England with six manufacturing counties, and comments on the statistical tables which he produces thus: "It appears that in the agricultural counties the proportion of paupers is above 100 per cent., of criminals 60 per cent., and of poor rates 150 per cent. more than in those where manufactures prevail."

Our very language preserves in the meaning of its words many evidences of the social degradation in which the tillers of the soil were formerly held. Philologists tell us that many words which were formerly applied to those who tilled the soil or were connected in some way with farm life, having lost their original meaning, still exist in our language, with now only a low moral or social signification. "*Villein*," in the middle ages, was merely a feudal tenant, and Blackstone describes in detail two sorts of them having different legal status. A "*peasant*", in the same way, was a countryman, and while the term is applied to small farmers in general it has a low social value. "*Boor*" was formerly merely a plowman or peasant, and "*churl*" was "a free tenant-at-will". "*Incivility*" meant merely the awkward behavior seen by city people in their unpolished country or farm acquaintances, and so on through a curious list. The significance of this in the present connection is in the indication it gives of the social contempt in which the class was once held, and it furnishes an explanation why agriculture did not progress faster in Europe, and why it still lags behind the other arts in many parts of the world which boast of a high civilization in other respects. Our own history throws much light upon the causes why agriculture did not advance during so many centuries.

The present aspects of American grain production, its recent rapid growth, and the general aspect of the vocation in this country, are explained by our exceptional social and political history. This industry is perfectly plastic and adaptive, and in any country is molded by the social, political, economical, and physical conditions of that country. In Egypt agriculture very early attained as high a state as those conditions allowed. If it did not advance later, as the other arts did, it was because the political and social conditions which more especially control agriculture continued essentially the same down through the centuries; there could be no farther growth until those political and social factors were changed and farmers were left as free to develop their art as the men of any other class. The American colonies first established this condition and made it a practical fact, and the present aspect of our grain production is the natural and necessary result of our political and social history. It is profitable, therefore, to review our own special agricultural history in this connection.

HISTORY OF AMERICAN AGRICULTURE.

The history of agriculture in the United States, particularly as it is related to grain production, falls naturally into four periods.

The first period is that of our colonial days, extending over about one hundred and sixty or one hundred and seventy years, or from the first settlement down to the American Revolution, and may be called the period of experiment.

The second, beginning with the Declaration of Independence, extends over a period of about fifty years, or to the time when the cast-iron plow came into common use throughout the country. This was the period of awakening, of the formation of agricultural societies, and of the beginning of a science of agriculture.

The third period, of about thirty years, began when the introduction of the cast-iron plow was complete, say about 1825, and extended to the time when the reaper began to come into common use, about 1855. During this period thrashing-machines, which had really been invented long before, became universally used; railroads began to be built and grew to considerable proportions, commercial fertilizers came into use, and advances were made in numerous other directions.

The fourth period began when the reaper became common, and extends to the present time. It includes the introduction into general use of the steam-thrasher, of improved harvesters and reapers, and the farther improvement of many labor-saving machines previously invented, a marked extension in the land transportation of grain by railways, the use of the elevator in handling grain, the ocean transportation of grain by steam, and the greater specialization of agricultural productions.

Each of these epochs or eras in our agricultural history is correlated with political and social events happening here or elsewhere about the same time, which make these dates important ones in the history of the world's material and intellectual progress, the agricultural changes in our country being but phases of a general progress in the industrial arts which has gone along with the growth and development of the physical sciences and the spread of political and religious liberty.

THE FIRST PERIOD.

The settlers of the original thirteen colonies, and most of the immigrants in the earlier days of the republic, came more especially from the middle classes of various countries of Europe, politically and socially representing

neither the aristocracy above nor their most dependent laborers beneath. They were artisans, tradesmen, farmers, and mechanics, from what was called the yeoman class in England and the *bourgeoise* and burgher class of the continent—hardy, thrifty, and industrious classes.

