assumed by the government to throw all the burden of doubt on the importer, to seize his goods on suspicion and confiscate them on proof satisfactory to itself, but not to him, though partially remediable by the courts, and very likely necessary to secure the government, place the importer in a situation by no means free from thorns. And the tedious, costly, and vexatious red tape of invoicing and appraising and satisfaction of legal forms, are bad at best even if necessary; and when reenforced by the zeal of officials anxious to win laurels by harassing importers, and desirous of throwing difficulties in the way of even legitimate trade, make it impossible for small capitalists to bear the risks. Thus the small merchant is driven out of the business and the trade concentrated in a few great houses. But a low duty would take away most of the temptation and most of the need for highly paid officials, and would make it practicable to utilize a much simpler system. As a protective system the drawback is, that the duty falls exactly when

the cheapness of foreign goods, and their consequent liability to compete, make it desirable to raise it. Here, too, the low revenue duty would make the change less serious.

The customs receipts of the United States in 1902 were $254,444,709, as against $308,033,524 from all other sources. This is on the whole a great decline in the ratio of customs to other receipts; the former from the foundation of the government to 1880 had exceeded the latter by about one third, and in 1890 stood $229,668,585 to $173,412,398. In some later years, however, the proportion has been even lower than last year: notably 1898, when it was $149,819,594 to $255,501,741.

Custozza, koos-tōt'zä, Italy, a village in the province of Verona, about 10 miles southwest of the city of Verona. It is noted as being the place where the Italians were twice defeated by the Austrians.

Cut-worm, the caterpillar of an owlet moth of the tribe of *Noctuæ*, and group *Agrotididæ;* and, loosely, many other grubs and worms living in the ground. It stays by day about the roots of plants, and comes forth at night to cut off their tender stems and leaves. Some of the moths fly by day, others only at night; the wings are nearly horizontal when closed; the thorax smooth and slightly convex; the antennæ of the males generally with two rows of tooth-like points on the under side; the fore legs are often spiny. The caterpillars are smooth, shining, naked, dark-colored, with longitudinal pale and dark stripes, and a few black dots on each ring; cylindrical, short, and thick, with 16 legs; the chrysalis is transformed in the ground, without a cocoon. They destroy whole fields of vegetables, and also asters, balsams, and other ornamental plants. The caterpillars vary in length from one to two inches, and are dark ashy gray, with brown head, and a pale dorsal stripe, with minute black dots; the chrysalis is a shining dark brown, and the moth appears from 20 July to the middle of August. The largest is the *A. telifera,* having the fore wings light brown, divided by two transverse bands of wavy dark brown lines, and with three spots (one lance-marked) encircled with dark brown; the hind wings are pearly white, the abdomen gray; expanse of wings at least two inches. The *A. inermis* is slightly smaller; the thorax is reddish brown. The *A. messoria* has the fore wings reddish gray, with five wavy blackish bands and three wing spots; the hind wings whitish, and dusky brown behind; the body grayish; the expanse of wings one and two fifths inches. The *A. tessellata* expands only one and a quarter inches; the fore wings are dark ash, with only a faint trace of bands, and with large alternate pale and black spots; the hind wings brownish gray in the middle, and blackish behind. The *A. devastator,* the moth of the cabbage cut-worm, has the fore wings dark satiny ashy gray, with four wavy, whitish bands edged with black, and white dots and dark spots; the hind wings are a light brownish gray, dusky behind; body gray; expanse of wings one and a half to one and three quarter inches. The only effectual way to prevent their depredations is to open the earth daily at the foot of the growing plants and kill the worms, which are easily found. It is said that a manure of sea mud will protect a garden from these worms; some cultivators protect their cabbage plants by wrapping a walnut leaf or paper cone firmly around the root, secured by an earth embankment.

Cutch, kŭch, India, a principality controlled by Bombay, lying to the south of Sind, area, 6,500 square miles. During the rainy season it is wholly insulated by water, the vast salt morass of the Rann separating it on the north and east from Sind and the Guicowar's dominions. Pop. (1902) 542,612.

Cutch, Gulf of, an inlet of the Arabian Sea, extending into the west coast of India about 100 miles, and forming an outlet for the salt marshes of Cutch in India.

Cutch Gundava, gŭn-dä'vä, Baluchistan, a division occupying a northeast projection, in a great measure separated from the rest of the country by the mountain range of Hala; area, 10,000 square miles. Pop. 120,000.

Cuthbert Bede. See BRADLEY, EDWARD.

Cuthbert, Saint, English anchoret, cenobite, and bishop: b. about 633; d. Farne, Northumbria, 20 March 687. He is one of the three most eminent saints of the Church in England, the other two being Saint Edmund of Edmundsbury, and Saint Thomas à Becket, archbishop of Canterbury. The time and place, and even the country of his birth are unknown, but the most trustworthy historians say he lived from 635 to 687. In his youth he entered the monastery of Melrose (the first Melrose), at that time within the limits of Northumbria, and after making his religious profession there, was successively prior of that abbey, prior of Lindisfarne, bishop of Hexham, and bishop of Lindisfarne, with intervals in which he withdrew from conversation with all men and lived a recluse hermit on the island of Farne. The fame of his sanctity, religious zeal, and miracles was great in his lifetime; but grew steadily greater after his death, and many churches in England were dedicated to him. His body was found incorrupt when his tomb was opened 11 years after burial. When Norse corsairs threatened Lindisfarne in 875, the monks of Lindisfarne bore the precious remains away to a place of safety inland, and for a time the body had no fixed resting place until it was deposited at Durham, where, enclosed in a splendid shrine, it remained till the Reformation, an object of veneration and the instrument of incessant miracles.

At the Reformation the shrine, with its costly ornamentation, went to increase the king's treasure, and the body of Cuthbert was buried under the pavement of the Durham Cathedral. The coffin was lifted in 1827 and the body, or rather the skeleton, of the saint, was found wrapped in five robes of embroidered silk; there were three coffins, one within another, namely, an outermost one, made in 1541, within that another, believed to date from 1104, and then the *cista,* in which the relics were deposited when the body was disinterred in 698. His feast is observed on 20 March.

Cuthbert, Ga., the county-seat of Randolph County, on the Central of Georgia Railroad. The town is the trading centre of a fruit-growing and cotton-raising region, and has colleges for men and women. Pop. (1900) 2,641.

Cuticle (Lat. *cuticula,* diminutive of *cutis,* «skin»), a thin, white, pellucid, insensible membrane, covering and protecting the true skin,

with which it is connected by the hairs, exhaling and inhaling vessels, and the *rete mucosum*. See SKIN.

Cutlass (Fr. *coutelas*, "small knife" or "sword"), a short sword used by seamen. The art of fencing with it is different from that with the small sword or broad sword. A guard over the hand is an advantage. It is a very effectual weapon in close contest; on account of its shortness it can be handled easily, and yet is long enough for defense.

Cutlass-fish. See SCABBARD-FISH, or SWORD-FISH.

Cutler, Arthur Hamilton, American educator: b. Holliston, Mass., 26 Jan. 1849. He was graduated at Harvard 1870; spent a few years in business, and in 1876 organized the Cutler School in New York, one of the leading preparatory schools in the United States, which has sent over 300 of its graduates to Harvard, Yale, Columbia, Princeton, and other colleges.

Cutler, Elbridge Jefferson, American educator: b. Holliston, Mass., 28 Dec. 1831; d. Cambridge, Mass., 27 Dec. 1870. He was professor of modern languages at Harvard 1865–70, and widely known as an able and generous literary critic. He published: 'War Poems' (1867); 'Stella' (1868). Consult 'Memoir' by A. P. Peabody (1872).

Cutler, Henry Stephen, American musician: b. Boston, Mass., 7 Oct. 1824; d. Swampscott, Mass., 5 Dec. 1902. He was organist of Trinity Church, New York, 1860–98, and on the occasion of the visit of the Prince of Wales to New York in 1860 the men and boys of Trinity choir were vested for the first time. From this incident the custom of vesting choirs in American Episcopal churches appears to have been originated. Cutler was the author of many musical compositions, and his arrangement of the hymn, 'The Son of God Goes Forth to War,' is widely known.

Cutler, Manasseh, American Congregational clergyman: b. Killingly, Conn., 3 May 1742; d. Hamilton, Mass., 28 July 1823. He was graduated at Yale in 1765, became a lawyer in 1767, and Congregational minister in 1771, and a chaplain in the Revolutionary army in 1776. After the war he helped form the Ohio Company, which settled Marietta in 1788, and had a leading part also in the formation of the State of Ohio, being credited with drafting the noted "Ordinance" of 1787. He was a member of Congress from Massachusetts 1800–5. He was also a botanist of distinction, describing 350 species of plants native to New England. Consult 'Life, Journals, and Correspondence of Manasseh Cutler' (1888).

Cutler, Timothy, American clergyman: b. Charlestown, Mass., 1683; d. Boston August 1765. He was graduated at Harvard in 1701; was a Congregational pastor at Stamford, Conn., 1710–19, when he became rector of Yale College. In 1722, convinced of the non-validity of Congregational ordination, he became a believer in episcopacy, and was dismissed by the trustees of Yale. Going to England, he was ordained by the Bishop of Norwich in 1723, was appointed a missionary of the Society for the Propagation of the Gospel, and taking charge of Christ Church, Boston, Mass., 1723, remained its rector until his death. He was throughout his later life one of the most influential of the colonial clergy.

Cutlery, cutting instruments of all kinds, made of steel. In earlier ages of man's history, and among savage nations whose civilization represents that of prehistoric man, sharp-edged implements were made of stone, shells, or bone. The Egyptians had a process for rendering bronze as hard as our steel. The Greeks were early acquainted with the properties of steel, and the Romans also knew this metal to a greater or lesser extent. Yet in Italy, to judge from the swords and surgical instruments discovered at Pompeii and Herculaneum, bronze continued to be the cutlery metal during the early Christian era. In later times Damascus, Toledo, and Ferrara were noted for the manufacture of sword-blades. Sheffield was renowned for cutlery in the days of Chaucer, and now the cutlery of the United States may justly claim to be as choice in design and as fine in temper as any in the world.

The process of modern cutlery manufacture is a long and interesting one. The manufacture of pocket knives, table knives, razors, and surgical instruments may justly claim to belong to the scientific arts. In the Old World the journeyman cutler must have served an apprenticeship of seven years. Even such a long training does not always make a skilful workman, and a cutler is always considered to be at his best between his 40th and 45th years. There are five distinct branches engaged in the production of a common penknife, namely, those of material making, blade-forging, blade-grinding, cutling, and blade-finishing. Then there are the minor industries of whetting, handle-cutting, hardening, and tempering, which demand considerable skill on the part of the operative. The several processes in the manufacture of a pocket knife include forging the blade, stamping the name on it, tempering, and hardening it, grinding, and assembling it, that is, putting it together. It then goes to the blade-finisher, and is inspected. After being whetted, it is again inspected. Finally it is cleaned and packed, after being inspected for the last time.

The best quality of steel must be employed in the making of good cutlery. For a four-blade knife from three to three and one quarter inches are forged from rod steel. Three heats and three operations are necessary to make one blade and an ordinary workman will forge about 18 dozen in one day.

Blades made from the best of steel are heated at low heat of a cherry red lustre to harden. They should be white when coming out of the water and readily show the color of the temper, without brightening when laid on a copper plate back down on a slow fire. A purple color is acknowledged by the most competent judges, to be the proper color of a true temper.

It is most important that the fire used in tempering should be free from gases and sulphur, the water in which the blade is plunged, clean and soft. Then follows the grinding. Blades in this country are ground on a Lake Huron stone; these stones are kept in order by the constant use of a nail-rod, commonly known as a racing-iron, to keep the edges of the stone sharp and open the surface pores which may have become clogged from grinding many blades.

What is called cutling consists of drilling, filing, fitting, polishing, assembling, and buffing.

A material maker takes the brass, german-silver, and steel from the sheet and works it up into what is known by the craft as scales and springs. Springs are pressed out in their proper shape. Bolsters are pressed, stamped and riveted on a brass lining and pressed through dies, according to the shape of the knife desired.

Blade-finishing is done on wheels of wood covered with emery-coated leather. The highest polish is obtained from crocus, oxide of iron, on wheels run at very slow speed, that is, with not more than 150 to 200 revolutions per minute. The crocus polishing powder is applied to the wheel by a piece of French felt. The same material is also used in pressing the work on the wheel.

Whetting is done on soft Arkansas stones, kerosene being used as a medium to keep the stone from gumming or clogging. In whetting a knife, the blade should not be laid flat, but should be held at an angle of from 25 to 35 degrees. When thus whetted it will have a white bevel on each side known to the profession as a "cannel."

Razors are made by very much the same process, excepting that the finest razor blades are tempered in fire regulated by a thermometer, so that absolutely the same temper can be given to each blade. In making a razor blade, only the very finest quality of steel can be used, as a very fine edge is required. It is not so with a carver. For a carver, double shear steel is better, as it readily takes the serrated edge which is absolutely necessary in cutting anything that has a partially yielding substance to divide. In a carver the proper degree of softness as well as hardness is needed. If the blade is too hard you cannot sharpen it on the steel which is absolutely necessary with a carver. A professional carver seldom or never cuts more than one slice of meat without putting his carver on the steel. The same rule applies to butchers' knives. It must not be presumed from this that a carver blade must be absolutely soft. If it is too soft it is useless.

Scissors and nail nippers of the better qualities are all hand-made. It is one of the axioms of a scissor maker that only the man who makes the scissors can tell what it cost or how much labor has been put in it, for the reason the more labor that is put in a scissor the better it will work and cut. The very best steel may be used, and if the scissor is not properly made, it will become useless in a very short time.

J. CURLEY,
J. Curley & Bro., New York.

Cuttack, kŭt-tăk', India. 1. An executive district in the lieutenant-governorship of Bengal, province of Orissa; area 3,633 square miles. Both the plains and hilly districts are infested with every species of wild animals, and a vast number of snakes and other venomous reptiles. Rice, pulse, sugar, spices, and dyestuffs are grown along the coast, which is low and marshy, and wheat and maize in the hilly regions. On the coast is extensively manufactured the best and whitest salt made in India. Pop. 1,937,671. 2. The capital of the district of Cuttack, on the Mahanadi River, 220 miles south of Calcutta, is chiefly noted for filigree-work in gold and silver. Pop. about 50,000. 3. The Cuttack Mehals are subject to 21 rajahs, tributary to Great Britain, and have an area of 14,387 square miles. Pop. 1,696,710.

Cut'tage, the propagation of plants by means of slips or cuttings which are detached parts of roots, stems, leaves, etc. This form of asexual or bud-propagation is found in nature among willows, poplars, and many other trees and shrubs, especially such as are readily broken by wind and drop their twigs and branches into streams and ponds with muddy shores. Artificially, it is one of the oldest methods known and is of wide importance, ranking with graftage (q.v.) and seedage. The advantages of cuttage are that, with the rare exceptions due to bud variation, plants may be propagated true to variety or species in very great number, and the cost of production of the kinds commonly so propagated is small when compared with certain other methods such as division and layerage, in which cases roots are developed before the removal of the parts which become new individuals. An idea of the scope of this practice may be obtained from the fact that, except in the production of new varieties which are obtained by means of seeds, the great majority of florists' perennial plants such as roses, carnations, violets, chrysanthemums, are so obtained, as are also many fruit plants such as gooseberries, currants, grapes, and pineapples, though in the last instance other methods are also used to a large extent.

The methods for making the cuttings "strike" root are very various. Some species such as currant and gooseberry will soon produce roots if plunged in moist soil out of doors; others must be grown under glass, often with extra degrees of heat in the soil (bottom heat), in propagating boxes (glass-covered frames upon the greenhouse benches), and other devices, as well as specially favorable soils, etc. The methods of making the cuttings also differ widely with the species of plant and the part used, as the following classification will show:

CUTTINGS.

Roots or Rootstocks	Stem	Leaf
Short, under glass, Dracæna.	Growing wood, Soft-Fuchsia. Hard-Rubber plant.	Entire, laid flat on surface, Begonia.
Long, in open air, Blackberry.	Ripened wood, Long, in open air, Currant.	Divided, Begonia Rex.
By tuber cuttings, Potatoes.	Short, under glass, Yew.	Bulb Scales, Lily.

Consult: Fuller, 'The Propagation of Plants' (New York 1887); Bailey, 'The Nursery-Book' (New York 1896); id. article "Cuttage"; 'Cyclopædia of American Horticulture' (New York 1900–2).

Cutter, Charles Ammi, American librarian: b. Boston, Mass., 14 March 1837; d. Walpole, N. H., 7 Sept. 1903. He was graduated at Harvard in 1855, and from its Divinity School 1859. He was assistant in the Harvard Library 1861–8; librarian of the Boston Athenæum 1869–93; and of the Forbes Library, Northampton, Mass., since 1894. He has devised and published an admirable system of classification for books, known as the 'Expansive Classification' which has been adopted by many libraries, especially

those of colleges and learned institutions. He edited the 'Library Journal' 1881–93, and has published: 'Rules for a Printed Dictionary Catalogue' (1876; 3d ed. 1891), and prepared the 'Catalogue of the Library of the Boston Athenæum' (5 vols., 1874–82).

Cutter, Ephraim, American physician: b. Woburn, Mass., 1 Sept. 1832. He was graduated at Yale University in 1852; practised medicine in his native city till 1875, in Cambridge and Boston till 1881, when he removed to New York and began practice there. He has invented a large number of surgical instruments; contributed over 400 articles to literature on scientific subjects, including microscopic medicine, laryngology, chronic diseases, and general medicine; and became a member of the Massachusetts Medical Society in 1856, and of the American Medical Association in 1871.

Cutter, George Washington, American poet: b. Massachusetts 1801; d. Washington, D. C., 24 Dec. 1865. He practised law in Kentucky until 1845; served as a captain in the Mexican war; became active in politics, and received a treasury clerkship. His poems are nearly all included in 'Buena Vista, and Other Poems' (1848); 'Song of Steam, and Other Poems' (1857); 'Poems, National and Patriotic' (1857).

Cutter, a name given to two kinds of small vessels. The first is one of the supplementary small-boats of a man-of-war equipped for both rowing and sailing. The cutters used by yachtsmen and by pilots, and revenue cutters are built with especial reference to speed, and have a single mast, and a "single-stick" straight-running bowsprit that may be housed in-board in dirty weather. They are much like the sloop in rig. The hull of the cutter is very deep and narrow, being almost V-shaped, with an almost perpendicular rise from the floor to the bulwarks, and a keel heavily loaded with lead. In heavy weather, working to windward, the cutter shows to best advantage. (See YACHTING.) A light sleigh with a single seat is called a cutter in some parts of the country.

Cutting, a detached part of a plant used for propagation.

Cuttle, Captain, a character in Dickens' 'Dombey and Son.' He is a retired merchant-captain with a hook in place of a right hand. He received and cared for Florence Dombey.

Cuttle-bone, the dorsal plate of *Sepia officinalis,* formerly employed in medicine as an absorbent, but now used for polishing wood, painting, varnishing, etc., as also for pounce and tooth-powder.

Cuttlefish, a common name for the Cephalopods, but originally applied to a member of the genus *Sepia.* In the United States it is restricted to the octopods (q.v.). The cuttlefish proper, *S. officinalis,* measures from 6 to 10 inches in length, and its color varies from pale-gray to dark-brown or neutral tints. The body is oval, flattened from above downward, and contained in a tough muscular sac (mantle), which expands along the whole of either margin into a narrow fin. The integument consists of a single layer of cells, lying upon connective tissue, in which are imbedded "chromatophores," or cells charged with various colored pigment-granules. By expansion of the cell the pigment is diffused, and by its contraction concentrated, hence the rapid flashes of changing color for which the *Cephalopoda* as a whole are so remarkable.

The head is broad, with a complex cartilage which protects the central nervous system, and a bright green eye. The front of the head is occupied entirely by the mouth, and the bases of the arms, of which there are 10, 8 having suckers on the extremity in 4 longitudinal rows. The two remaining arms, known as "tentacles," occupy the interspaces between the ventral arms and those next to them. They are twice as long as the others, and can be withdrawn into pockets situated beneath the eyes and carried in this position when not in use. The mouth, situated in the centre of the roots of the arms, is surrounded by a lip with seven prominent angles, which bear small suckers in some species.

On the lower side, between the muscular sac and the body proper which contains the viscera, is a hollow space, the "branchial" or "mantle-cavity," containing the siphon, the intestines, kidneys, genital organs, and gills. Respiration is carried on by rhythmic contractions of the mantle, in consequence of which water enters at either side, passes over the gills, and is expelled by the siphon; this takes place about 70 times in a minute. On the dorsal side of the animal, immediately beneath the integument, is a closed sac which contains the cuttle-bone. Speaking generally, this may be said to be of an elongated spoon or boat shape; it consists of a horny lamina. Lying parallel to the terminal portion of the intestine is the "ink-bag," a hollow gland opening near the anus, and furnishing a deep-brown fluid, which is ejected by the animal when alarmed in order to conceal its retreat. The pigment known as "sepia" is prepared from it. The heart is situated posteriorly, and consists of a pear-shaped sac which receives on either side a vein from the gills, dilated just before its termination into a muscular contractile antechamber or auricle.

The nervous system consists of the three pairs of ganglia common to the mollusca, concentrated round the œsophagus.

Of the sense organs the eyes are the most conspicuous. They occupy depressions in the head cartilage.

The ears are a pair of small closed vesicles, imbedded in the head-cartilage, and supplied by nerves which, though apparently springing from the pedal ganglia, really have their origin in the cerebral. A ciliated pit, usually considered olfactory, lies behind each eye. The sexes are separate. The testis and ovary are both single and situated in the hinder part of the body; the latter lies in the visceral sac or pericardium above described, the former in an almost closed diverticulum of it. The eggs have a tough capsule, with a projection at one end and a kind of handle at the other by which they are attached in bunches to a twig of seaweed or other similar substance.

Cuttlefish are found in littoral regions or in moderately deep water; ordinarily they rest horizontally on or near the bottom, the fins gently undulating, the tentacles retracted, and the arms depressed. Progression may take place by means of the fins with considerable rapidity in either direction, the funnel being turned so that the stream of water issuing from it

assists in propulsion; rapid darts backward when the animal is alarmed are brought about either by the sudden ejection of water through the siphon, or by spreading out and reuniting the arms.

The cuttlefish is of commercial importance in the countries where it is common. The "brace," which is all that the animal has for a backbone, is the cuttlefish bone, and the ink which it ejects from its ink-sac when in danger is the sepia of commerce. See CEPHALOPODA; SQUID.

Cutlips, one of the common names of a fish, *Lagochila lacera,* found in some of the rivers of the Mississippi valley. The name is due to the peculiar formation of its lower lip, which is divided into two parts, in such a manner as to suggest the other common names its bears: splitmouth, harelip, and rabbit-mouth.

Cutty Stool, the stool of repentance, a seat formerly set apart in Scottish kirks, on which offenders against chastity were exhibited before the congregation and submitted to the minister's rebukes before they were readmitted to church privileges.

Cuttyhunk, Mass., an island in Buzzard's Bay. It was on this island that Bartholomew Gosnold landed, on 25 May 1602, and there established the first settlement of white men in that part of the world. He named the island after Queen Elizabeth, calling it Elizabeth Isle. The settlement did not continue a full month before it was abandoned, the colonists returning to England. It is now used chiefly as a place of summer resort. Its permanent population is less than 100.

Cuvier, Georges Chrétien Léopold Dagobert, zhörzh krā-tē-ĕn lā-ō-pōld dä-gō-bār kü-vē-ā, BARON, French naturalist: b. Montbéliard, France, 23 Aug. 1769; d. Paris 13 May 1832. After finishing his education at Stuttgart he accepted the situation of tutor in a Protestant family in Normandy. The Abbé Texier, whom the troubles of the time had driven into exile from the capital, introduced him by letter to Jussieu and Geoffroy. Several memoirs, written about this time, and transmitted to the latter, established his reputation and procured his admission to two or three of the learned societies in Paris. In 1800 he was appointed successor to Daubenton as professor of natural history at the College of France, and in 1802 succeeded Mertrud in the chair of comparative anatomy at the Garden of Plants. From that time he devoted himself steadily to the studies which have immortalized his name.

Cuvier's 'Lessons in Comparative Anatomy,' and the 'Animal Kingdom,' in which the whole animal kingdom is arranged according to the organization of the beings of which it consists, have raised him to the pinnacle of scientific fame, and established him as the first naturalist of his time in the world after Linnæus, the celebrated Swedish botanist.

His numerous memoirs and works on these subjects show a master-mind in the study of zoology; and extending the principles laid down in his comparative anatomy to the study of palæontology, he has been enabled to render immense service to geology. Starting from the law that there is a correlation of forms in organized beings — that all the parts of each individual have mutual relations with each other, tending to produce one end, that of the existence of the being — that each living being has in its nature its own proper functions, and ought therefore to have forms appropriated for that function; and that consequently the analogous parts of all animals have received modifications of form which enable them to be recognized — he was able to ascertain from the inspection of a single fossil bone, not only the family to which it ought to belong, but the genus to which it must be referred. Even the very species of animal was thus to be made out, and the restoration of its external form as it might have lived and died became in his hands an object of certainty and precision. His 'Animal Kingdom' has been frequently translated, and forms the basis of all arrangements followed at the present time. Cuvier filled many offices of great importance in the state; particularly those connected with educational institutions. Napoleon treated him with much consideration; Louis XVIII. and Charles X. advanced him to honor; and Louis Philippe raised him to the rank of a peer of the realm. See Candolle, 'Notice sur la Vie et les Ouvrages de G. Cuvier'; Lee, 'Memoir of Baron Cuvier' (1833); Lomenie, 'G. Cuvier, par un homme de rien' (1841); Florens, 'Cuvier; Histoire de ses Travaux' (1845); de Blairville, 'Cuvier et Geoffrey Saint Hilaire' (1890).

Cuxhaven, kooks'hä-fĕn, Germany, a fortified seaport at the mouth of the river Elbe, in a detached portion of territory belonging to Hamburg. The old harbor is one of the safest on the coast, is often resorted to in cases of danger. Many passengers for foreign parts embark at Cuxhaven, which is annually rising to greater importance. Here vessels generally take pilots to go up the river to Hamburg and other places. These pilots are privileged, and by their statutes are compelled always to keep pilot-vessels out at sea, with men ready to conduct any vessel which may demand assistance. Cuxhaven is defended by several detached forts on the adjoining coast. Pop. (1901) 7,000.

Cuyabá, koo-yā-bā', Brazil, the capital of the state of Matto Grosso, situated on the Cuyabá River, a part of the Paraguay river system. It was founded early in the 18th century by adventurers from São Paulo, in search of gold. The climate being somewhat more healthful than that of other portions of the state, it has retained a moderate degree of prosperity since the mining industry terminated. A military arsenal and barracks are located here. From Rio de Janeiro in a direct line the distance to Cuyabá is about 840 miles, but only one third of the railroad has been completed which is to connect Cuyabá with the coast, through São Paulo. At the present time transportation is mainly by way of the Paraguay and La Plata rivers to Buenos Ayres; thence by the Atlantic to the national capital — a total distance of about 3,720 miles. Pop. a little more than 8,000. See MATTO GROSSO.

Cuyler, kī'lĕr, **Theodore Ledyard,** American Presbyterian clergyman: b. Aurora, N. Y., 10 Jan. 1822. He was graduated at Princeton College in 1841 and at Princeton Theological Seminary in 1846. From 1860 to 1890 he was pastor of Lafayette Avenue Presbyterian Church in Brooklyn, resigning to devote his time to literary and reform work. In 1900 he sup-

ported McKinley for the presidency while opposing imperialism. He has written: 'Newly Enlisted'; 'Christianity in the Home'; 'Cedar Christian' (1863); 'The Empty Crib' (1868); 'Heart Life' (1871); 'From the Nile to Norway' (1881); 'Stirring the Eagle's Nest' (1890); 'Beulah Land'; 'Mountain Tops with Jesus'; etc. He has been a constant contributor to the religious press and beside his published volumes has written some 3,000 articles and letters in newspapers and magazines, many of these having been reprinted in England. At the observance of the 25th anniversary of his Brooklyn pastorate it was stated that he had admitted into his church by membership 3,610 persons.

Cuyo, koo'yō, Philippines, a town and the capital of the province of Paragua, situated on the southwestern coast of the island of Cuyo, Cuyos group. The town is well built, and has an important trade. It is protected by a fort built on a land spit near the town. Pop. 8,258.

Cuyos Islands, Philippines, a group of 47 islands lying south of the island of Mindoro, and east of Palawan; total area, 63 square miles. The most important island of the group is Cuyo, 8 miles long; area; 20 square miles. The islands, with the exception of Cuyo, are infertile, and there is but little manufacture; the chief industry is the gathering and preparation of edible birds' nests and trepang. By the civil government act of 1902, these islands were made a part of the province of Paragua, Palawan.

Cuyp, koip, or **Kuyp, Albert,** Dutch artist: b. Dordrecht 1605; d. there 1691. He was a son of Jacob Cuyp (q.v.), and excelled in the painting of cattle grazing or reposing, moonlights, wintry landscapes, still waters with ships, horse-markets, hunts, camps, and cavalry fights; and in rendering effects of warm golden sunlight he is without a rival. During his lifetime and long after, Albert's pictures, though in many respects equal to those of Claude, were held in little estimation. Opinion, however, has now changed regarding them, and a fine example of his art has realized over $25,000.

Cuyp, Benjamin, Dutch artist: b. Dordrecht 1608; d. 1672. He was a nephew of Albert Cuyp (q.v.), and became a member of the guild in Dordrecht in 1631. He painted biblical pieces in Rembrandt's style, and familiar scenes of country life. His best works are in the manner of Teniers.

Cuyp, Jacob Gerritse, yä kōb gĕr-rēt'sē, Dutch painter, commonly called the OLD CUYP; b. Dordrecht 1575; d. 1651. Jacob Cuyp's representation of cows and sheep, battles, and encampments, are clever, but his fame rests principally on his excellent portraits. His coloring is warm and transparent; his manner, free, and spirited. Cuyp was one of the four founders of the Guild of St. Luke at Dordrecht.

Cuyuni, koo-yoo'nē, a river of South America, rises in Venezuela, flows first north, then east, through British Guiana, and flows into the Mazaruni. It has numerous rapids and falls; the lowest is 59° 3′ W., about 30 miles above the mouth.

Cuzcatlán, kooz-kät-län', Salvador, C. A., an Indian town, capital of a nation which occupied the territory represented by the modern departments of San Salvador and Cuscatlán. It was taken by the Spaniards under Alvarado in 1524. See CUSCATLÁN.

Cuzco, kooz'kō, Peru, a department in the southeastern part of the republic, bounded by the province of Loreto on the north, by Bolivia on the northeast and east, by Puno and Arequipa on the south, and by Apurimac, Ayacucho, and Junin on the west. Its area is 27,285 square miles. Within its limits are found nearly all varieties of temperature, with the corresponding products. The fertile valleys of the Vilcamayo enjoy an Italian climate; toward the Bolivian frontier there are vast tropical forests, abounding in all the productions of the torrid zone; on the slopes of the Andes are plains covered with pasture or crops of cereals; and still higher up on the table-lands and peaks are large flocks of vicuñas and alpacas. In general, the easterly regions have the characteristics of the upper Amazon country, while the southwest is extremely mountainous, with beautiful and healthful elevated plains or valleys, like that in which the city of Cuzco is situated. Pop. of the department about 240,000.

Cuzco, Peru, the most famous ancient city of South America. Situated in lat. 13° 31′ S., and lon. 73° 3′ W., Cuzco is at an elevation of 11,380 feet above the sea (compare Mount Washington, 6,288 feet, and Mont Blanc, 15,779 feet), and its climate is temperate; but in winter snow often falls. It was the chief town of the Inca tribe (q.v.). The writings left by Spanish conquerors and early chroniclers, upon which subsequent accounts have been based, not only preserved the Indian myths but also added some fanciful details in regard to the place, the inhabitants, and their institutions. According to such myths and accounts, the founder of the city was Manco Ccapac, son of the sun-god; strong walls, we are told, surrounded it, and in its midst was a great square, from which started four roads binding together the "empire of the four quarters of the world" (in the native tongue, "Tahuantinsuyu"), the first road leading to Puitu, the modern Quito, the second over the Andes, the third to Chile, and the fourth to the ocean. The temple of the sun, with the surrounding dwellings for priests and virgins of the sun, occupied a district of the city called "The Golden." Five mighty walls enclosed that sacred place. The temple itself was circular in form. Its chief hall, dedicated to the sun-god, contained an image of the sun made of beaten gold; the door-posts were of gold; all the walls were covered with disks of the same metal; and the mummies of the Incas ranged beside the god were decked out with golden ornaments. A door encased in silver led to a chapel dedicated to the moon-goddess, sister and wife of the sun-god. Here the images and furnishings were of the white metal, and the mummies of the wives of the Incas were decorated with silver. A part of the site of the temple is now occupied by the Church of S. Domingo. The Sacsahuaman fortress overlooked the city from a hill 250 metres high. It had a triple wall, built of enormous stones. Through deep ravines on either side of the Sacsahuaman hill flow the little rivers of Huatanay and Rodadero, the former passing beneath the houses on the west side of the square, down through the centre of a broad street, where it is crossed by numerous stone bridges, and eventually uniting with the Roda-

dero. The main part of the old city was built between these two rivers; and even to-day the houses there commonly show the massive masonry of the Inca architecture in their lower portions, though having a modern superstructure. Now, as formerly, the streets run at right angles. The government established by the Incas, though in form a despotic theoracy, was relatively mild and patriarchal. Nowhere and never have there been chiefs of state so successful in monopolizing all power, all initiative. Accordingly, when the Spanish conqueror Pizarro captured Inca Atahulapa, the people were incapable of effective resistance. Atahualpa's successors were Huascar and Manco. The former was slain; the latter was induced by promises of friendship to lead the Spaniards into Cuzco (15 Nov. 1533). An enormous booty was obtained by despoiling the temples and palaces. Besides gold and silver, the common soldiers received 200 slaves each, and the sacred sun-maidens were treated as a part of the loot. In 1536 the last of the Incas, Manco, besieged the city unsuccessfully. It remained the principal Spanish stronghold for a long time, though Pizarro founded Ciudad de los Reyes (Lima) 6 Jan. 1535. Extremely interesting are the remnants of the fortifications, temple, etc., some of which are constructed of huge masses of rock (one piece 16 feet in height; others 10 and 12 feet) of irregular shape, yet made to fit exactly one into the other with minute accuracy, as in mosaics. Such works, constructed before 1370, are scarcely surpassed by any in the world in respect to their solidity and the skilful workmanship they attest. Among the public buildings are the Cabildo, the university, library and museum, etc. The city has suffered from lack of means of transportation and communication. Only in the last few years has an effort been made to connect it by railroad with the Titicaca region. It has shrunken in trade as in population. Gold and silver work, leather, sugar, cotton, linen and wool are produced to a limited extent. The inhabitants at the time of the conquest numbered perhaps 100,000; a century ago about 50,000; at present about 30,000.

Cyanide Process. See GOLD.

Cyanides, sī'ą-nīdz or sī'ą-nīdz. See HYDROCYANIC ACID.

Cyanin, sī'ą-nĭn, the blue coloring-matter of certain flowers, as the violet and corn-flower.

Cyanite. See KYANITE.

Cyanogen, sī-ăn'ō-jĕn, a colorless poisonous gas which liquefies at — 25°, or under a pressure of four atmospheres at 20°, and at — 34° becomes crystalline. It burns with a peach-blossom-colored flame, forming CO_2 and nitrogen; water dissolves four volumes, and alcohol 23 volumes of the gas. It is very poisonous, and smells like prussic acid. Cyanogen gas passed into strong aqueous hydrochloric acid is converted into oxamide. Nascent hydrogen from tin and hydrochloric acid converts cyanogen into ethylene-diamine, $N_2(C_2H_4)''H_4$. A solution of cyanogen in water turns dark and deposits azulmic acid, $C_4H_3N_5O$, and the solution contains hydrocyanic acid, urea, and oxalate and formate of ammonia. Cyanogen dissolves in an aqueous solution of potash, forming cyanide and isocyanate of potassium. It may be regarded as the nitril of oxalic acid. Dry ammonia gas and cyanogen combine, forming hydrazulmin, $C_4N_6H_6$. Small quantities of cyanogen are formed during the distillation of coal.

Cyanometer, sī-ą nŏm'ē-tėr ("measurer of blue"), the name of an instrument invented by Saussure for ascertaining the intensity of color in the sky. It consists of a circular piece of metal or pasteboard, with a band, divided by radii into 51 portions, each of which is painted with a shade of blue, beginning with the deepest, not distinguishable from black, and decreasing gradually to the lightest, not distinguishable from white. It is used in the open air, and the observer holding it up between himself and that part of the air whose color he wishes to ascertain, and in such a position as to secure its being strongly enlightened without receiving the direct rays of the sun, turns it gradually round on its own plane till he perceives an exact similarity between the tint of the instrument and the tint of the sky. The number of that particular tint as marked on the instrument marks the intensity of color in the sky at that particular period.

Cyanophyceæ (Gr. "dark-blue"), the lowest group (blue-green) of *Algæ* (q.v.). Their color is caused by the diffusion of phycocyan, a blue pigment, throughout their cell-contents. In this group no sexual reproduction has been observed, the only reproductive means known to exist in it consisting of spores and hormogonia of a non-sexual character.

Cyanose, sī'a-nōs, native sulphate of copper ($CuSO_4$, $5H_2O$), met with generally in stalactitic or reniform masses, but sometimes in well-defined crystals. It is dark-blue, translucent, vitreous, brittle, readily soluble in water, and with a most disagreeable metallic taste.

Cyanosis, sī-ą-nō'sĭs, a condition of diminished oxidation in the blood, causing lividity of the skin, blueness of the lips, and symptoms of weakness and fainting. It may be a permanent affection, such as is seen in blue babies, in whom the venous blood obtains access to the arteries without passing through the lungs to be oxidized; or it may be a temporary condition due to choking, to excessive coughing as in false croup, or in true diphtheria. It also results as a temporary condition in poisoning by means of a number of the newer drugs used for headaches and vague pains, such as acetanilid and the like. It may also result from coal-gas poisoning, and a large variety of other forms of poisoning. Removal of the source, if possible, fresh air, oxygen, artificial respiration, are useful in the treatment of the condition. The congenital varieties are unmodifiable.

Cyan'otype Process, a method whereby photographic pictures are obtained by the use of a cyanide. This process is in common use by architects and engineers for copying plans, producing an image with white lines on a blue ground. Sensitive paper is made by brushing it over with a solution of ferric oxalate (10 grains to the ounce); it is then exposed under the positive and treated with a solution of potassium ferricyanide, by which the image is developed. The color of the ground is deepened by subsequent washing with solution of potassium bisulphate.