The religious element, which was everywhere a factor in the settlement of the original colonies, tended to bring here men with noble aims and of especially high moral character. The political as well as the religious influences which sent them here aided in inciting habits of intellectual activity, for at home they had been an industrious and thrifty class. By a kind of natural selection the political and religious causes which impelled them to emigrate made them more uniform in their social position, moral worth, religious faith, industrial habits, and in the hereditary excellence of their families, than were the inhabitants of any country of the Old World. It was a selection made from various nationalities, yet reasonably uniform in race and exceptionally uniform and high in industrial and moral character. It was a wonderful stock, a vigorous breed of men. Many had property, but there was no considerable wealth. Great wealth was then rare everywhere except among the nobility. In the political and religious disturbances of those days, before coming to this country others had been despoiled of their property and came in poverty, but they had industrious habits and thrifty instincts. There was neither an aristocracy nor a peasantry, and practically there were no paupers, for they represented the working and the business classes rather than the gentry, the warrior, or the parasitic classes. Belonging to a class at home which did not hold labor or business to be socially degrading, they found here no class above them, which, from a lofty social stand-point, diffused downward the idea that a peaceful life devoted to honest labor was below an idle one supported by the labor of others, or less honorable than a warlike one sustained by plunder. They were a peaceful and thrifty set of men, who, if not farmers to begin with, largely became farmers from the necessities of the case. The early colonists had to feed themselves from such soils as they settled upon, and these were not the more fertile soils of the country. As times then were, and under the policy which mother countries then extended to their colonies, there could be no manufactures, and thus it was that agriculture became the chief vocation. When they emigrated they abandoned many old things. Feudalism, with the warlike spirit it fostered, was in their minds intimately associated with the state churches they had fled from, and in all its features it was odious to them; so here the owners of the land became the tillers of the soil, and the men who digged in the field represented the best elements of society, socially, intellectually, and morally, and for the first time in the history of our Christian civilization the agricultural laborer was socially respected, in fact as well as in theory. This was the stock of men who were to work out a great problem in the New World, and such were the social and political causes which placed on farms here an intelligent class to direct, an ingenious class to devise new aids and new helps, and an enterprising class ready to test new things and hold fast to that which is good. The fertility of invention and the boldness of execution which has marked our recent agricultural operations are but the legitimate result of social forces beginning long ago. As already shown, in no other vocation are effects so enduring as in this conservative industry, and we cannot refrain from picturing to ourselves what might have been had the beginning been otherwise. Had American agriculture been relegated to and founded upon a "peasant class", or a class socially inferior, that class would have remained inferior in intelligence, would have resisted improvement, would never themselves have invented that wealth of labor-saving machinery and implements that have originated here, nor would they have freely adopted the inventions of others, and, more than all this, would not so intelligently have managed the farms which they had so completely under their control. The freedom of management and control, which goes along with our system of land ownership, is one of the most important elements in our grain production. The freedom to farm as he will, unrestricted by landlords or conditions of leases, enables the farmer to adapt his crops and his methods to varying conditions. In intelligent hands it is the great element of agricultural progress; but with a socially degraded and ignorant class owning the land and directing its culture this very freedom may lead toward deterioration, or at least to a great lagging behind in the march of progress. The agriculture of Mexico is suggestive of what ours might have been, and probably would have been, had the vocation been relegated to a "peasant class" here, as there.

As an illustration of the intellectual and political importance of this social fact in the history and development of American agriculture it may be said that not only were the colonial officers and statesmen drawn largely from the farms, but of the twenty-one Presidents of the United States since the founding of the republic fifteen were farmers or the sons of farmers, ten of the fifteen the sons of farmers working small farms, and four, indeed we might say five, in their youthful days were on new or "pioneer" farms, personally employed in the arduous and toilsome work of subduing new land to cultivation.

To return to the condition of the colonies. The settlers came from various countries of Europe. Some of them were farmers at home, and continued so here; others, not originally of that vocation, became so because of the necessities of the situation. A hundred and forty years before our national independence agriculture had a good foothold in all the settlements, and a full century before the same epoch all of the useful domestic animals and all of the cultivated plants grown in the mother countries had been tried on our soil, and very nearly all of those we now have were already in successful cultivation. Agriculture is even yet so largely an art and so little a science that its introduction into any new country is a matter of experiment. With all of our present knowledge, and with all the aids of modern science in the settling up of a new and untried country, it cannot be predicted with any certainty what crops will be profitable, what will grow but remain unprofitable, and what will be total failures.