Cyanuric (sī-ą-nū'rĭk) **Acid** (from "cyanogen" and "uric"), an organic acid having the

formula $C_3N_3O_3H_3$, and obtained by the dry distillation of uric acid. It is a polymer of cyanic acid, CNOH, and may be obtained, along with another polymer of unknown molecular weight called cyamelide, by the spontaneous polymerization of cyanic acid. To obtain it in this way, potassium cyanate, CNOK, is treated with hydrochloric acid in the presence of ether, the mixture being well shaken. Potassium chloride and cyanic acid are formed, the latter polymerizing at once into the two compounds mentioned above, the cyanuric acid that is formed being taken up by the ether, from which it may afterward be recovered by evaporation. Cyanuric acid forms colorless efflorescent crystals which contain two molecules of water when deposited from solution in water. The hydrous crystals have the form of rhombic prisms; but anhydrous crystals, octahedral in form, are also known. Cyanuric acid dissolves in hot nitric, hydrochloric, or sulphuric acid, there being no decomposition unless the action is prolonged. When heated it becomes converted into cyanic acid, this reaction being one of the tests that are employed for its detection.

Cyath'ea, a genus of arborescent ferns, order *Polypodiaceæ,* characterized by having the spores, which are borne on the back of the frond, enclosed in a cup-shaped indusium. There are many species scattered over the tropical regions of the world. *C. medullaris* is a fine New Zealand species of comparatively hardy character. The soft, pulpy, medullary substance in the centre of the trunk is an article of food somewhat resembling sago. This species and the South African *C. dealbata* are cultivated as ornamental plants. *C. arborea* is a West Indian species.

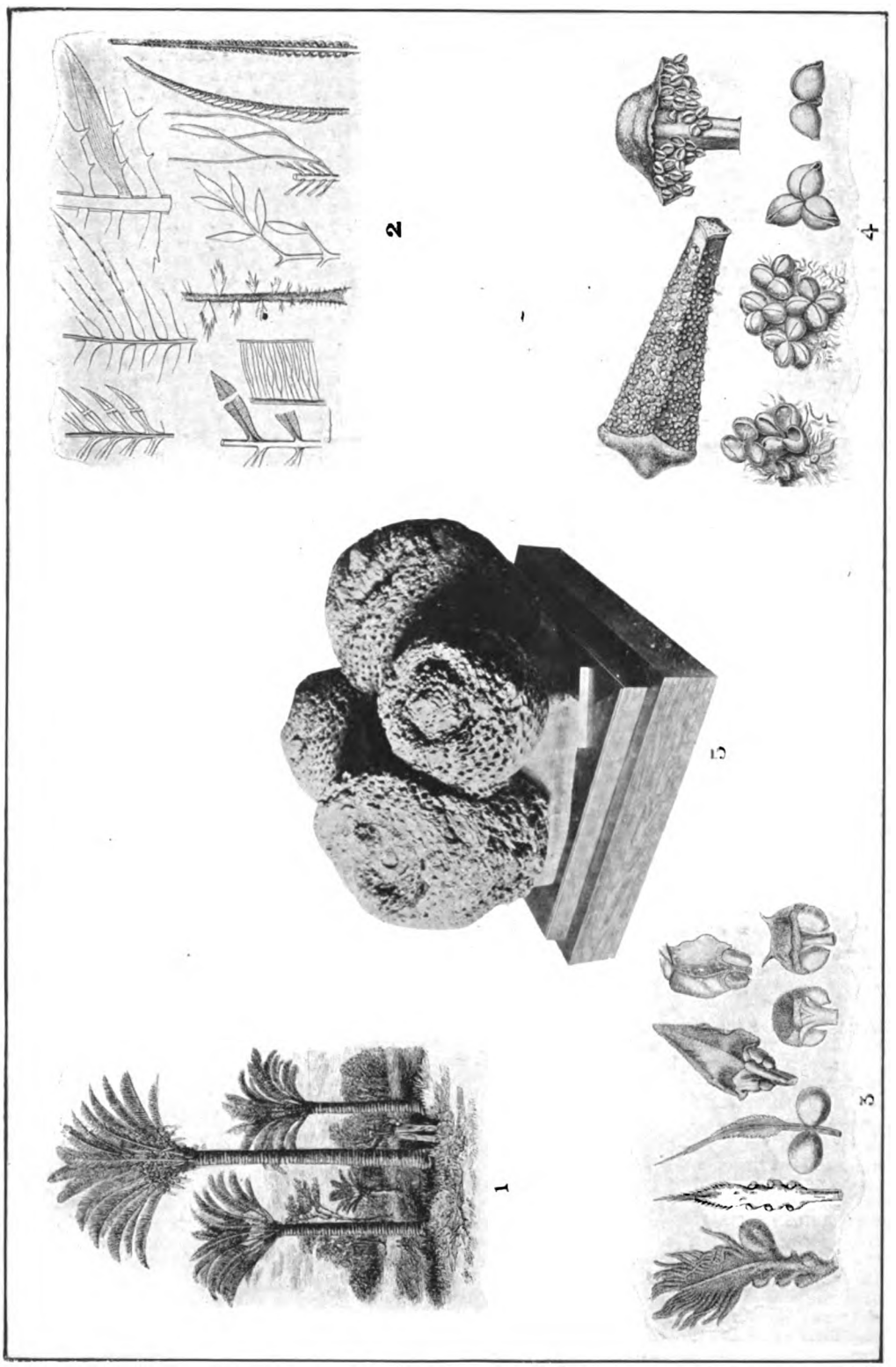
Cyathom'eter, a recently invented apparatus for determining the level and volume of liquids in closed vessels. It is adapted to bottles and to stationary vessels and is designed especially to prevent fraud in the retail trade in valuable liquids. The apparatus consists of a glass tube fluted internally, of a glass telltale or float provided with two straight springs, and of a solid ball. The tube is suspended in a bottle arranged for the purpose at the time of manufacture, from a band of twisted wires of inoxidizable metal, the extremities of which, after passing through the neck, are united and provided with a lead seal. When a full bottle is provided with the cyathometer, the telltale is at the upper part of the tube. If a certain portion of the contents be poured out, the levels of the bottle and tube will descend together and the telltale will constantly follow them. If, on the contrary, any quantity whatever of liquid be added, the levels will rise, but the telltale, held by its springs, which are braced against the flutings of the tube, will remain where it was before the addition. It is therefore submerged and marks the precise point where the addition or substitution began. Any fraud will be revealed by the telltale at the very moment at which it occurred. When the cyathometer is adapted to vats, tanks, casks, etc., the telltale consists of a float and sleeve placed in contact, and each carrying three or four springs pointing in contrary directions, those of the float engaging with the sleeve. The apparatus lends itself also to the control of movable receptacles of large capacity.

Cybele, sĭb'ĕ-lē or sĭb-ē'lē, a goddess of the Phrygians, like Isis, the symbol of the moon, and what is nearly connected with this, of the fruitfulness of the earth, for which reason she is confounded with Rhea, whose worship originated in Crete, and in whom personified nature was revered. According to Diodorus Cybele was the daughter of the Phrygian king Mæon and his wife Dindyma. At her birth her father, vexed that the child was not a boy, exposed her upon Mount Cybelus, where she was nursed by lions and panthers, and afterward found and brought up by the wives of the herdsmen. She invented fifes and drums, with which she cured the diseases of beasts and children, became intimate with Marsyas, and fell violently in love with Atys. She was afterward recognized and received by her parents. Her father discovering her love for Atys had him seized and executed, and left his body unburied. The grief of Cybele on this occasion deranged her understanding and she began a long search for Atys. In art her original statue was nothing but a dark quadrangular stone. Afterward she was represented as a matron, with a mural crown on her head, in reference to the improved condition of men arising from agriculture and their union into cities. A common attribute of the goddess is the veil about her head, which refers to the mysterious and incomprehensible in nature. In her right hand she often holds a staff, as an emblem of her power, and in her left a Phrygian drum. Sometimes a few ears of corn stand near her. The sun also is sometimes represented in her right hand, and the crescent of the moon in her left. We sometimes see her in a chariot drawn by lions; or else she sits upon a lion, and, as omnipotent nature, she holds a thunderbolt; or a lion lies near her. These symbols are all representations of her dominion and of the introduction of civilization by her means in the period of barbarism.

Cycads (from *Cycas* = Neo-Lat. nom. pl. of Gr. *κύκας,* the original name of the African cocoa-palm), a group of naked-seeded or gymnospermous plants, the cycadales. The existing cycads are an ornate remnant of an ancient and once widely extended series of forms, their nearest living relative being the gingko or maidenhair-tree. The large pith of the thick palm-like trunk of certain species is the source of the sago starch of commerce, whence the common name, sago-palm.

The cycads are a primitive and composite type with the wood structure of pines (and *Cordaites*), certain frond and other characters of ferns, and the outward habit of palms. As in the latter, the stem elongates by the slow growth of a terminal bud, with the unfolding of successive crowns of leaves or fronds spirally arranged in close order. As the leaves wilt down, there is formed from their bases an outer more or less persistent armor, which gives the stem its very characteristic appearance. For trunk-forming plants the cycads are mostly small or even pygmean. They include tuberous to columnar forms, and vary in size from underground trunks a few centimetres in diameter with fronds no more than a decimetre long to the tallest species of *Cycas* (Fig. 2, plate), which may reach a height of 20 metres. The most robust trunks reach rarely a metre in

CYCADS.



1. Cycads.
2. Margin, Nervation and other characters of Cycad leaves or fronds.
3. Megasporophylls of Cycads.
4. Microsporophylls Microsporangia of Cycads.
5. Cycadeoidea Marshiana.

diameter and the longest fronds a length of four metres. Several Central American and Peruvian species are epiphytic. Most of the cycads branch one or more times after reaching a certain age, and all are handsome and easily grown greenhouse plants. The Japanese gardeners produce examples of their native species, *Cycas revoluta*, with from 15 to 20 branches, and some of these plants are known to be upward of 300 years old.

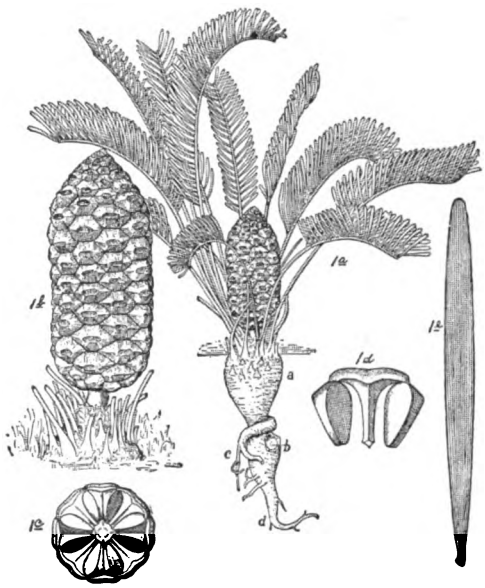


FIG. 1.— *Zamia floridana* DC. ♀ (From Wieland.) Miami, Florida, 15 November, fully six months previous to fecundation.
1*a*.— Entire plant. × 1-12.
a. main trunk (underground).
b. position of an old branch.
c. secondary tap root running out from the main foliage-bearing trunk, which is itself secondary.
d. primary or original tap root.
1*b*.— Cone (ten-ranked) seen in 1*a*. × ⅙.
1*c*.— Transverse section of a different cone. × ⅙. Eight sporophyllar ranks are seen. These cones vary much in size as well as in number of sporophyllar ranks, which may be odd or even. The number of sporophylls in each rank also varies.
1*d*.— Single sporophyll with ovules attached. × ⅓.
1*e*.— Pinnule showing dichotomous venation. × ½.

The cycads are widely dispersed in tropical and subtropical regions, but not usually abundant. *Zamia floridana* (Fig. 1), locally known as the coontie, occurs in thickly set clumps as underbrush in the more open pine woods of Florida, while *Z. pumila* is found more sparsely among the denser forest growths of the hammocks. The low-growing *Stangeria paradoxa* is abundant on the Natal border, and dense thickets of *Macrozamia spirali* cover wide stretches, to the exclusion of other growths, in southeastern Australia. But as a rule the cycads now play a rather inconspicuous role in forest facies, as compared with that of Mesozoic times as indicated by the fossil record. The more general type of occurrence in small open dells, as fern-like forest growths, is illustrated in the accompanying plate.

The stem consists finally in a thin zone of wood, cambium, and bast, enclosing a large medulla, and enveloped by a thick cortex, this being in the main the arrangement in all the gymnosperms and the dicotyls. But there is this difference: the cortex supports primarily the primitive outer investiture or armor of old foliar bases, which is quite persistent in some

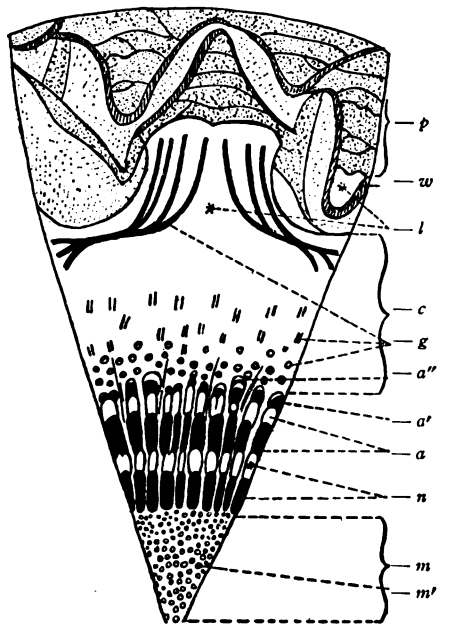


FIG. 3.— *Macrozamia Fraseri*. Transverse section of trunk × ½. (From Worsdell.) *p*, periderm in successively formed layers; *w*, wall of one of the leaf bases; *l*, leaf base; *c*, cortex; *g*, girdle leaf traces; *a″*, isolated bundle of a 3d anomalous wood zone; *a′*, 2d anomalous wood zone; *a*, 1st anomalous wood zone; *n*, normal wood (xylern dark, phloem light); *m*, medulla; *m′*, medullary bundle.

forms, but in others is more or less rapidly excised by the formation of successive layers of periderm, at first arising within the leaf-bases, and then in the cortex itself, with the casting off of thin bark. Moreover, in *Cycas*, *Macrozamia*, *Encephalartos*, and *Bowenia*, the woody cylinder does not as in the other genera remain single. After a time the primary cambium becomes inactive, and there successively arise in the cortex secondary cambiums of diminishing power and regularity. From these are produced the so-called "anomalous wood zones," which may rarely increase to a dozen.

The principal features of this second or polyxylic trunk type are shown in Fig. 3, together with the addition of a medullar system of anastamosing cauline bundles. These also occur in the pith of *Encephalartos*. The cortical bundle system is a complex one, varying greatly in the several genera, and including in part bundles or "girdle leaf traces" of a primitive concentric structure.

The cycads, unlike all vascular cryptogams, send down a primary root which continues as a tap-root. In the case of such subterranean trunks as those of certain species of *Zamia* (Fig. 1), the tap-root remains prominent, and its lateral branches are relatively small, the trunk assuming a carrot-like form. But in most genera the root system comes to be quite fila-

mentous, being largely made up of freely branching adventitious roots.

The leaves or fronds are usually of two kinds, scale and foliage. There are also the fertile or carpellary leaves of *Cycas*. All appear in terminal rosettes in the order named, scale, foliage, and when present, carpellary leaves. The scale leaves are dry and aborted foliage leaves, and are present in all but certain species of *Macrozamia*. The elliptical to acuminate foliage leaves are bipinnate in *Bowenia*, and pinnate in all the other genera. Prefoliation is direct in *Dion* and *Macrozamia*. In *Cycas* the rachis is straight, but the pinnules are circinnately rolled like those of ferns. Conversely in several other genera the pinnules lie straight along the once deflexed rachis. The pinnules, various types of which are shown (Fig. 4, plate), are of hard to leathery texture, much varying size and form, and dichotomous venation, except in *Cycas*, which has a single midvein. Those of *Stangeria* are very fern-like. The anatomical structure is much as in certain conifers and the extinct *Cordaites*.

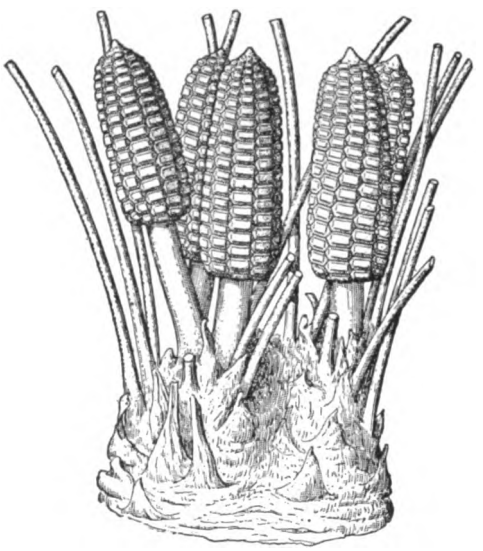


FIG. 5.— *Zamia floridana* DC. ♂ × ½. November stage of growth. Slightly bifurcate trunk bearing three staminate cones on the right and two on the left. Trunk shown with leaves removed and as if cut away on the ground level. (From Wieland.)

Fructification.— The living cycads are all diœcious. The microsporophylls are always organized into cones which may vary from a few centimetres long to enormous forms 80 centimetres long by 15 or more centimetres in diameter, bearing as many as 600 microsporophylls, these being the most massive to be seen in seed plants. Several forms of microsporophylls are shown isolated (Fig. 6, plate), and staminate cones (Fig. 5) as borne on the parent plant. The sporangia are borne on the under side of the sporophyll and are structurally much like those of *Angiopteris* among the *Marattiaceæ*. In certain genera there is an obscure grouping into sori (Fig. 6, plate, A, B, and C).

The ovules, which are the largest known in the vegetable kingdom, are in the genus *Cycas*, doubtless the most primitive type among recent phanerogams, borne on the margins of modified leaves, emergent in regular series like the ordinary foliage leaves. In the other genera the megasporophylls each bear but a single pair of ovules, and are organized into a large terminal cone, or several such cones. See illustration of principal types of megasporophylls (Fig. 7, plate). The ovulate and staminate strobili agree in general form, and in the terminal or nearly terminal position in which they are borne in all the genera. After the production of cones in plants of either sex the stem continues its growth as a sympode.

Fecundation.— Among the various primitive characters of the cycads going to prove their descent from homosporous tree-ferns, easily the most recondite is the occurrence of motile multiciliate male cells of the coiled type characteristic of all the Pteridophytes except the club mosses. Spermatozoids are doubtless common to all the cycadales and are present in gingko, but are not known in any other phanerogams. The pollen grains are drawn through the micropylar tube into the pollen chamber (by suction), after which the pollen tube ruptures the exine and enters the nuccellar tissue, where it may branch. Meanwhile spermatozoids form from the generative cells and, after the rupture of the pollen tube, swim actively to the archegonium through a liquid medium afforded in part by the tube, and probably also by extrusion from the egg-cell. The mature spermatozoids are the largest known in any plant (or animal), at least in *Zamia floridana*. In this species they are visible to the naked eye, and have been studied alive in sugar solutions. They are of nearly spherical top-shape, with a ciliferous spiral running from the apex to the middle region, and motion is mainly by means of their cilia, but there is also amœboid motion of the spiral end (see Figs. 8 and 9).

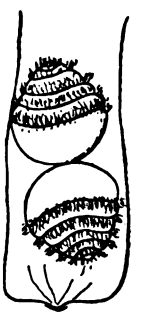


FIG. 8.— *Zamia floridana* DC. End of mature pollen tube after formation of the cilia of the two spermatozoids and just before these pull apart to swim free to the archegonia. × 50. (From Webber.)

FIG. 9.— *Zamia floridana* DC. Mature spermatozoid while swimming free. × 100. (From Webber.)

From this most primitive form of fecundation known in flowering plants, it seems evident that not until the later stages of plant evolution did the pollen tube begin to serve as a direct means of transfer of the male cells as in other phanerogams.

The seed-coats instead of being entirely woody, as in the conifers, develop a lignified inner and a pulpy outer layer. In the cone-bearing forms appression faces form, but in *Cycas* the free seeds look much like plums, those of *C. circinalis* reaching the size of goose-

eggs. The embryo is one to three cotyledonous. Structurally cycad seeds are closely analogous to those of *Gingko* and the *Cordaitales*.

Classification and Geographic Distribution.— The living cycads include 107 species divided into two families, the *Cycadaceæ*, with the single genus *Cycas* and the *Zamiaceæ*, including the other genera. The species are nearly equally divided between the New and Old World tropical and sub-tropical regions. There are four indigenous Occidental genera as follows: *Zamia*, with 37 species, ranges over the mainland from Florida, where two species occur, to Brazil, and also over the West Indies; *Ceratozamia*, with six species, and *Dion* with two, are mainly Mexican and Central American; while the monotypic *Microcycas* is Cuban. In the Orient five genera occur: *Cycas*, with 23 species, is the most notable, and ranges over Australia, the East Indies, and Japan; *Macrozamia*, with 12 species, and the monotypic *Bowenia* are both strictly Australasian: while *Encephalartos* with 20 species, and the ditypic *Stangeria* are African.

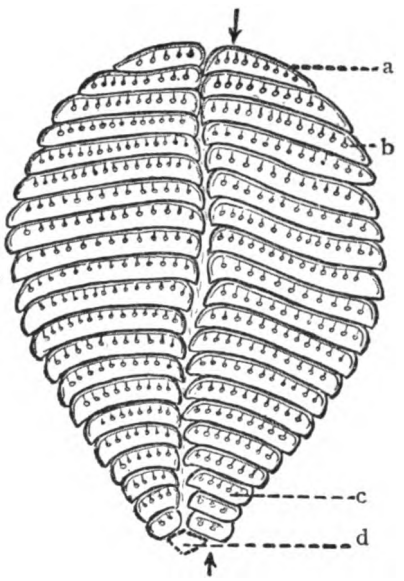


FIG. 11.—*Cycadeoidea ingens*—type specimen. Transverse section through upper portion of a single one of the yet folded crown of young fronds as fossilized when just about to emerge from the ramentum. The top side is next the centre of the trunk.

a, a pinnule cut near its summit; *b*, one of the transversely cut vascular bundles; *c*, a pinnule cut near its base; *d*, position of rachis. × 4. (From Wieland.)

Fossil Cycads.— As in the case of various unique types in the existing flora, the present isolation of the cycads is connected with a history of great extent in space and time. The living forms are only two side branches of a varied cycadalean group, of which the *Cycadaceæ* are the more ancient, characteristic leaves of the *Cycas* type having already been present in the Carboniferous limestone.

The *Zamiaceæ* were already present in the Jurassic, during which period cycadaceous types apparently culminated in both variety and extent.— Noteworthy is the occurrence of an associated leaf and fruit justly referred to the living genus *Cycas* in the upper Cretaceous (Atane Beds) of Greenland. Since Cretaceous time the northern limit of the cycads has slowly retreated from the Arctic area to its present position. A species referable to the African *Encephalartos* was yet left behind in the lower Miocene of southern Europe.

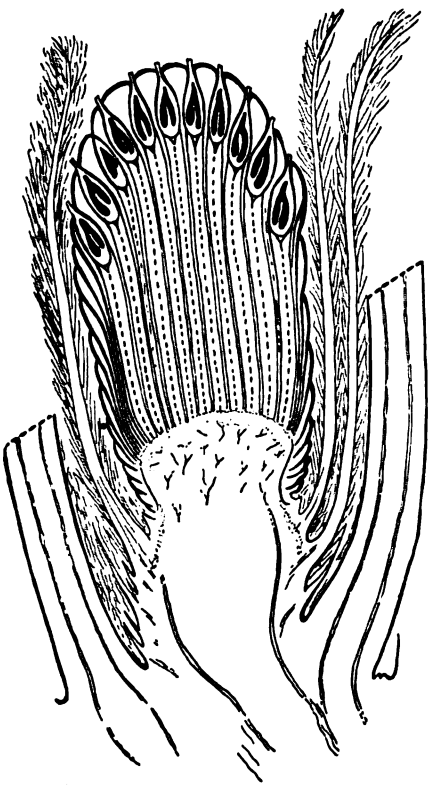


FIG. 12.—*Cycadeoidea Wielandi*. Longitudinal section through an ovulate strobilus borne on trunk 393 of the Yale collection. Exteriorly are the old leaf bases shown partly cut away. The fruit arises from the axil of that to the right. The bundle supply of the leaf bases and thick peduncle is shown, also the exterior hairy bracts. × ½. (From Wieland.)

Bennettiteæ.— In addition many cycad-like plants are known, from the Cretaceous on, which are but distantly related to the living forms. Among these the *Bennettiteæ* are of deep interest from an evolutionary point of view, and may represent a fifth great group of the gymnosperms, the Bennettitales. Interesting imprints of leaves, fruits, and stems belonging to this group are known with certainty from the Trias of southern Sweden, and the general type seems to have extended quite over the globe in Jurassic time. Beautifully silicified trunks with microscopic structure preserved have been found in considerable number in the European Jurassic and Cretaceous, also in Maryland, and more recently in the Black Hills region in uppermost Jurassic or else lowermost Cretaceous strata. The American specimens include both low-branching trunks (Fig. 10, plate) and columnar forms, and are now among the best-known of ancient plants. These trunks are usu-

ally referred to the genera *Cycadeoidea* and *Cycadella*. They possess abundant ramentum and are more fern-like than are those of the living cycads, with which there is, however, in most essentials of trunk, and especially in leaf-structure, as determined from the silicified crowns of young leaves discovered by Wieland (Fig. 11), a close agreement. But in fructification they are entirely different.

The ovulate cone is a bract-enveloped spherical to pear-shaped and small to full pear-sized body, terminating a short axillary shoot emerging laterally on the trunk from among the old leaf-bases and ramentum, as here illustrated (Fig. 12). In structure this fruit is wholly unique. The end of the peduncle expands into a fleshy convex or conical receptacle, on which is inserted, as if fused into a single body, a series of sterile scales, and fertile sporophylls. Each of the latter bears at its end a single seed with the elongate micropylar tube directed outward from between the expanded tips of the non-fertile interstitial scales, which are of such

FIG. 13.— *Cycadeoidea*. Longitudinal section through bisporangiate strobilus. Diagrammatic. At the centre is the apical ovulate cone closely invested by a zone of short-stalked ovules and interseminal scales. On the left is a single once pinnate and yet folded fertile frond of the staminate disk. On the right a similar synangia-bearing frond is arbitrarily shown in an expanded position. Exteriorly are the imbricating hairy bracts. About ¾ natural size. (From Wieland.)

evenly decreasing length from the centre of the receptacle to its periphery, as to thus form a continuous outer covering of the fruit. Basally there are sterile organs only. The ellipsoidal seeds are about three millimetres long, orthotropous, exalbuminous or nearly so, and dicotyledonous. Perhaps the nearest approach in general form among plants now living to the present type of fructification is to be seen in the peculiar ovulate strobilus of certain species of the monocotyl *Pandanus*, rather than in any known cycads whatsoever. The staminate fructification is even more noteworthy (Fig. 13). It is bisporangiate, and also a lateral bract-enveloped shoot. At the centre is an ovulate cone of the structure just described *which may in some species be functional*. In any case an earlier bisexual condition is indicated, from which both monœcious and dicœcious forms were derived. Surrounding the ovulate centre is an hypogynous staminate disk, made up in different

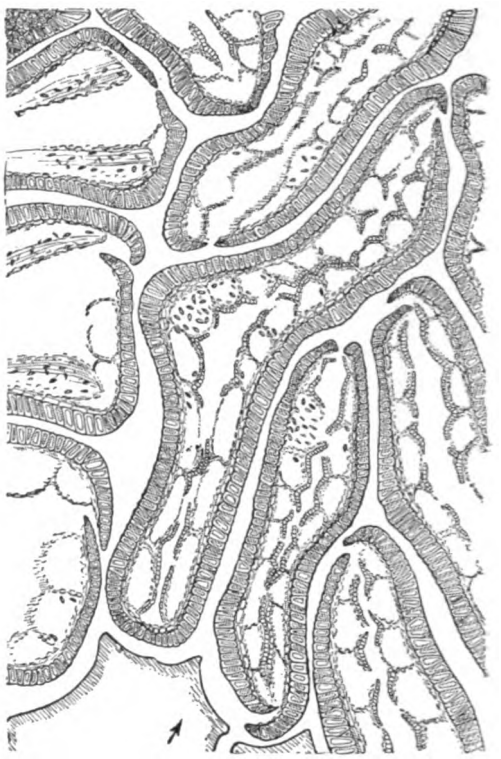


FIG. 14.— *Cycadeoidea dacotensis* Macbride. Portion of a transverse section through one of the bisporangiate strobili, cutting adjacent synangia. In the central synangium the outer covering of heavy walled prismatic cells is seen to be followed by a thin-walled layer. Adhering to this are the sporangial loculi closely ranged on each side of the synangium in two rows. Each loculus is delimited by bands of collapsed cells with adhering pollen grains, and each row of loculi is bounded on the inner side by well defined tissue a single cell in thickness, except between the angles of adjacent loculi, where there is a thickness of several cells. This layer thus bounds the two opposed inner faces of the synangium. It is usually split on the median line of the sporangia, and the striate appearance of its elongate cells when cut obliquely is indicated in several instances.

The tips of the three synangia on the left side of the figure are seen to be oriented nearly at right angles to the others, being cut very obliquely. At the lower left-hand corner portions of two transversely cut sporophylls are seen. × about 25. (From Wieland.)

species of from 12 to 20 once pinnate fertile fronds with basally adnate petioles, each frond having been once deflexed in prefloration. When fully expanded, these flowers were quite 30 centimetres in diameter, and must have been objects of great beauty. The pollen-bearing or staminate fronds are of essentially filicinian form. The pollen is borne, as explained in fuller detail (Figs. 14 and 15), in synangia nearly identical structurally with the asexual spore-bearing synangia of the living tree fern

Marattia. Thus these fossil fruits exhibit a striking intermediate condition indicative of the evolution of heterospory in these gymnosperms from some ancient homosporous marattiacean stock. Moreover, while the staminate disk surrounding the ovulate axis here indicates primarily an evolution terminating in the gymnosperms, the juxtaposition of parts is exceedingly suggestive of the possibility, if not the manner as well, of angiosperm development directly from filicinian forms.

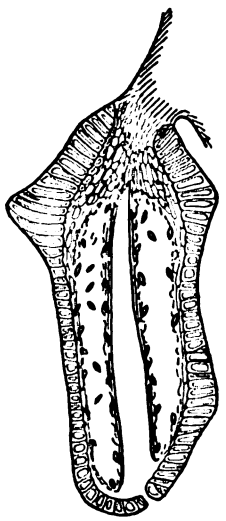


FIG. 15. — *Cycadeoidea dacotensis*. Macbride. Longitudinal section (in the narrow direction) through a synangium, showing attachment to the sporophyll, the several layers of the synangial wall, its dehiscence, the attachment of the sporangia, and the median sulcus between them. The basal buttressing of the outer wall is characteristic. Pollen grains shown enlarged. × 37. (From Wieland.)

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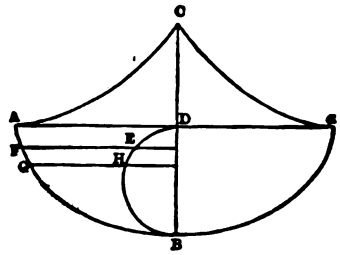
Cyclades, sīk'lā-dēz, or **Kyklades,** the ancient and likewise the modern name given to the principal group of islands in the Grecian Archipelago, now belonging to the kingdom of Greece, and formed into a separate province. The largest islands of the group are Andros, Paros, Myconos, Tenos, Naxos, Melos, and Thera or Santorin. They are situated between lat. 36° and 38° N., and lon. 24° and 26° 30′ E. They are generally mountainous, and evidently of volcanic formation. Hermopolis is the principal trade centre. Pop. about 143,828.

Cyclamen, sīk'la-mĕn, a genus of perennial herbs of the natural order *Primulaceæ*. There are about a dozen species, mostly natives of the Caucasus and the Mediterranean region, and characterized by flattish turnip-like tubers or corms, long-stemmed, more or less rounded or heart-shaped leaves, and solitary, single flowers with reflexed petals of great range of color. The best known species grown in America is *C. latifolium*, popularly known as *C. persicum*. It has produced a very large number of horticultural varieties, including some double forms, and is probably the most satisfactory window gardening plant, because of the profusion of its blossoms during many months, and also because of the simplicity of its culture. The seeds are

sown in early winter and kept steadily growing until the following winter, when they should commence to blossom; that is, in from 12 to 15 months. The roots must not be allowed to dry up like other bulb roots. The plants do not stand the heat of American summers and are therefore less popular as garden flowers than in Europe. The name sow-bread is sometimes given to the species chiefly cultivated in the United States, because swine are fond of the acrid tubers.

Cycle (Greek, *cyclos* or *kuklos*, a circle) is used for every uniformly returning succession of the same events. On such successions or cycles of years rests all chronology, particularly the calendar. Our common solar year, determined by the periodical return of the sun to the same point in the ecliptic, contains 52 weeks and one day, and one day more each leap-year. Consequently in different years the same day of the year cannot fall upon the same day of the week; for example, the year 1894 began with a Monday, 1895 with a Tuesday, 1896 with a Wednesday; but 1897, being preceded by a leap-year, began, not with a Thursday, but with a Friday. If we count only common years, it is manifest that from seven years to seven years every year would begin again with the same day of the week as the seventh year before; or, to express the same in other words, after seven years the dominical letter would return in the same order. But as every fourth year, instead of a common year, is a leap-year, this can only take place after 4 x 7, or 28 years. Such a period of 28 years is called (1) a solar cycle, and serves to show the day of the week falling on the first day of January in every year. For this purpose it is only requisite to know with what day of the week a particular year began, and then to prepare a table for the first days of the 27 following years. It is the custom now to fix the beginning of the solar cycle at the ninth year B.C., which was a leap-year, and began with Monday. If you wish to know what day of the week the new-year's day of any year of our reckoning is, you have only to add nine to the number of the year, and then, after dividing this sum by 28, the quotient gives the number of complete cycles, and the remainder shows what year of the solar period the given year is, of which the table above mentioned gives the day of the week with which it begins. But this reckoning is only adapted to the Julian calendar. In the Gregorian it is interrupted by the circumstance that in 400 years the last year of the century is three times a common year. Hence this reckoning will not give the day of the week for the first day of the year; but from 1582 (the commencement of the Gregorian calendar) to 1700 for the 11th, from 1700 to 1800 for the 12th, in the 19th century for the 13th day of the year, and so on, from which we must then reckon back to the new-year's day. Hence it is far more convenient to prepare a table for the beginning of a century (for example, for 1801, which began with Thursday), and divide by 28 the number of years from that to the given year, and with the remainder seek in the table the day of the week for the first day of the year. Besides this another cycle is necessary for the determination of festival days, by the aid of which the feast of Easter, by which all the movable feasts are regulated, is to be reckoned. Easter depends on the first full moon after the vernal equinox. (2) The lunar cycle is a period of 19 years, after which the new moon falls again on the same day of the month. On 2 Jan. 1813 there was a new moon; 2 Jan. 1832 there was a new moon again. As the time from one new moon to another, as astronomy teaches, is about 29½ days, a table of the new moons for 19 years may be very easily prepared. It is only necessary to observe that this lunar cycle always begins with a year of which the first new moon falls on the 1st of January, and that this was the case the first year B.C. Divide by 19 the number of the year plus 1, and the remainder will show what year in the lunar period the given year is. The number of the year is called the golden number. Besides these two cycles, which are indispensable for the calculations of the calendar, there are some others, several of them known by the names of periods. In China a cycle covers a period of 60 years; hence the poet, Moore, may have had in mind a definite length of time when he used the expression, "A cycle of Cathay."

Cycloid, the curve generated by a point in the plane of a circle when the circle is rolled along a straight line and always in the same plane. Imagine a circle, D E H B, which is



rolled along a straight line A D *a* in the plane of the circle itself till the point first at rest is brought to rest again, after an entire revolution. The curve A F G B *a* thus described by this point is called a *cycloid.* The circle DEB is called the generating circle; the line A D *a* on which it is described, the base of the cycloid. The length of the cycloid is four times the diameter of the generating circle, and its area three times the area of this circle. This line is very important in the higher branches of mechanics. Imagine a pendulum C B suspended by a thread in such a way that in the swinging of the pendulum between two cheeks C A, C *a*, each of which is bent in the form of a semicycloid equal to the semicycloid A F G B, the thread rolls and unrolls itself. Then the bob of the pendulum will describe the curve A F G B *a*, and the longest vibrations will be performed in the same time as the shortest, producing isochronism. The cycloid is hence called an isochrone. It is also called brachistochrone or line of swiftest descent; because it is the line in which a heavy body, falling in a direction oblique to the horizon, would pass in the shortest time between two points.

Cycloid Fishes, an order of fishes, according to the arrangement of Agassiz, having smooth, round, or oval scales, as the salmon and herring. The scales are formed of concentric layers, not covered with enamel and not spinous on the margins; they are generally imbricated, but are sometimes placed side by side without overlapping.

Cyclom'eter, an invention for measuring and recording the distance traveled by wheeled vehicles, extensively used in cycling. Its most important application is in railroading. The apparatus is connected with the wheels of a car, and by recording the number of revolutions tells on a sheet of paper inside the car the number of miles traveled. It is purely automatic, and in addition, by an attachment of extreme beauty and ingenuity, every inequality in the road-bed of a railroad is detected and located.

Cyclone (Gr. "whirling," "revolving"), a term originally applied to the violent rotatory tempests of the tropical and sub-tropical regions, called in the West Indies hurricanes; in Senegal, tornadoes; at the Cape of Good Hope, trovados; in the Chinese Sea, typhoons; and on the west coast of Central America, papagallos. The diameter of rotation of such storms is from 200 to 300 miles and sometimes exceeds 500, and the velocity of the wind, according to Humboldt, is sometimes as much as from 200 to 300 miles an hour. The centre of the storm often advances 30 miles an hour. Since the discovery of the rotatory course of winds even at a distance from the tropics the term cyclone has, however, been applied to any system of winds blowing round a centre of low pressure, and a cyclone is distinguished from an anti-cyclone, which is a system of winds with a centre of high pressure. These two system are always in proximity to one another, though their centres may be, and usually are, very wide apart. In the cyclone there is a gradual rise of barometric pressure from the centre to the circumference, in the anti-cyclone a gradual fall; in consequence of this the tendency of the winds in a cyclone is toward the centre, in an anti-cyclone it is from the centre; a cyclonic system travels in a certain direction from the region where it originates till it is dissipated or destroyed; an anti-cyclonic system generally remains in the region where it is formed, its centre only shifting about within comparatively narrow limits; the isobaric lines of a cyclone, especially near the centre, are almost circular, those of the anti-cyclone extremely irregular, and the atmospheric gradient (that is, the rate of increase or decrease of pressure) is usually greater in the former than in the latter. While the general tendency of cyclonic winds is toward the centre of the cyclone, their actual course is not directly toward that space, but spirally round it, the lines of rotation being nearly the same as those of the isobaric curves. The direction of rotation is stated in 'Buys-Ballot's Law of the Winds,' which in one of its forms is: "Stand with your back to the wind, and the barometer is lower, in the northern hemisphere, on your left hand than on your right; in the southern hemisphere, on your right hand than on your left." There are important differences in the weather accompanying cyclones and anti-cyclones, but these are so much modified by local circumstances that it is impossible to enter upon them here. Almost the only general observation that can be made on this head is that the air in a region over which an anti-cyclone hovers, especially near the centre, is very dry, and either clear or almost free from clouds. The great cyclonic area of the United States is the central Mississippi valley, notably Kansas. They are less common apparently on the east side of the river and less violent, but occur with some frequency as far east as the Alleghanies.