The uncertainties were much greater then than now, and in the New World the agricultural problems which were presented to the early settlers were peculiar and could only be settled by long experiment. They found here everything new. The wild plants were new to them, and the good or bad qualities of each could only be learned by experience. Their crops, their flocks, and their herds were subject to ravages by new enemies. From whatever part of Europe the emigrants came they found here a climate very unlike that which they had known before. In the northern colonies an almost arctic winter was followed by a summer of tropical heat, the severity of the winter preventing the success of some crops, while the drier air, the clearer sky, and the greater abundance of sunshine proved unpropitious to others. The warmer parts of America, too, were unlike the warmer parts of Europe, and, as a consequence, the adaptability of each separate crop to our climate, to our soil, and to the various natural conditions found here, had to be tried each by itself and for itself in each locality, or new varieties had to be developed here adapted to the soil and climate. This was an agricultural experiment on the grandest scale the world had ever seen, and it went on with the occupation of each new district; in fact, the same experiments were tried over and over again, and under the methods then existing might have been going on yet. All the crops and the cultivated plants of the Old World were tried here. Some few, after repeated and utter failures, were abandoned; but with many others, where the failure was not total, attempts to cultivate them were unprofitably kept up until well into the present century, or until agriculture became more specialized and modern methods of diffusing information came into use. Comparatively few of the whole number remained in profitable cultivation, and they but slowly found the regions and conditions where their culture was economically profitable. Hemp, indigo, rice, cotton, millet, spelt, madder, lentils, lucerne, sainfoin, woad, melilot, rape, colza, and others were tried over and over again in nearly every locality from the Carolinas to Maine, and in some places the experiments on some of these plants continued for two hundred years. Cotton soon failed in Connecticut, but hemp long struggled as far north as Vermont. Not only these plants from Europe, but others from Asia and from the East Indies were tried. Societies were formed in the mother country to encourage the cultivation of cinnamon, allspice, and the various tropical plants and spices of the Indies in the colonies, and the effort to produce raw silk was continued in nearly every colony until long after our independence. So extensively did these experiments go on, and so completely had they been tried, that not a single species of domestic animal, and but one species of cultivated plant (sorghum), has been introduced since the Revolutionary War of sufficient importance to be enumerated in the census tables.

The agriculture of nearly all the countries of Europe from which the early immigrants came was essentially a mixed agriculture, based on the growing of various kinds of crops and various kinds of animals on the same farm. There the raising of animals had been upon the permanent pastures and meadows, but the forage grasses of the Old World were those that were there indigenous, and the pastures were made up of such varieties as ages of cultivation and of use had adapted to the conditions there found. All over northern and western Europe the pastures were then what are called "natural". The artificial seeding to grass only became common toward the close of the last century (*a*), and was not practiced there to any extent until introduced from this country.

Of nearly three hundred species of grasses known to botanists as indigenous to some part of the United States very few indeed are as well adapted to agriculture as are those European species which have been modified by centuries of cultivation. The early colonists found here only wild grasses, and no such pastures as they were accustomed to in their mother countries. As a consequence, all the domestic animals deteriorated on American soil. Scarcely a traveler or a writer upon the subject before the American Revolution but remarked their deterioration in size and in form. Our oxen were lively and tractable in the yoke, our horses excellent for the purposes for which they were used, but both were smaller than their progenitors from the old countries, although they were more hardy. What would have been their condition had it not been for Indian corn we can never know. That native cereal formed a large amount of the forage of the domestic animals, and probably also saved some of the colonies from actual extermination; it certainly saved all from much poverty and suffering.

During the whole of this long period, however well experiments might be performed, and however decisive, they were practically useless to the great mass of farmers. There was no way by which the experience of any one man, or the experience of any community, could be generally diffused among other workers. The political condition of the times in all civilized countries practically forbade those two great means of disseminating useful knowledge among the masses which have since come into use and proved so efficacious: first, special societies; second, a free press.

Societies or organizations of workers in the same field, whether for business, philanthropy, or the administration of civil trusts, have been the most potent of all instruments for such dissemination of knowledge among the masses, and have prepared the way for the press to scatter the seeds of knowledge. Their influence has been of so much importance that the history of our agriculture can only be understood when one knows their history. Agricultural societies were the most immediate as well as the most important means of disseminating information, and of stimulating that intellectual movement which accompanied the awakening of agriculture from its long sleep. Guilds and organizations pertaining to other industries had existed long before, and some learned societies interested

a Regarding the history of artificial seeding of pastures in this country, see "Agricultural Progress", in Harper's *First Century of the Republic.*

themselves in part with questions pertaining to rural economy, but agricultural societies of the character and with the aims of those now so common were practically unknown before the last century, and, after being started, had for a long time a very slow growth. They had their beginning in Europe before the close of the colonial period. The Society of the Improvers of the Knowledge of Agriculture in Scotland was formed in 1723. The Society of Agriculture, Commerce, and Arts of Brittany was founded at Rennes, the old capital of that province, in 1753, and this was followed toward the end of the reign of Louis XV (1761) by an agricultural society in Paris. The general statement occurs in the early memoirs of the Agricultural Society of the Seine that "soon other societies were founded in France on this model". The Society Economique de Berne, which had already been in existence some years, began in 1763 to interest itself especially in agricultural matters, and a few other agricultural societies, so called, were started on the continent of Europe previous to the American Revolution. But all of those societies were organized by the land-owners, and represented specially their interests, and everywhere there the land-owners then belonged to a social and political class above the peasants, who formed a majority of the actual tillers of the soil, and consequently it was long before those organizations worked any considerable change in the actual condition of agriculture in Europe.