Cyclopædia. See ENCYCLOPÆDIA.

Cyclopean (sī-klō-pē'an) **Works,** in ancient architecture, masonry constructed with large blocks of stone unhewn and uncemented, said to be the works of a fabulous race of giants, the Cyclopes (q.v.) Some of these works were the walls of Argos, Tiryns, and Mycenæ. Similar walls are to be found in various parts of Greece, Italy, and Sicily, at Persepolis and elsewhere in Asia, and at Cuzco, Peru.

Cyclopes, sī'klō-pēz, a race of giants in the mythology of Greece. The earlier mythology makes them the sons of Uranus and Ge (Heaven and Earth). They belonged to the Titans, were three in number — Arges, Steropes, and Brontes — and had only one eye, situated in the middle of their forehead. They were cast into Tartarus by their father, and again by Cronus, but being released by Zeus provided him with thunderbolts, and became his ministers. They were slain by Apollo for having furnished Zeus with thunderbolts to kill Asclepius. Wholly different from these are the sons of Neptune, of whom Polyphemus was the chief. They are described in the Odyssey (ix. 106, et seq.) as uncouth giants, supporting themselves by the breeding of cattle. According to Homer they resided on the west side of Sicily. A later tradition describes the Cyclopes as the servants and assistants of Hephaistus (Vulcan), engaged in making the armor and metal ornaments for gods and heroes. The name Cyclopes is also given to a Thracian tribe of giants, who according to tradition built the stone works known as cyclopean (q.v.) They were named from their king Cyclops.

Cyclops, sī'klŏps, a genus of small fresh-water crustaceans, type of a family (*Cyclopidæ*) in the order *Copepoda* (q.v.). They are popularly included under the wide title of "water-fleas." Various species are common as active swimmers in fresh-water pools or slow-flowing brooks, and a few forms have been recorded from the sea. The head-region is not distinct from the first ring of the thorax; there is a pear-shaped segmented body and a long abdomen; both pairs of antennæ are long, and in the male the anterior pair form claspers. The average length of the commonest species is from two to three millimetres; the males are generally smaller than the females. A very marked feature, to which the name refers, is the single medium eye, usually bright crimson and sparkling like a gem; and not less noticeable are the two large egg-bags carried by the females. They eat both animal and vegetable matter, and are very prolific.

Cyclora'ma, a painted conspectus of a scene arranged in a circular room, so as to afford the eye a single comprehensive view. Battles have been thus presented in the United States in the form of circular panoramas, as that of Gettysburg. See PANORAMA.

Cyclostomi, sī-klŏs'to-mī (Gr. "round-mouthed"), one of the five primary divisions or classes of the craniate *Vertebrata,* also called *Agnatha, Marsipobranchii,* etc. Excluding the doubtful extinct ostracoderms, the cyclostomes have an imperfect, embryonic brain case, no lower jaw, no paired limbs or their supporting girdles, no ribs and no scales. The skeleton

is purely cartilaginous and the notochord persists in living forms. There are many remarkable structural specializations in the representatives of the three or four subdivisions, and the peculiarities of the living forms are such as to indicate that they are survivals of a once extensive group of fish-like animals; but only a single species of fossil can be referred to here with certainty. The following may be indicated as orders: *Cycliæ,* with the vertebral column well developed and, like other parts of the internal skeleton, ossified; no external skeleton and no paired limbs; the tail provided with a large diphyurcal fin supported by rays; the skull a cartilaginous capsule, with prominent ear sacs, and a large median nasal sac with a circle of cirri about its orifice; this group is represented by a single species (*Palæospondylus gunni*), from the Devonian rocks of Scotland; *Hyperoartia,* having the internal skeleton entirely unossified, with a persistent notochord and no vertebræ; body eel-like with a caudal fin; the mouth a suctorial disk, with the rasping end of a piston-like tongue appearing at its centre; the nasal sac median and its diverticulum not penetrating the palate; and seven pairs of pouch-like gill slits, which communicate with a common respiratory tube distinct from the esophagus; represented by the single family, *Petromyzontidæ,* with the principal genera *Petromyzon* (lamprey, q.v.), *Lampetra, Mordacia* and *Geotria;* and *Hyperotretra,* like the last in the characters enumerated except that the nasal diverticulum (*hypophysis*) perforates the palate and opens into the mouth and there is no separate internal respiratory tube. There are two families of this group, the *Bdellostomidæ,* with 6 to 14 gill pouches on each side opening separately at the surface; and the *Myxinidæ,* with the single genus *Myxine* (hag fishes, q.v.), in which the six pairs of gill pouches have a single common external opening on each side. To these Prof. Cope has added the great extinct group *Ostracophori* (q.v.).

Cydias, sĭd'ĭ-ăs, Greek painter: b. the island of Cythnus, one of the Cyclades. Hortensius, the orator, purchased his painting of the Argonauts for 144,000 sesterces (nearly $5,600). This same piece was afterward transferred by Agrippa to the portico of Neptune.

Cyd'nus, a river of Cilicia, rising in the Taurus, and flowing through Tarsus into the Mediterranean Sea. The mouth of the Cydnus is often choked with sand and other alluvial deposits.

Cydonia (named, it is believed, from a place called Kydon, in the island of Crete, of which this fruit is a native), a genus of fruit trees, order *Pomaceæ.* It has leafy calyx lobes, and many-seeded cells in its fruit. *C. vulgaris* is the quince; *C. japonica* is an ornamental shrub. See QUINCE.

Cygnus, sĭg'nŭs («the Swan»), one of Ptolemy's northern constellations. It includes the double star Albireo, the components of which are differently colored, one of them being orange and the other blue. The motions of the double star, 61 Cygni, have been carefully observed, and it has been estimated that the pair together weigh about one third as much as our sun.

Cylinder, the name of a geometrical solid formed by two parallel circular surfaces, called the superior base and the inferior base, and a convex surface terminated by them. There is a distinction between rectangular cylinders and oblique cylinders. In the first case, the axis, that is, the straight line joining the centre of the two opposite bases, must be perpendicular; in the second, the axis must form an angle with the inferior base. The cubic contents of a cylinder are equal to the product of the base by the altitude. Archimedes found that the solidity of a sphere inscribed in an equilateral cylinder, that is, of a sphere whose diameter is equal to the height and also to the diameter of the base of the cylinder, is equal to two thirds of the cubic contents of the cylinder. Or from another point of view it may be defined as the solid generated by the rotation of a line in a circle.

Cylindrical Lens, a lens whose surfaces are cylindrical instead of spherical, which is usually the case. A convex cylindrical lens brings the image of a source of light to a focus in a line instead of in a point. These lenses are employed in spectroscopes for examining star-spectra. They are usually planocylindrical; that is, cylindrical on one side and flat on the other.

Cylindroma. See TUMOR.

Cylon, Greek leader. He was an Athenian, who, with the intent to make himself tyrant of Athens, occupied the Acropolis, and being reduced by a blockade, was put to death by Megacles, in violation of his oath to spare him.

Cyma, sī'mą, in architecture, a wavy molding the profile of which is made up of a curve of contrary flexure, either concave at top and convex at bottom or the reverse. In the first case it is called a cyma recta; in the second a cyma reversa. It is a member of the cornice, standing below the abacus or corona.

Cymbals, among the ancients, musical instruments, consisting of two hollow basins of brass, which emitted a ringing sound when struck together. The instruments which are now used in military music, and have been borrowed from the East, seem to have taken their rise from these. They were used in the worship of Cybele, Bacchus, Juno, and other deities.

Cymbeline, sĭm'bĕ-lĭn or sĭm'bĕ-līn, British king of the 1st century. Not very much is known of his career. Shakespeare's play of 'Cymbeline' was written about 1609. A few facts about Cymbeline and his sons the dramatist took from Holinshed's 'Chronicle,' but the story of Imogen forms the ninth novel of the second day of Boccaccio's 'Decameron.' These two stories Shakespeare has interwoven; and the atmosphere of the two is not dissimilar: there is a tonic moral quality in Imogen's unassailable virtue like the bracing mountain air in which the royal youths have been brought up.

Cyme, an ancient city of Æolia, which, although styled by Strabo the largest and noblest of Æolian cities, is of little historical importance. The father of Hesiod lived here before he migrated to Ascra in Bœotia.

Cyme, in botany, a mode of definite inflorescence in which the principal axis terminates in a flower, and a number of secondary

axes rise from the primary, each of these terminating in a flower, while from these secondary axes others may rise terminating in the same way, and so on. All the flower-stalks rise to nearly the same height, so that they resemble a compressed panicle.

Cymri, kĭm'rī, or **Kymry,** a branch of the Celtic family of nations which appears to have succeeded the Gaels in the great migration of the Celts westward, and to have driven the Gaelic branch to the west (into Ireland and the Isle of Man) and to the north (into the Highlands of Scotland), while they themselves occupied the southern parts of Great Britain. At a later period (during the 5th and subsequent centuries) they were themselves driven out of the Lowlands of Great Britain by the invasions of German tribes, and compelled to take refuge in the mountainous regions of Wales, Cornwall, and the northwest of England. A part of them also crossed over into Gaul, and settled in Brittany. Wales may now be regarded as the chief seat of the Cymri (a name which the Welsh still give to themselves), as it is still the chief place where the Cymric dialect of the Celtic language is spoken. A variety of this dialect, called the Cornish, was at one time spoken also in Cornwall, and another variety, called the Armorican, is still spoken in some parts of Brittany. On account of the similarity of the name the Cymri have been identified both with the Cimbri and the Cimmerii, but the identification in both cases, especially the latter, is doubtful. The origin of the name is unknown.

Cynægirus, sĭn-ē-jī'rus, Athenian hero. At the battle of Marathon he lost his hands in attempting to prevent a Persian ship from being pushed off, and then seized the gunwale with his teeth.

Cynanchum, sĭ-năn'kŭm, a genus of *Asclepiadaceæ,* of which some species have been used medicinally, as *C. monspeliacum,* a violent purgative, the so-called Montpellier scammony, and *C. vincetoricum,* formerly in repute as an antidote to other poisons. The Indian *C. extensum* yields fibre, and the *C. ovalifolium* of Penang, caoutchouc.

Cyn'ara, a small genus of compositæ, in many respects like the thistle. The two best-known species are the artichoke (*C. scolymus*) and the cardoon (*C. cardunculus*). Both are hardy perennials, found wild in southern Europe and northern Africa. The flowers are sometimes used to curdle milk. See ARTICHOKE; CARDOON.

Cynewulf, kĭn'ĕ-woolf, Anglo-Saxon religious poet. His name is only known from its being given in runes in the poems attributed to him, namely: 'Elene' (Helena), the legend of the discovery of the true cross; 'Juliana,' the story of the martyr of that name; and 'Crist' (Christ), a long poem incomplete at the beginning. The name Cynewulf also occurs as the solution of one of the metrical riddles in the Anglo-Saxon collection. Other poems, the 'Andreas,' the 'Wanderer,' the 'Sea-farer,' etc., have been ascribed to him without sufficient grounds. Cynewulf probably lived in the first half of the 8th century. From his poems we may gather that he spent the earlier part of his life as a wandering minstrel, devoting the latter to the composition of the religious poems connected with his name.

Cynics, a school of philosophers founded by Antisthenes, a scholar of Socrates, at Athens, about 380 B.C. This philosophy was a one-sided development of the Socratic teaching by Antisthenes and his followers, who looked only to the severer aspect of their master's doctrines, and did not see or did not rightly appreciate the way in which the seeming severity of the teaching of Socrates was corrected by the genial character of the man himself. An equally one-sided attention to the other aspect of the practical philosophy of Socrates, as exhibited in his own life, gave rise to the opposite teaching of Aristippus and his followers. There were, nevertheless, some noble features in the doctrines of the Cynics. They made virtue to consist in self-denial and independence of external circumstances, by which, as they thought, man assimilates himself to God. This simplicity of life, however, was soon carried so far by the Cynics that it degenerated into carelessness, and even neglect of decency. In their attempts at living conformably to nature they brought themselves down to the level of savages, and even of brutes. No wonder, then, that the Cynics soon became objects of contempt. The most famous of their number were, besides their founder, Diogenes of Sinope (412 to 323 B.C.), Crates of Thebes (about 328 B.C.), with his wife Hipparchia, and Menippus (about 60 B.C.), who was the last of them. After him this philosophy merged in the Stoic, a more worthy and honorable sect. See CYRENAICS.

Cynips, the gall-fly; a genus of insects belonging to the order *Hymenoptera,* the sub-order *Petiolata,* section *Parasitica,* and family *Cynipidæ.* They are a kind of small flies remarkable for their extremely minute head and large, elevated thorax. The females are provided with an ovipositor by which they make holes where they deposit their eggs in different parts of plants, thus producing those excrescences which are known as galls. In these excrescences the small larvæ are produced, which live there either singly or several of them together for five or six months, and consume the interior for their nourishment. Some of the species undergo their transformations before leaving the excrescences, others quit them and bury themselves in the earth, to undergo their transformations there. The *C. gallotinctoria* is of a pale fawn-color, and lives on a species of oak which grows in the Levant, where it produces the so-called gall-nuts, which yield a black coloring matter, and are used in the making of ink. The *C. rosæ,* or bedeguar gall-fly, produces the hairy excrescences which are seen on the rose-bush and the sweet-brier. It is black, with the exception of the feet and the abdomen, which are red. The *C. psenes* is used in the Levant for caprification, an operation intended to hasten the maturity of figs. (See CAPRIFICATION.) Some species of gall-flies, such as the *C. fulviceps* and the *C. quercus-inferus,* have in some cases been produced from aphides instead of in the ordinary way from galls.

Cynocephalus, sī-nō-sef'a-lŭs (Gr. "dog-head"), a genus of monkeys including the various species of baboon (q.v.).

Cynodictis, sī-nō-dĭk'tĭs, a genus of primitive *Canidæ* (see Dogs, Fossil) of the Oligocene Epoch in Europe and America, a collateral ancestor of the modern dog family. It was of weasel-like proportions, with long tail, small brain, civet-like teeth and other primitive characters. Most of the species were small.

Cy'nodon Dac'tylon, Capriola Dactylon, Bermuda or **Bahama Grass,** a low, creeping, perennial grass found in most warm and tropical countries, where from its drought-resisting capacity it is used as a common pasture grass. It has delicate leaves and upright, leafy flowering branches which bear three to seven slender divergent spikes. Three of the four species are Australian. In the United States it is dispersed from Pennsylvania to Florida and westward to Texas and California, being hardy from Philadelphia southward. It grows freely on poor, sandy soils, but the leaves are short; on good soil it will grow one or two feet high. It will grow on almost any soil, if not too wet. Its root-stock runs readily, thus making it a valuable grass for binding drifting sands and for holding embankments liable to wash. Being insensible to heat and drought it soon makes a fine sod equally useful for grazing or for a lawn. It is also used for hay and is in bloom from April to October. It will not grow in the shade and it is easily injured by low temperatures, turning brown with the first frosts. It rarely bears seed, except in the extreme Southern States. The usual method of propagation is to chop up the roots, sow them broadcast and plow in, shallow. Once introduced it is hard to get rid of, but it has been eradicated by constantly plowing the land every week or so, or growing oats, followed by cowpeas in rows, which could be cultivated. Its rhizome is used in medicine, as a substitute for sarsaparilla. The plant is a favorite food of the wild goat, hence the name *Capriola.*

Cynoglossum, hound's-tongue, a genus of plants of the natural order *Boraginaceæ,* consisting of about 75 species of coarse herbs of wide distribution in temperate climates. The flowers form scorpioid racemes, as in the allied comfrey and forget-me-not, and are of a reddish color. Five species are found in America, the best known being hound's-tongue *C. officinale*). This genus is found in waste places from Quebec to Minnesota, and south to Kansas and North Carolina. It has a disagreeable smell like that of mice, and was at one time used as a remedy for scrofula. It is a troublesome weed, native in Europe and Asia. Another well-known species is *C. virginicum,* wild comfrey, which grows from New Brunswick south to Florida, and west to Louisiana and Kansas.

Cynomo'rium, a genus of parasitic plants, the best-known representative of which is *Cynomorium coccineum,* a fungus-like plant, found in the islands of Malta and Gozo. It was long known as *Fungus melitensis,* and enjoyed the highest reputation as a styptic, besides being used as an astringent in dysentery and other maladies. These uses, however, depended on the doctrine of signatures alone, its scarlet color and blood-like juice being interpreted as providential indications of its curative destination for all injuries or diseases accompanied by bleeding. It was jealously guarded by the Knights of Malta.

Cynosarges, sī-nō-sär'jēz, in ancient Athens, originally the name of a sanctuary of Hercules and a gymnasium in the east of the city, afterward extended to the suburb of Athens surrounding the gymnasium. It was in this gymnasium that Antisthenes, the founder of the Cynics, taught.

Cynoscephalæ, sĭn-ŏs-sĕf'ą-lē (Gr. signifying dogs' heads), the name of a range of hills in Thessaly, memorable for two battles fought there in ancient times. The first was 364 B.C., between the Thebans and Alexander of Pheræ, in which Pelopidas was slain; and the second, 197 B.C., in which the last Philip of Macedon was defeated by the Roman consul Flaminius.

Cynosure, sĭn'ō- or sī'nō-shūr, or **Cynosura,** an old name for the constellation of the Little Bear or Ursa Minor, which contains the pole star in the tip of the tail. Cynosure, in a figurative sense, is hence used as equivalent to something which attracts general attention or draws all eyes toward it. The word literally means dog's tail.

Cynosu'rus, a genus of grasses. See Dog's-tail Grass.

Cynthia, the moon; a surname of Artemis or Diana, the moon goddess. In mythology Mount Cynthus, on the island of Delos, is said to have been the birthplace of Diana.

Cynthiana, sĭn-thĭ-ā'nạ, Ky., city, county-seat of Harrison County, on the south fork of the Licking River and on the Kentucky Central Railroad; 33 miles northeast of Lexington. It is a trade centre for farming and stock raising, and is the seat of Harrison Female College. It has carriage, plow, and cigar factories, distilleries (noted for their Bourbon whiskey), good schools, public library, two national banks, and several newspapers. Pop. (1900) 3,257.

Cynthius, surname of Apollo, the sun god, from Mount Cynthus, on the island of Delos, at the foot of which he had a temple, and on which he was born. Diana, his sister, is called Cynthia.

Cyperaceæ, sī-pē-rā'sē-ē, a natural order of monocotyledonous plants including 2,000 species. These herbaceous plants generally grow in moist places on the margins of lakes and streams, with a cylindrical or triangular culm with or without knots; the leaves are sheathing. The order comprises the genera *Carex, Scirpus, Cyperus, Schœnus, Mariscus, Papyrus,* and others.

Cyperus, sī-pē'rus, a genus of perennial herbs of the natural order *Cyperaceæ* (q.v.). The numerous species which are natives of tropical and temperate climates are characterized by having rootstocks or tubers, grass-like leaves, simple stems sparsely leafy below, perfect flowers in small compressed spikes which are arranged in compound umbels with numerous more or less attenuated bracts which have suggested the popular names umbrella plant and umbrella palm, which are perhaps most frequently given to *C. alternifolius.* This species is a very popular window garden and greenhouse plant, native of Madagascar. It is readily propagated by means of seed or by division of the larger plants and is easily cultivated in any good potting soil kept moist. It does best in a moist atmosphere. Many of the species are troublesome weeds in cultivated fields; some

are useful for food, their underground parts being starchy and mucilaginous; the tubers of others are used in perfumery. The chufa (*C. esculentus*) is valued in the Southern States for its tubers, upon which swine thrive well. Papyrus (q.v.) is the product of *C. papyrus*. Some species have been used in medicine but are now rarely employed.

Cy-près, sē prā (Fr. "as near," namely, as possible), the principle in the American and English law whereby a gift legal in form, which cannot be administered exactly as the testator specified, or which is not definitely specified, may be applied as nearly as possible like what was intended by the donor. In the United States the majority of cases wherein the cy-près doctrine is applied comes under charitable bequests on gifts for the advancement of education. In the United States it is held that the equity courts cannot make valid charities which are uncertain, but where charitable trusts have once been in part administered as directed by the testator, such action will prevent the trust from being defeated by change of circumstances. Where only a general charitable intention is expressed, as, relief of the poor, aid for the injured, under the cy-près doctrine the court of chancery may direct the disposal of the gift to some form of charity "as nearly as possible" like that mentioned or indicated by the testamentary gift of the testator. The laws based on the cy-près doctrine vary in different States. For further ways in which the cy-près doctrine is applied see ESTATE; FEE TAIL.

Cypress, the popular name for members of the genus *Cupressus* and for certain species of the related genera, *Taxodium* and *Chamæcyparis*, all of which belong to the natural order *Coniferæ*. There are about a dozen species of *Cupressus*, which are trees or sometimes shrubs with small aromatic, evergreen opposite leaves and tiny monœcious solitary flowers, the pistillate developing into almost globular cones containing numerous seeds which mature the second season. The best-known species is probably the common European cypress (*C. sempervirens*) which has been introduced into the United States. It is a stately tree of about 80 feet, of remarkable longevity, and of wide utility principally on account of its remarkably durable wood, which is highly resistant to the attacks of insects. It is yellowish or reddish, hard and dense and is used in cabinet work and in the making of musical instruments. Some writers believe it is the "cedar" and also the "gopher" wood mentioned in the Bible. *C. tortulosa* is probably the tallest species; it is a native of the Himalayas and attains a height of 150 feet. The hardiest species and perhaps the one most frequently planted is *C. macnabiana*, a bush with several small trunks or a small, dense, pyramidal tree of about 20 feet. It is a native of California, where it is very popular in private grounds and public parks. Another popular Californian species is *C. macrocarpa*, generally known as the Monterey cypress. It usually grows about 40 feet tall but occasionally nearly doubles that height. It thrives well even upon poor soils and makes a rapid growth under favorable conditions, but is more susceptible to frost than the preceding species. Numerous horticultural varieties of diversely colored foliage, and varying habit and height have been developed. *C. funebris*, a native of China, ranks about with the last-mentioned species in hardiness, rather excels it in height and is frequently planted on account of its wide-extending, pendulous branches and twigs. The cedar of Goa (*C. lusitanica*) is of unknown habitat but is frequently planted in southern Europe.

The bald or deciduous cypress (*Taxodium distichum*, formerly called *Cupressus disticha* and *Schubertia disticha*) is one of the most valuable of American timber trees, its straight and close-grained, soft, brown wood being highly esteemed where exposure to moisture is expected and where durability but not great strength is demanded. It is very largely used in greenhouse construction. Its range is from Delaware to Missouri and southward to the Gulf States and is especially abundant in swamps, but will thrive with a more or less noticeable change of habit in dry ground. It is a highly ornamental tree often 150 feet tall and sometimes more than 10 feet in diameter, with buttressed trunk, brown, flaky bark, erect or spreading branches bearing narrow light green leaves, purplish staminate flowers and nearly globular cones. The spread of the branches in old specimens is often more than 80 feet. It has developed a large number of horticultural varieties and is very popular as a park tree as far north as New York, about its northern limit of hardiness. In the southern swamps the trees develop "knees" from their roots. These knees, which are sometimes 10 feet tall, are supposed to act as aërators, but their function is not definitely known. When fully developed their tops are above high-water level.

The species of *Chamæcyparis* best known as cypress are *C. obtusa*, the hinoki cypress, and *C. pisifera*, the Sawara cypress. *C. lawsoniana*, the Orford cedar, was formerly known as *Cupressus lawsoniana*. It is a native of the Pacific coast States; the other two are natives of eastern Asia. They attain heights of about 100 and 120 feet respectively, have developed numerous horticultural varieties and are frequently planted in parks for their ornamental foliage and graceful habit of growth. See CEDAR.

Cypress Vine. See IPOMŒA.

Cyprian, sĭp'rĭ-ăn, **Saint (Thasius Cæcilius Cyprianus),** African bishop, martyr and one of the fathers of the Church: b. about 200; d. Carthage 14 Sept. 258. He was of patrician parentage, and inherited a considerable estate. Having received the highest education he professed rhetoric with eminent success in Carthage and in his school held disputations with representatives of the schools of philosophy and with believers in the Christian religion, with the result that he applied for admission in the Church. Shortly after being baptized (246) he was ordained priest and then was elected by the Christians of Carthage to be their bishop (248). In the persecution of the Christians by Decius (249–51) he prudently withdrew from Carthage and lived in concealment, but on the accession of Gallus (251-3) he returned to his see. There had been lively controversies among the churches over the question of readmission to the Christian communion of those who in times of persecution had renounced the religion of Christ; churches in Asia Minor and churches in Africa, among them the church

of Carthage, had in synods and in the letters addressed by their bishops to other bishops, strongly condemned the practice of some churches, among them that of Rome, in accepting as valid the baptism conferred by heretics. On the question of readmitting the *lapsi* to communion Cyprian favored leniency: he would readmit the fallen on proof of sincere repentance. But he would not acknowledge the validity of baptism conferred by an heretical minister. On this point he was at variance with the tradition and practice of the Church of Rome, and in support of his view he sent to Pope Stephen the acts of a synod of Carthage in which the invalidity of baptism conferred by heretics was declared. Pope Stephen replied that the tradition of the Church was opposed to this and bade Cyprian not to innovate, but to recognize as true and valid baptism administered by heretics if given in the name of the Trinity. Firmilian, a contemporary, states that Stephen threatened Cyprian with excommunication. To the threat the bishop of Carthage replied with great heat, but in the entire controversy on rebaptism he never calls the authority of the Pontiff in question, although he laments what he calls the injustice of the decision. In this controversy the final decision of the Roman Catholic Church was in favor of Stephen: that decision was rendered in the Council of Arles (314) and in that of Nice (325). In the reign of Valerian a new persecution of the Christians was decreed, and Cyprian being arrested and brought before the proconsul refused to sacrifice to the gods and was beheaded 14 Sept. 258; his day in the Roman calendar is 16 September, which day he shares with Pope Saint Cornelius.

Cyprinidæ, sĭ-prĭn'ĭ-dē, a family of fishes (the minnows) of the order *Plectospondyli.* The body is covered with cycloid scales, the head naked; the mouth is toothless and the maxillary bone does not enter its margin; the lower pharyngeal bones are large, elongated and bear one, two, or three series, of a few teeth each; the dorsal fin is short and there is no adipose fin. The intestine is usually normal, but one genus (*Compostoma*) is unique in having its coils passed around the swim bladder. The number of genera and species is estimated at 200 and 1,000 respectively, and in point of numbers they are the most important fresh-water fishes of Eurasia and North America, swarming in every brook, river, and pond. Some of the Old World species reach a large size but the American ones are mostly very small, only a very few ever exceeding a foot in length. They have little importance commercially, but are vastly important in nature, as they furnish the food supply of larger fishes, many birds, etc. Sexual dimorphism is very generally displayed during the breeding season in the spring, when the males become ornamented with epidermal warts and tubercles on the head and elsewhere, and their fins become bright red, yellow, or silvery. Thirty-five genera and about 250 species are recorded by Jordan and Evermann as belonging to the North American fauna. Among them are the different varieties of minnows, dace, shiners, chub, and roach (qq.v.).

Cyprinodon'tidæ (Gr. «carp-toothed»), a family of fishes, order *Malacoptera,* sub-order *Abdominalia.* Although the dentition of the family resembles that of the carp, the jaws are more retractile and toothed. *Fundulus* is the most prominent genus of the family.

Cypripedium, a genus of plants of the natural order *Orchidaceæ.* The genus has about 40 species, 10 of them occurring in North America, and known generally as lady's-slippers. In medicine the term is applied to the rhizomes and rootlets of several species of *Cypripedium.* The root contains a volatile oil, tannic, and gallic acids, and is used as a mild antispasmodic, for much the same purposes as valerian.

Cy'pris, a fresh-water crustacean, typical of the *Cyprida,* of the order *Ostracoda.* It is sometimes called water flea, and has an unsegmented body, seven pairs of appendages, a rudimentary abdomen, and a bivalve enclosing all. The shell is dainty and elastic; the posterior antennæ bear a long tuft of bristles on their second joint; the second pair of maxillæ have a small gill-appendage; and the posterior limbs are very irregular. *C. pubera,* the largest form, measures about one tenth of an inch. Some species, including *C. fusca* and *C. pubera,* reproduce by parthenogenesis in summer and autumn, the males being transient; while others, notably the *C. ovum,* the males are found throughout the year, and parthenogenesis seems not to occur. The eggs are usually laid in masses on stones and water-plants. The adults are said to be able to survive desiccation, and this is true of the eggs. Some species are very abundant as fossils in fresh-water strata.

Cyprus, an island under British control, lying south of Asia Minor, and the most eastern in the Mediterranean, near the mouth of the Bay or Gulf of Iskanderun. Stretching from southwest to northeast, it is about 148 miles long, with a width varying from 100 miles to 15 miles at a narrow peninsula in the north. Area 3,584 square miles. The main physical features of Cyprus consist of a range of mountains running along a large part of the northern coast, and a range parallel to it occupying a considerable part of the island on the south, with a broad tract of plain, called the Messaria, between, extending on either side to the sea. The second range culminates in Mount Troödos (6,406 feet). Cyprus is deficient in water, its streams being chiefly mountain torrents, which dry up in summer. The climate is in general healthy, excepting in various places during the heats of summer, which, causing a rapid evaporation, give rise to malarial fever. The forests were formerly very extensive, and in ancient times yielded wood much valued by the Phœnicians for ship-building, but owing to indiscriminate cutting, the depredations of goats, etc., they now cover a comparatively small area, with the result that the fertility of much of the soil has been impaired. The forests are now under government supervision, and eucalypti, pines, and other trees are being planted. Agriculture is in a rather backward state, but various vegetables are raised. The cultivation of the vine and the production of wine is increasing, most of it being sent to Egypt and France. Much mischief is sometimes done by locusts, but measures have been taken, under the supervision of the government, by

which their numbers have been greatly diminished in recent years. The extensive pasture lands of the island support numbers of sheep and goats. Cyprus possesses much mineral wealth, and in early times was celebrated for its copper, a metal the English name of which can be traced to that of this island. The copper is again being worked, as are also quarries of sandstone, marble, granite, limestone, etc. Salt in large quantities is obtained from works at Limasol and Larnaca. The sponge-fishery is of some importance. In addition to wine the chief articles of export are carobs, cotton, silk cocoons, cereals, raisins, skins, wool, cheese, and fruits. The imports are cottons and other manufactured goods. Education is being attended to by the government and about $22,000 is expended annually in government grants, three fourths to Christian and the remainder to Moslem schools. There are five high schools and fully 300 elementary schools. Roads and telegraphs have been constructed throughout the island, but there are no railroads. Cables connect it with Syria and Egypt. About one fourth of the people are Mohammedans, the rest are mostly members of the Greek Church.

The Phœnicians established themselves in Cyprus about 1100 or 1200 B.C. Greek colonists followed later; and for a time it was under Assyria. The Phœnicians introduced the worship of Astarte, which afterward passed into that of the Greek goddess Aphrodite (Venus). Amasis brought the island under the Egyptian yoke, 550 B.C. In 525 B.C. it was subdued by Cambyses and annexed to the Persian empire, but it again became a dependency of Egypt under Ptolemy Soter toward the end of the 4th century B.C. In this condition it remained till the year 57 B.C., when it was made a Roman province. After the division of the Roman territories Cyprus continued subject to the eastern empire. In 1182 Isaac Comnenus, a prince of the imperial family of Constantinople, made himself independent, but the island was wrested from him in 1191, during the third Crusade, by Richard I. of England, who afterward bestowed it upon Guy of Lusignan on condition of his renouncing his claim to the title of king of Jerusalem. After the extinction of the legitimate male line of Lusignan, James, an illegitimate descendant, became the ruler. His wife was a Venetian (Catharine Cornaro), and as she had no children, at his death the Venetians took advantage of this circumstance to make themselves masters of the island (1489). They enjoyed the undisturbed possession of it till 1571, when, in the reign of Selim II., notwithstanding a brave resistance on the part of Marco Antonio Bragadino, who defended Famagusta 11 months, it was conquered by the Turks and annexed to the Ottoman empire. In 1830 it was taken by the viceroy of Egypt, but was retaken by the Turks in 1840, and retained by them till June 1878, when it was ceded to Great Britain by the Convention of Constantinople, concluded during the negotiations consequent on the Russo-Turkish war of 1877–8. It still nominally forms a part of the Turkish dominions, the agreement being that it should be administered by Great Britain so long as Russia should retain possession of Batoum and Kars. Great Britain was also bound to pay a subsidy to the Porte, which amounts annually to £92,868. It is not paid directly, however, but retained as an offset against British claims against Turkey. In 1882 a new constitution was framed by the British government for Cyprus. By this a legislative council consisting of 12 elected and 6 official members is appointed, and is presided over by the high commissioner. Of the 12 elected members 9 are Christians and 3 Mohammedans. The yearly budget is laid before the council, and no new tax is to be imposed or existing tax increased without the vote of the council. Control is, however, reserved from the council over such permanent charges on the revenue as the amount of tribute payable to Turkey, the salaries of the high commissioner, judges, the official members of the council, etc. To provide for special emergencies and matters of international concern, power is reserved to the British sovereign to legislate for the island by order in council. The island is divided into six districts, each presided over by a commissioner, and each having a district court. In recent years a vast quantity of interesting archæological objects have been found in Cyprus. Pop. about 300,000.

Cypsel'idæ. See SWIFT.

Cyrano de Bergerac. See BERGERAC, CYRANO DE.

Cyrenaica, sĭr-ē-nā'ĭ-ka, anciently a Greek state in the north of Africa, west of Egypt, comprising five cities (Pentapolis), among which was Cyrene, a Spartan colony. During the most flourishing period of the history of the city of Cyrene that town held in nominal subjection the whole of Cyrenaica, or the country lying between Carthage on the west, Egypt on the east, and Phazania (Fezzan) on the south, with the Mediterranean for its northern boundary. But the Greek colonists actually occupied no more than the elevated district in the north, now called Jebel Akdar, along with the adjacent coast. Cyrenaica remained independent at first as a monarchy under a dynasty of kings, the successors of Battus, who led the first colony to Cyrene, afterward as a republic, until it was subdued by Ptolemy, the son of Lagus, and annexed to Egypt 321 or 322 B.C. By the will of the last king of Cyrenaica belonging to the Ptolemaic dynasty, it was left to the Romans, 95 B.C., who, about 20 years later, erected it along with Crete into a Roman province. Under Constantine it was separated from Crete and made a province by itself. See CYRENE.

Cyrenaics, or **Cyrenians,** a sect of ancient philosophers, whose founder was a disciple of Socrates, being Aristippus, a native of Cyrene, in Africa, after which city his followers were called. His great maxim was, that a man ought to control circumstances, and not be controlled by them. He held that the sum of life was made up of pleasure and pain; the one to be sought after as good, the other to be avoided as evil. The chief good then, was the greatest number of agreeable perceptions; and the true philosopher the man who actively and successfully pursued pleasure. Every act was regarded as morally indifferent, and only to be viewed as it produced pleasure or pain to the individual. The chief successors of Aristippus were Theodorus, Hegesias, and Anniceris, each of whom became the founder of a sect known respectively as the Theodoran, Hegesian, and Annicerian schools. As cynicism was the forerunner of

stoicism, so cyrenaicism paved the way for epicureanism, which constitutes its chief merit.

Cyrene, sī-rē'nē, in Greek mythology, the daughter of Peneus, who was carried by her lover Apollo into Africa, and gave name to that part called Cyrenaica.

Cyrene, in ancient times a celebrated city and the capital of Cyrenaica, in Africa, about 10 miles from the north coast, founded by Battus and a body of Dorian colonists, 631 B.C. Numerous interesting remains have been discovered here, including a bath, two temples (supposed to be of the Roman period), and a magnificent necropolis, containing grottoes, façades, and monuments of various kinds. In one of the grottoes are several curious paintings. Cyrene was the birthplace of Aristippus, Carneades the philosopher, Eratosthenes, and Callimachus the grammarian. The town now occupying the site of the ancient Cyrene is a miserable place in the regency of Tripolis. See CYRENAICA.

Cyre'nius, a Greek form of Publius Sulpicius Quirinus, named in Luke ii. as governor of Syria. He received his appointment as governor in 6 A.D., but the difficulty in harmonizing this with Luke is obviated by admitting that he had been governor also at an earlier date — according to Zumpt, from 4 B.C. to 1 B.C.

Cyril, sĭr'ĭl, **Saint,** patriarch of Alexandria, and one of the fathers of the Church: b. Alexandria 376; d. there June 444. He was patriarch of Alexandria from 412, when he succeeded to his uncle Theophilus in that station, till his death. He was a very zealous champion of orthodoxy and a fiery adversary of Nestorius, Eutyches, and all the heresiarchs and heresies of his time. So intemperate was his zeal for orthodoxy and for the extermination of dissent from the creed of Nicæa, Chalcedon, and Constantinople, that it has brought down upon him the animadversion of some modern Church historians and has given material for historical novels in which imagination fills in what was lacking in the portrait of Saint Cyril drawn by his contemporary adversaries. Among modern Protestant writers Dean Milman in his 'History of Latin Christianity' presses against him charges of barbarity, persecution, and bloodshed, on account of which Cyril, though styled saint, must be esteemed "one of the worst heretics against the spirit of the gospel." He is charged with having closed the churches of the Novations and seized their church property; with having with an armed rabble wrecked the synagogues and driven the Jews in thousands out of the city; with having excited such tumults that the authority of the governor of Egypt, Orestes, was for a time defied. The murder of the illustrious Hypatia, neo-platonist philosopher and adversary of the Christian Church, is not alleged to have been instigated by him, but it is regarded as the inevitable sequel to his violent acts and speeches; and the perpetrators of it were, it is alleged on the authority of contemporaries, "officers of his Church." It is further charged that he was attended at Ephesus, on the occasion of the council of the Church held there in 431, by a rabble of followers, presumably to overawe the fathers, over whom he himself presided: in that council he procured the condemnation of Nestorius, followed by deprivation and banishment by the emperor. The works of Cyril, in the edition published at Paris in 1638 (7 vols.) consist of commentaries, treatises, homilies, and epistles. Cyril holds high rank among the Church fathers as a theologian.

Cyrillus and **Methodius,** apostles of the Slavs. They were brothers, and natives of Thessalonica. Cyril was the name adopted as a monk by Constantine, b. 827. For his learning he was surnamed "the philosopher." The Khasars, a Tartar people, having about the year 860 asked the Emperor Michael III. to send them Christian missionaries, Cyril was sent and made many converts. The Bulgarians of Thrace and Mœsia were evangelized by Methodius, who baptized their king Bogoris in 861. At the request of Ratislav, Duke of Moravia, the brothers then turned to the countries on the March and Danube. They prepared a Slav translation of the Scriptures and chief liturgical books (which became the foundation of the literature of the Slavs), and by their services in the mother-tongue won the hearts of the people from the Roman missionaries. The two brothers were summoned to Rome to explain their conduct, in conducting services in the vernacular, and Cyril died there in 869. Methodius, who in the same year was consecrated bishop of the Moravians, completed the evangelization of the Slavs. Called to Rome in 879 to justify his celebration of the mass in the native tongue, he succeeded in gaining the approval of Pope John VIII., and (according to the most probable account) d. Hradisch on the March 6 April 885. Bohemia and Moravia celebrated the millenary festival of their two apostles on 5 July 1863. Both brothers are recognized as saints by the Roman Catholic Church. Their festival falls in the Roman Catholic Church on 9 March; in the Greek Church 11 May. The Cyrillic alphabet, modified out of the Greek by Cyril, superseded the more ancient Slavonic alphabet over a wide area. The history of Cyril and Methodius is still very obscure. See Ginzel, 'Geschichte der Slawenapostel Cyril und Method' (1857); Dümmler and Miklosich, 'Die Legende vom Heiligen Cyril' (1870).

Cyril of Jerusalem, Saint, Greek father of the Church: b. Jerusalem about 315; d. there about 386. After his ordination to the priesthood in 345 his special office was to instruct the catechumens, both those who were to be prepared for admission to the Christian communion through baptism and those who after baptism were to be inducted into knowledge of the mysteries of the Christian religion, especially the mystery of the Eucharist. This occupation led to his writing his book of 'Catecheses,' one of the most interesting monuments of the ecclesiastical literature of that time. He was made bishop of Jerusalem in 350. Twice he was deposed and sent into exile by imperial decree because of his unflinching zeal for the creed of Nicæa as against the Arian party, first in the reign of Constantine II. and then in that of Valens. On the accession of Theodosius in 379, he was restored to his see and there remained till his death. At the ecumenical council of Constantinople (381) he was received with acclamations by the fathers as a confessor of the faith who had gladly suffered persecution

for the truth's sake. His 'Catecheses,' or catechetical lectures are 23 in number, of which 18 are for the instruction of catechumens in the stage of preparation for baptism, while the remaining five, called the 'Catecheses Mystagogicæ,' treat, as their title imports, of the mysteries of the Christian religion. The work, translated into English, is one of the volumes of the Oxford 'Library of the Fathers.'

Cyrilla, a genus of shrubs consisting of one variable species, *C. racemiflora,* of the natural order *Cyrillaceæ.* The shrubs are found from the Carolinas westward to Texas and southward to Brazil. They are almost evergreen, and have attractive bright green leaves and white flowers in racemes. Popularly they are known as leatherwood and are sometimes seen in ornamental plantings as far north as New York, which is about the limit of their hardiness. They succeed best in moist, sandy soil and partial shade.

Cyrillian Letters, a kind of Slavonian alphabet, more properly called Kirillitsa, used in Russia, Servia, and Bulgaria, with some modifications. Tradition makes them the invention of St. Cyril in the 9th century, but modern research points toward the fact that the name was originally used of the rival alphabet, the Glagolitic or Glagolitsa. But the form now known as Cyrillian is much nearer the modern alphabet of the three Slavic peoples mentioned.

Cyrus, king of Persia: d. 529 B.C. The only ancient original authorities for the facts of his life are Herodotus and Ctesias. According to Herodotus he was the son of Cambyses, a distinguished Persian, and of Mandane, daughter of the Median king Astyages. He founded the Persian monarchy. A short time before his birth the soothsayers at the court of Astyages divined from a dream of his that his future grandson was to dethrone him. Upon this he gave orders that Cyrus should be destroyed immediately after his birth. For this purpose he was delivered to a herdsman, who, moved with compassion, brought him up, and named him Cyrus. His courage and spirit betrayed his descent to the king. The Magi having succeeded in quieting the uneasiness which the discovery occasioned him, he sent Cyrus to his parents in Persia, with marks of his favor. But Cyrus soon drew together a formidable army of Persians, and conquered his grandfather (559 B.C.), and thus became king of Media and Persia. In 546 he conquered Crœsus, the rich and powerful king of Lydia, and in 538 took Babylon after a siege of two years. He also subdued Phœnicia and Palestine, to which he caused the Jews to return from the Babylonish captivity. While Asia, from the Hellespont to the Indies, was under his dominion, he engaged in an unjust war against the Massagetæ — a people of Scythia, northeast of the Caspian Sea, beyond the Araxes, then ruled by a queen named Tomyris. In the first battle he conquered by stratagem, but in the second was defeated, and was himself slain (529 B.C.). The stories related by Xenophon in the 'Cyropædia' (professing to be an account of the life and character of Cyrus), that he received a splendid education at the court of Astyages, inherited his kingdom, and ruled like a genuine philosopher, are mere romance, Xenophon's design being to represent the model of a king, without regard to historical truth, and in this way perhaps to exhibit to his countrymen the advantages of a monarchy. The chief points in which the account of Ctesias differs from that of Herodotus are that Ctesias does not make Cyrus any relation of Astyages, that after the conquest of Media Cyrus married Amytis, the daughter of Astyages, and honored the latter as a father, and that he met his death in a battle with a nation called the Derbices, who were assisted by the Indians. Ctesias also mentions certain wars of Cyrus not related by Herodotus, and gives a somewhat different account of the war with Crœsus, king of Lydia.

Cyrus, called the Younger, king of Persia: b. about 424 B.C.; d. 401 B.C. He was the second son of Darius Nothus, or Ochus, and at 15 obtained the supreme power over all the provinces of Asia Minor. His ambition early displayed itself; and when, after his father's death (404 B.C.), his elder brother, Artaxerxes Memnon, ascended the throne, Cyrus formed a conspiracy against him, which was, however, discovered. Cyrus was arrested by his brother and condemned to death, but at the intercession of his mother Parysatis, was released, and made governor of Asia Minor. Here Cyrus assembled a numerous army to make war upon Artaxerxes and dethrone him. Being informed of his brother's design, Artaxerxes marched against him with a much larger army. In the plains of Cunaxa, in the province of Babylon, the two armies encountered each other (401 B.C.). In the battle that ensued the troops of Cyrus were at first victorious, but the fruits of the victory were lost through the death of Cyrus himself in the battle. An account of the life of Cyrus is contained in the opening book of Xenophon's 'Anabasis,' which gives a detailed account of the retreat of the Greek auxiliaries of Cyrus from the interior of Persia to the coast of the Black Sea.

Cys"tadeno'ma. See TUMOR.

Cysticercus, sĭs-tĭ-sẽr'kŭs, a larval stage of the tapeworm, sometimes found in the human body in the form of small-sized tumors, and which may be distributed in a variety of situations. The tumors may range from the size of a pea to that of a hazelnut, and may exist singly or may be multiple. They are found chiefly in the back and sides of the trunk, less frequently in the extremities, and are sometimes subcutaneous. Occasionally they involve the brain and other organs, as the liver, kidneys, spleen, etc. Frequently they give rise to no symptoms whatever, but when occurring in an important organ of the body may cause major symptoms. In the flesh of many of the lower animals cysticerci also frequently occur, and it is by those present in the meat which he eats that tapeworms are largely communicated to man.

Cystinu'ria, a condition in which large amounts of cystin are found in the urine. It is a very rare condition, and is usually associated with excessive intestinal putrefaction. Sometimes cystin calculi result because of the excess of this acid in the urine.

Cysti'tis, an inflammation of the urinary bladder, usually resulting in pain and increased desire to urinate. The urine may be cloudy or bloody, and there is usually an excess of mu-

cus and pus found. The pain is situated over the pubic bone and may extend to the back, and there may be some associated fever with chills, if the inflammation is severe. Cystitis is most frequently due to an infection from without, usually the result of passing an unclean catheter. It may also result from urethritis, and is a very common condition in old men in whom the prostate gland is enlarged. It may also result from the presence of a stone in the bladder. Treatment is often difficult, requiring skilled medical attendance; but sitz-baths and hot applications to the abdomen are of service, and abstinence from peppery or alcoholic foods is advisable.

Cystoi'dea, an order of extinct echinoderms. They are spheroidal animals, pedunculate or sessile, enclosed by polygonal calcareous plates. They have a mouth above; the arms are rudimentary. Buch first elucidated their structure and affinities in an essay published at Berlin, in 1845, and gave them the name of *Cystideæ* in place of *Sphæronites,* which was their original appellation. Now *Cystideæ* has become *Cystoidea.* They range from the Upper Cambrian to the Silurian, being especially prominent in the Bala Limestone.

Cystop'teris, bladder-fern, a genus of delicate flaccid polypodiaceous ferns. They are found in moist, cool localities. Two are natives of Great Britain, *C. fragilis* (the brittle fern), common, and *C. montana,* very rare. The brittle fern has a wide range, being found within the Arctic circle to Chile, south Africa, and Australasia. They have dot-like sori covered by coral-like indusia.

Cysts, circumscribed tumors containing more or less fluid substance, or occasional gases, cut off from the neighboring tissues by a distinct limiting wall. See TUMORS.

Cy'tase, a ferment or enzyme that exerts a kind of digestive action upon the cell-walls of plants, rendering them soluble in water. It occurs in the hyphæ of certain parasitic fungi, and also in the germinating seeds of certain plants in which the reserve food-material is normally stored up in masses of stony hardness. It dissolves cellulose, but has no effect upon lignin, and is destroyed by exposure to a temperature of 150° F. The chemical nature of cytase is not yet established, and it may prove to be a mixture of several enzymes instead of a single substance of definite composition.

Cythere, sī-thē'rē, a genus of *Entomostraca,* order *Ostracoda,* family *Cytheridæ.* The eye is single, the inferior antennæ setigerous, but without a tuft or pencil of tiny filaments; three pairs of feet are enclosed within the shell, and no heart is present.

Cytherea (from Cytherea, a name for Venus), a genus of conchiferous mollusks belonging to the family *Veneridæ.* The shell is like that of the genus *Venus.* There are three cardinal teeth and an anterior one beneath the tunicle. The cythereas are in all seas; 176 recent species are known, and 200 fossil, the latter ranging from the Oölite down.

Cytisin, sīt'ī-sĭn ($C_{11}H_{27}N_3O$). When the ripe seeds of laburnum are powdered, extracted with acidulated water, the fluid treated successively with lead acetate and tannic acid, and the precipitate, before it becomes resinous, mixed with lead oxide, then dried and exhausted with alcohol, crude cytisin is obtained on evaporation, and after proper purification it forms a brilliant crystalline mass. It is very soluble in water and alcohol, but insoluble in ether, benzol, and chloroform, has a bitter taste, but no odor. It is a very powerful base, decomposing the salts of ammonia and the metals even in the cold. It combines with the strong acids, but the salts are all deliquescent except the nitrate, which crystallizes very readily in splendid, thick, transparent, colorless, monoclinic prisms. It can be sublimed without decomposition by careful heating in a current of hydrogen. The poisonous properties of laburnum are well known. The toxicological effects are due to this alkaloid, which in doses of from 0.1 to 0.5 of a grain is fatal in a few minutes to ordinary small animals.

Cytisus, sīt'ī-sŭs, a genus of low shrubs or small trees of the natural order *Leguminosæ.* There are about 40 species, natives mostly of Europe, western Asia and northern Africa. They are characterized by small, deciduous or evergreen trifoliate leaves, yellow, purple or white flowers in terminal or axillary racemes or heads, and few- to many-seeded pods. Several species with long twiggy branches are called broom; others are popularly known as laburnum and others by the genus name. A good many are cultivated for ornament either in shrubberies or in greenhouses, where some, especially *C. canariensis,* are known as genistas and are very popular about Easter time. In Europe several species are valued as forage plants, but in America they have not met the expectations of experimenters. See BROOM; GENISTA.

Cytode, sī'tōd, a piece or bit of protoplasm, defined by Haeckel as without a nucleus. In this respect it differs from a cell. The monera of Haeckel are cytodes which have not yet reached a cell-stage. At present, although the nucleus of some of the monera has not been detected, it is supposed that they may yet be found to be provided with it. A cytode is thus a provisional unit of organization.

Cytology, the science which deals with the structure, development, and functions of the cell; of the multiplication of cells and of the relations of cells to organs and tissues. It is distinguished from histology in that histology deals with tissues, while cytology deals rather with the cells of which tissues are composed. A sharp distinction cannot be made between cytology and morphology, although in general it may be said that cytology is concerned more with individual cells than with organs. Cytology may be called "oil immersion" morphology, because microscopes with very high magnifying powers are required for cytological studies. The terms, cytology and morphology, are used very indiscriminately by many botanists and zoologists. During the past 10 years, most botanical studies with such titles as "The Morphology of —," contain more or less cytology, while only a smaller number of articles purporting to be cytological, are largely morphological. Among the problems which belong indisputably to cytology are the following: The origin, development, structure, and functions of the cell and of its various constituents; nuclear and cell division; fertilization; organization of the embryo; the relation of the individual cell to cell complexes; the role of the cell in heredity.

An idea of the subject matter of cytology can best be gained by examining, from the cytological standpoint, a few prominent subjects which are also studied by investigators in other fields. See EMBRYOLOGY, FERTILIZATION, HEREDITY (*Cell*), etc.

The Cell.—A cell has been defined as "a mass of protoplasm with a nucleus in it." While this is true for many simple forms, there is in addition, in the vast majority of cases, a cell wall surrounding the protoplasm. (FIG. 1.)

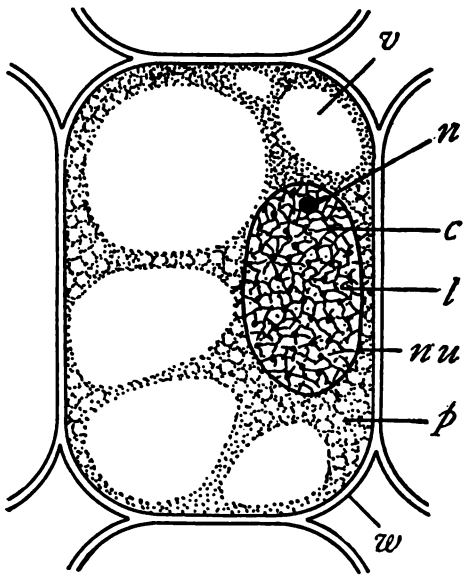


FIG. 1

FIG. 1.— A cell illustrating the parts which are common to nearly all cells. Highly magnified. *v*, vacuole; *n*, nucleolus; *c*, chromatin; *l*, linin; *nu*, nucleus; *p*, protoplasm; *w*, cell wall.

Cells without nuclei were reported frequently about 30 years ago, but at present no animal cells without nuclei are known. Numerous cases of non-nucleate cells were reported by the older botanists, but as lenses and methods of preparation have improved, nuclei have been demonstrated until the only doubtful cases now known to the botanist are the blue-green algæ and the bacteria.

Most cells are too small to be seen without a microscope, cells which are visible to the naked eye being rather exceptional. The egg of a bird consists of a single cell, as do the eggs of all animals and plants. The largest plant cells are the internodal cells of the stonewort, *Chara*, which reach a length of two inches. The largest egg cell described for any plant is that of *Zamia*, a plant related to the sago palm; this cell reaches a length of about one eighth of an inch.

The most usual shape of free cells is the spherical, and cells forming a part of a tissue are usually more or less rectangular in form.

When first formed, the cells of the individual animal or plant are very much alike, but as one examines cells farther and farther from the regions where active cell multiplication is taking place, it is seen that the originally similar cells are becoming very unlike. In the higher plants the outer cells become differentiated into protective tissue, the innermost into conductive tissue, others into assimilative tissue and still others become reproductive cells. In higher animals similar differentiations take place, cells which finally become so different, as those which form nerves, muscle, glands, and even the teeth, having been practically alike in the beginning. Among the unicellular organisms there is often a remarkable differentiation and division of labor, the single cell performing the functions of locomotion, securing food, respiration, digestion, assimilation, etc. Such differentiation and the causes which lead to it are among the most important of cytological problems.

It is a remarkable fact that while undergoing nuclear division, the cells of animals and plants strikingly resemble one another, even in the behavior of the most minute constituents of the nucleus and protoplasm. (FIG. 2.) This

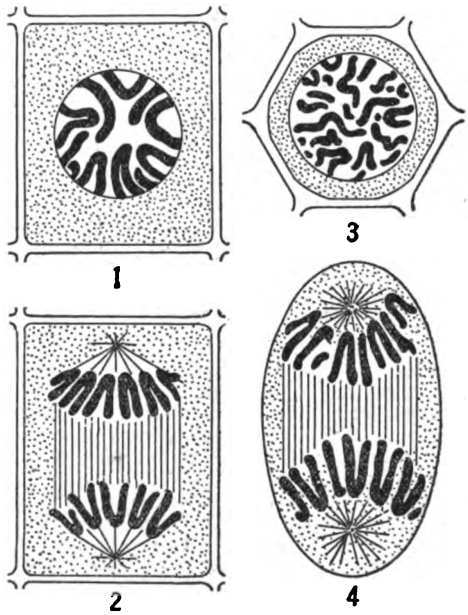


FIG. 2

FIG. 2.— Cells undergoing nuclear division: 1 an early and 2 a later stage in the division of the nucleus in a cell of the root tip of the common *Onion*. 3 and 4, the corresponding stages in epidermal cells of the *Salamander*. In 2 and 4 the V-shaped chromosomes, which are regarded as the physical basis of heredity, are clearly seen. Highly magnified.

must mean that animals have been derived from plants or that structures of amazing similarity have arisen independently in animals and plants.

Fertilization.—One of the most important problems of cytology is the problem of fertilization and attendant phenomena. While new individuals, even in the more highly organized plants and animals, may arise occasionally without fertilization (by parthenogenesis, chemical stimulus, vegetative multiplication, etc.), such cases are so rare that fertilization is assumed to occur unless its absence is definitely established. To the cytologist, fertilization consists in the union of definitely organized male and female elements. The cytological details of fertilization are essentially alike in plants and animals. (FIG. 3.) Fertilization, both in plants and in animals, is preceded by a reduction in the number of

chromosomes, so that the number of chromosomes found in the male nucleus or in the female nucleus is just one half the number which is found in the body cells of a given plant or animal. Consequently, when the two sexual nuclei fuse during fertilization, the number of chromosomes which characterizes the body cells

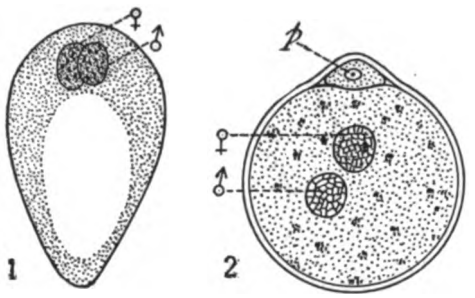


FIG. 3

FIG. 3.— Fertilization. 1, the egg (oosphere) of a *Lily*, showing the male and female nuclei about to unite; 2, the egg of a *mouse* with the male and female nuclei about to unite; *p*, polar body. (2, after SOBOTTA.) Highly magnified.

is restored. The complicated details of the processes by which this reduction in the number of chromosomes is effected, are essentially alike in animals and plants. Those cytologists who have investigated most thoroughly the phenomena of fertilization have come to the conclusion that heredity is referable to a definite cytological basis.

A Cytological View of Heredity.— Almost without exception, cytologists believe that chromatin is the physical basis of heredity. The reasons for this belief are, briefly, as follows: The male and female parents are equally potent in transmitting characters to offspring; an equal amount of chromatin and an equal number of chromosomes are contributed by each parent; nothing but chromatin is contributed equally by the two parents. (FIG. 4.) There is usually a great difference in size between the male and female germ cells. The sperm cell (spermatozoan) of the ostrich is almost invisible to the naked eye, while the egg is as large as a cocoanut, and such differences in size are usual both in plants and animals. The egg contains a large amount of protoplasm and various foodstuffs, while the male cell contains very little protoplasm or foodstuffs and in many cases even that little is left outside at the time of fertilization, only the nucleus entering the egg. Hence, protoplasm and foodstuffs do not transmit hereditary characters. While the male nucleus is usually the smaller at the time of its entrance into the egg, it increases in size so that, at the time of fusion, the sex nuclei are alike in size. (See FIG. 3.) Investigators of this subject are usually tempted into speculative philosophy. Philosophizing over the facts is commendable, but the wild philosophizing in advance of the facts which has attended this subject, has been of little value, except as it has stimulated investigation.

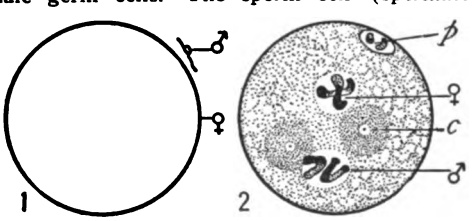


FIG. 4

FIG. 4.— 1, The egg and sperm of *Fucus*, showing great inequality in size; 2, fertilization in a *worm* (*Ascaris*) showing the equal contribution of chromatin, each parent contributing two chromosomes. *p*, polar body; *c*, centrosome. (2 after BOVERI.) Highly magnified.

The organization of embryos and mature organisms from eggs is a cytological problem which has not yet been solved. The visible stages in development have been observed and described *ad infinitum*. Both experimental cytology dealing largely with living material, and anatomical studies of thin sections, stained so as to show the most minute details of structure, are contributing to the solution of the problem, but the fundamental causes underlying the phenomena are still unknown and seem as difficult of solution as the problem of the origin of life. The eggs of the sunflower and the willow, like the eggs of all flowering plants, are too small to be examined with the naked eye, but even when examined with the aid of modern technique and the most powerful microscopes, they present no essential differences in external appearance or internal structure, and yet one always develops into a sunflower, and the other into a willow. Within the fertilized egg are all the potentialities of the adult, even to the color of the flower or the markings on the wings of the butterfly. Some have believed that each part of the adult comes from a certain predetermined part of the fertilized egg. This is called the theory of germinal localization. Others have made experiments to show that this theory is not true. Most botanists and zoologists accept, as a working hypothesis, that chromatin is the physical basis of heredity, an hypothesis which assumes that there is no pre-localization in the protoplasm of the egg. The problem of organization is so bound up with that of heredity that much of the literature of the subject will be found in treatises on heredity.

References.—Cytology is too recent a subject to have given rise to many text-books, most of the literature being in the form of articles in leading botanical and zoological journals. Probably the most important book on the subject is Prof. E. B. Wilson's 'The Cell in Development and Inheritance.' The following headings of chapters in Prof. Wilson's treatise indicate quite accurately the subject matter of cytology as presented in the few universities which offer courses in this subject: (1) General sketch of the cell; (2) Cell division; (3) The germ cells; (4) Fertilization of the ovum; (5) Reduction of chromosomes, oogenesis, and spermatogenesis; (6) Some problems of cell organization; (7) Some aspects of cell chemistry and cell physiology; (8) Cell division and development; (9) Theories of inheritance and development. This book contains a very complete bibliography. Other books on the subject are: Hertwig's 'The Cell' and Häcker's 'Praxis und Theorie der Zellen- und Befruchtungslehre.' All volumes cited above are by zoologists; no similar books have been written by botanists. A part of the subject is covered by Prof. Strasburger's

book on 'Reduktionstheilung, Spindelbildung, Centrosomen, und Cilienbildner im Pflanzenreich.' The chief scientific journals in which the great majority of cytological investigations are published are: (Botanical), 'Annals of Botany,' 'Botanical Gazette,' 'Jahrbücher für wissenschaftliche Botanik,' 'Berichte der Deutschen Botanischen Gesellschaft,' 'Flora,' and 'Annals des Science Naturelles Botanique,' (Zoological), 'Journal of Morphology,' 'La Cellule,' 'Anatomische Anzeiger,' 'Archives de Biologie,' 'Sitzungsbericht der Gesellschaft für Morphologie und Physiologie München,' and 'Bulletin Acad. Roy. de Belgique.'

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Cy'toplasm. See CELL.

Cyz'icus, Asia Minor, a peninsula 60 miles southwest of Constantinople. It projects into the Sea of Marmora, and is connected with the mainland by a narrow isthmus, but was once an island and the site of the ancient town of same name, which stood on its south extremity, and of which some remains, including a fine amphitheatre, are still seen. The peninsula, which stretches east to west for 18 miles, with a breadth of about 9 miles, is very beautiful and picturesque.

Czar, zär, **Zar,** or **Tsar,** tsär, the ordinary title of the emperor of Russia, derived from the Old Slavonic *cesar,* king or emperor, which, although long held to be derived from the Roman tital *Cæsar,* is almost certainly of Tartar origin and is a survival of Asiatic dominion in Russia, as may be judged from the fact that there were czars of Georgia and other khanates, evidence of the non-imperial content of the term. In the beginning of the 10th century the Bulgarian prince Symeon assumed this title, which remained attached to the Bulgarian crown. In 1346 it was adopted by Stephan Duschan, king of Servia. Among the Russians the Byzantine emperors were so called, as were also the khans of the Mongols that ruled in Russia. Ivan III., grand prince of Moscow, held the title, and Ivan IV. caused himself to be crowned as czar in 1547. In 1721 the senate and clergy conferred on Peter I., in the name of the nation, the title Emperor of Russia, for which in Russia the Latin word *imperator* is used. But among the Russians the common designation of the emperor is czar, or, as it is more properly spelled, tsar.

Czarina, zär-ē'nä, the title of the wife of the czar of Russia.

Czarovitz, zär'ō-vĭch, or **Czarevitch,** the title of the eldest son of the czar of Russia.

Czartoryski, chär-tō-rĭ'skē, **Adam George,** prince, Polish statesman, and patriot: b. Warsaw 14 Jan. 1770; d. Paris 16 July 1861. His education was completed at the University of Edinburgh and in London. After the partition of his country in 1795 he was sent as a hostage to St. Petersburg. There he formed a close friendship with Prince Alexander, who on his elevation to the throne appointed him minister of foreign affairs and curator of all the educational establishments in Poland. On 11 April 1805 he signed in name of Russia the Treaty of Alliance with Great Britain, after which he resigned his office. On the outbreak of the Polish revolution of 1830 he showed himself active on behalf of his country, and was chosen president of the provisional government (18 December). On 30 Jan. 1831 he became the head of the national government, and gave up the half of his property to the service of his country On the appointment of Krukowiecki to the dictatorship Czartoryski resigned his post as president of the senate. In the last days of the struggle for freedom he served as a common soldier in the corps of Gen. Romarino. Thenceforth he lived at Paris, ceaselessly engaged in aiding his needy fellow-countrymen. He was excluded from the amnesty of 1831, and his estates in Poland were confiscated.

Czaslau, chäs'low, Bohemia. 1. Town, capital of a circle or district of the same name; located in a fertile plain, 45 miles east-southeast of Prague; and is memorable for the defeat which the Austrians sustained from Frederick the Great in 1742. The Church Saint Peter and Saint Paul has the loftiest steeple in Bohemia, and contains the remains of the celebrated Hussite leader, John Ziska. Pop. (1890), 8,388. 2. The circle or district is well wooded and fertile, yielding excellent crops of corn and flax; and large quantities of minerals, especially iron. Area, 233 square miles. Pop. 61,064.

Czech (or **Chekh**) **Language and Literature.** The Czech is a dialect of the Slavonic family of Aryan languages; it is the speech of the people of Bohemia and is spoken also by the Moravians and by the Slovaks of Hungary. It is a language very rich in native radical words which lend themselves readily to combination, and hence the language possesses in itself ample resources for the expression of new ideas without need of recourse to foreign tongues. It has a precise and regular grammatical structure comparable to that of the classical languages; yet like other languages of the Slavonic family it is without a definite form for the passive voice of the verb. The Czech had the rare good fortune in the 15th century of having its alphabetic system constituted according to phonetic laws and as a result each of the letters has a fixed phonetic value, and there are no superfluous letters. To John Hus, who revised the Czech version of the Scriptures is due the credit of setting up a standard both of orthography and of literary expression. Others have since worked on the same lines and now the Czech language is an unexcelled mechanism for the expression of thought.

The language was cultivated for literary production in the 9th century or earlier; but owing to the intrusion of Germanic speech and of Germanic civilization, also to the universal employment of the Latin language by churchmen, the speech of the privileged and the cultured classes was Teutonic or Roman, and the native tongue was for a long time neglected as a means of communication save among peasants and serfs. Hence the literature of Bohemia for centuries was written in Latin and the court speech was German. But there was a remnant of the educated who cherished the mother tongue and kept alive the national traditions; and to them,—and chief among them to the patriotic monks of the abbey of Sazava,—is mainly due the retention of the vernacular speech in its literary forms, and its having been saved from degradation and from becoming the patois of rustics; these monks and patriots saved the literary language from extinction and kept

alive the national spirit of the people by reproducing and adding to the epic and lyric poesy and the chronicles of their Slavonic forefathers.

There are in existence fragments of Czech literature dating from the 10th century; the genuineness of other alleged fragments for which a like antiquity is claimed is disputable; we reach firm ground with the Czech version (about 1245) of the Latin work 'Alexandreis,' written by Philippus Gualterus ab Insulis; contemporary with this are several metrical lives of saints and several legends. To the beginning of the 14th century is referred the lengthy 'Chronicle' of Dalimil,—a versified history of the world from the creation to the year 1314; the author cherished a cordial hatred of the Teutonic race. To the 14th century also belongs a series of pungent 'Satires on Craftsmen,' and a notable epic poem, 'The New Council,' by Smil of Pardubitz, who is also the reputed author of a lively and original 'Dialogue Between a Groom and a Scholar.' There is extant also from the 14th century an important law treatise, 'Exposition of the Law of the Land of Bohemia,' by Andreas Duba, the chief justice of the realm. There are extant translations of books of the Scripture into Czech dating from the 13th and 14th centuries,—mostly of books of the New Testament and the book of Psalms. John Wiclif mentions a copy of an *evangelium* (gospel, probably meaning a book of the four gospels) in Bohemian (Czech), German and Latin, owned by Anne of Luxemburg, sister of the Emperor Charles IV., who was hereditary king of Bohemia: Anne was the first wife of Richard II. of England. There were in existence at this time two Czech versions of the Psalter; the Czech version of the whole Bible was made in the beginning of the 15th century. Another monument of Czech literature in the 14th century is a prose chronicle extending from the earliest times to the year 1330, by the priest Pulkava, which he wrote originally in Latin, but which afterward he translated into his native idiom. The most original of the Czech authors of the same period is Thomas of Stitny, a writer on religious and moral questions; his aim was to popularize the teachings of the schoolmen touching matters of belief and Christian living; the titles of his two principal works are: 'General Christian Matters' and 'Books of Christian Instruction.' Finally, to this age is to be referred a Czech version of the 'History of the Trojan War,' written in Italian by Guido di Colonna, but made up from the works of Dictys Cretensis and Dares Phrygius; this was one of the first works in the Bohemian language to be multiplied by the printer's art (1468).

John Hus (died at the stake 6 July 1415) did for the national tongue of the Czechs what Luther did for that of the Germans. He did not himself translate the Bible into Czech, but made a great many changes in the Czech version of the Bible already in existence, and incidentally systematized the orthography of the language. Like the commotions attending the rise of Protestantism, the Hussite wars called forth a swarm of political and religious manifestoes and tractates. Of more lasting importance were the Czech translations of the 'Travels' of Marco Polo and of Sir John Mandeville, which appeared about the same time. Though the printing press was as yet unknown the 'Postils,' the 'Net of Faith,' and other fugitive pieces of the cobbler, Peter Chelcicky, the Hans Sachs of the United Brethren, had a universal circulation among the masses. In 1487 the printing press was set up at Prague, and the following year the Czech Bible was first printed.

The printing press and the Protestant Reformation stimulated literary activity enormously, and there is room here only for a most cursory review of the field. The first grammar of the Czech language was published in 1533. A work, entitled a 'Chronicle,' but which is in fact a collection of old Czech legends, compiled by one Hajek and published before 1550, became the people's *vade mecum;* it is a treasury of Czech myth. Christopher Harant wrote an account of his travels in the Holy Land, a work of real value, which is not yet antiquated; it was reprinted in 1854. After the subjugation of the Czechs in 1621 by Austria, Czech literature with Czech national spirit went into decline and so continued till their resuscitation in the beginning of the 19th century. The first impulse to the Czech renaissance was given by the philological researches of Joseph Dobrovsky. He wrote, not in the national tongue, but in German and in Latin, and his researches were conducted with purely scientific, philological ends; for he had no thought that the Czech language and literature would ever regain eminent standing, but were doomed to extinction in the struggle for life, in which it had been for centuries engaged; his works he regarded as monuments of a language and a literature that before long must be numbered with the languages and literatures of ancient peoples. But his writings and the labors of his successors in the same field, epecially Joseph Jungmann, author of a noble dictionary of the Czech language and of a history of Czech literature, called forth a national movement that has seldom had a parallel. Since 1809, date of Dobrovsky's first work on the 'Bohemian Language' (*Ausführliches Lehrgebäude der bömischen Sprache*) there has been a great revival of national feeling in the Czech people and of Czech literary activity in all departments, poetry, fiction, folklore, history, drama, antiquarianism, philology, music, moral and intellectual philosophy, natural and physical science. In the University of Prague the national language is a recognized medium of instruction; scientific and literary societies employing the national language are numerous; and the scientific and literary periodicals of Bohemia are both numerous and of the highest class.

Czechs (cheks), the extreme western branch of the great Slavonic family of races. The Czechs have their headquarters in Bohemia, where they arrived in the 5th century. The origin of the name is unknown. The total number of the Czechs (including Moravians, Slovaks, etc.), is about 6,000,000, nearly all of whom live in the Austrian empire. The Czechs proper, in Bohemia, number about 2,700,000. They speak a Slavonic dialect of great antiquity and of high scientific cultivation. The Czech language is distinguished as highly inflectional, with great facility for forming derivatives, frequentatives, inceptives, and diminutives of all kinds, and is very musical. Like the Greek it has a dual number, and its manifold declensions, tenses, and participial formations, with their

subtle shades of distinction, give the language a complex grammatical structure. The alphabet consists of 42 letters, expressing a great variety of sounds.

Czegled, tsē'glād, Hungary, large market town, in the county of Pest, circle of Ketskemet, on a plain between the Danube and Theiss, 39 miles southeast of Budapest. The land in the vicinity is well cultivated, and produces large quantities of grain and common red wine. Pop. (1900) 29,900, mostly Protestants.

Czermak, chĕr'māk, **John Nepomuk,** German physiologist and physician: b. Prague 17 June 1828; d. Leipsic 16 Sept. 1873. In 1865 he became professor of physiology at Jena, and from 1869 till his death filled a similar position at Leipsic. He was the inventor and introducer of the laryngoscope and rhinoscope, and of a new method for the therapeutical and surgical treatment of diseases of the epiglottis and throat. His work on 'The Laryngoscope' has been translated and published in several languages.

Czernigov, chĕr'nē-gōf, Russia, a province; area 20,243 square miles. The surface, with exception of a hilly district along the Dneiper, is flat and the soil fertile. The Dnieper flows along its west frontier, and the Desna passes through its centre. It has numerous lakes, though none are of great extent. All kinds of grain grow in abundance, but the crops often suffer from hosts of locusts. Hemp, flax, tobacco, and the opium poppy grow well, and the forests furnish timber and fuel. The chief mineral products are saltpetre, porcelain-earth, chalk, and a little iron. The interior trade is almost confined to the four annual fairs, which are held in Nijni-Novgorod. The chief exports are cattle, corn, brandy, honey, wax, and potash. Pop., almost all belonging to the Greek Church, nearly 3,000,000.

Czernigov, Russia, town, capital of the province of the same name, situated on the right bank of the Desna, 80 miles north-northeast of Kiev. It is a place of great antiquity, and contains numerous buildings of antiquarian interest. It is the seat of an archbishop, and has many churches — one of them, St. Sophia, supposed to have been founded in 1024 — three monasteries, a gymnasium, and an orphan hospital. Three important annual fairs are held here. Pop. about 27,000.

Czernowitz, chĕr'nō-vĭts, Austria, capital of the province of Bukowina; 720 feet above sea-level, near the right bank of the Pruth, 165 miles southeast of Lemberg. Among its buildings are the palace of a Greek archbishop; the cathedral modeled after St. Isaac's at St. Petersburg; the Armenian Church; the synagogue; and the "Austria Monument." The university was founded in 1875. The manufactures and trade are steadily developing. Pop. (1900) 67,622.

Czerny, chĕr'nē, **George,** Servian hospodar: b. near Belgrade 21 Dec. 1766; d. July 1817. His true name was George Petrovitch, but he was called Czerny or Kara George on account of his dark color, Czerny in Slavonic, and Kara in Turkish, signifying black. In 1788, as the leader of a Servian volunteer corps, he fought in the Austrian army against the Turks, and in 1801 returned to his native country and organized an insurrection with the view of delivering it from the Turkish yoke. He succeeded in driving the Turkish garrisons out of Servia, took the town of Belgrade, and compelled the Porte to recognize him as hospodar of Servia. When the Turks again invaded Servia, in 1813, he was compelled to retire. In 1817 he ventured to return to his native country, in the hope of inducing Milosh Obrenovitch, who had meanwhile received Servia as a vassal state from the Turks, to take part in a comprehensive scheme of rebellion; but Milosh betrayed him to the pasha of Belgrade, who caused him to be assassinated.

Czerny, Karl, Austrian pianist and composer: b. Vienna 21 Feb. 1791; d. there 15 July 1857; son of a teacher of the pianoforte. He was the author of an immense number of pieces, which, from their brilliancy, were at one time extremely popular. His exercises for the pianoforte are still valuable. Among his pupils were Liszt, Döhler, and other distinguished musicians.

Czerny, or **Tcherny,** a Slavonic prefix sometimes signifying *black,* and sometimes *tributary,* appearing in many geographical names, as Czernigov, Czernowitz. It corresponds in the former meaning to Turkish Kara, Czerny George and Karageorge being interchangeable.

Czolgosz, chōl'gōsh, **Leon,** American assassin: b. Detroit, Mich., 1873; d. Auburn 29 Oct. 1901. He was of Polish-German ancestry; worked at various trades in the United States and became affiliated with anarchists through the teachings of Emma Goldman (q.v.). On 6 Sept. 1901, while President McKinley was holding a public reception at the Pan-American Exposition in Buffalo, N. Y., Czolgosz shot him twice. On 14 September the President died; on 23 September Czolgosz was brought to trial; on the 26th was sentenced to death, and was executed in the prison at Auburn, N. Y.

Czuczor, tsoo'tsōr, **Gergely,** Hungarian poet and philologist: b. Audod 17 Dec. 1800; d. Pest 9 Sept. 1866. His two fine hero-ballads, 'The Battle of Augsburg' (1824) and 'The Diet of Arad' (1828), brought him instant celebrity. He was a Benedictine monk, and the eroticism of the first collection of his 'Poetical Works' (1836) brought on him stern animadversion from his superiors. In 1848 he published 'Reveil,' a passionate appeal to Hungarian national sentiment, and was imprisoned for it.