Under the system of repression, which was then the policy of the mother country toward her colonies, the agricultural awakening, which had begun in Europe in the second and third quarters of the eighteenth century, could not, or at least did not, reach our shores. Of the many thousands of societies of all kinds (except religious) which now exist in this country only one (the American Philosophical Society of Philadelphia), so far as I know, dates its beginning before the American Revolution. The general political condition of most countries was unfavorable to them, and the especial relations existing between the mother country and the colonies, although not actually prohibiting them, practically repressed their formation. There were a few local and temporary societies for other special purposes, such as encouraging silk production, but general agricultural societies, so far as I have been able to learn, did not exist in the colonies. Their organization marks the second period of our agricultural history, and will be noticed under that head.

During the colonial period the products of agriculture, the fisheries, and the forests constituted practically all of our exports, that of metals, furs, and manufactured articles being very insignificant. The exports were very unequal in different years, owing somewhat to unequal production, but more to the difficulties attending transportation and commerce as then conducted, and to the laws then in existence restricting trade. Taking the agricultural exports as a whole, tobacco was the most important, although there were in some years comparatively large exports of wheat, corn, flour, bread, seeds, salt pork, beef, hams, lard, tallow, soap, candles, cheese, and live animals, the latter going to the West Indies. For a half century before the Revolution there was an almost continuous exportation of breadstuffs and of animal products, particularly from the ports north of the Potomac, but these went largely to the warmer portions of Europe, the Mediterranean region, and to the West Indies, rather than to the mother country. In a treatise prepared in London just after the peace of 1783 (*Observations on the Commerce of the American States, with an Appendix*, second edition, London, 1783), the argument of which is that, although the colonies are lost, "England must retain the carrying trade wherever she possibly can," the writer appends tables of exports and imports, giving a very good idea of the commerce of particular years. In this he says (page 45) that wheat is one of the most important articles of American export, "but, excepting the influx of three or four years, there never was any market in Europe for the wheat and wheat flour of America except in Spain, Portugal, and the ports of the Mediterranean." We get an interesting glimpse of the limitations to which commerce was subjected at the time the republic came into existence in a foot-note in the same volume (page 46), in which it is stated that—

> In war time the importation of flour from America has usually been allowed into the French islands, but in peace times it was prohibited, both in the Dutch and French settlements, those nations knowing the advantage of supplying and carrying it themselves. A vessel having ten barrels of flour in any of their ports would be confiscated. * * * * As flour is the principal staple of New York, New Jersey, and Pennsylvania, and the British West India Islands are open to receive it in our ships, while the French and Dutch settlements are shut against it, it is certain that those states will be glad to sell their flour to any ships that may come to take it to our islands.

Meat production for exportation was probably then as intimately connected with the production of corn as it is now; but here, too, there were similar obstacles in the way of large production and free exportation. The art of breeding as now practiced was then unknown. Bakewell's famous experiments began about the close of this period The improved breeds in existence were local, and if of sheep were contraband. The history of the contraband nature of Spanish merinos is well known, and similar conditions existed in respect to the English mutton breeds. Jared Eliot, in his *Essays on Field Husbandry in New England* (first essay, 1748, page 14), speaking of the poor breeds of sheep in Connecticut and of the desirability of having better, states: "The *English* Breed of *Cotswold Sheep* cannot be obtained, or at least without great Difficulty: for Wool live Sheep are contra-band Goods, which all strangers are prohibited from carrying out on Pain of having their right Hand cut off," and advertisements in Pennsylvania newspapers some time after the Revolutionary War, offering Southdown sheep for sale, say that the seller has animals of pure breed, but cannot tell how he obtained them, from whose flock in the old country they came, who brought them, or on what ship, as it will subject the vessel to confiscation and the parties involved

to fines and imprisonment. Under such circumstances and conditions, combined with the deterioration of cattle in America, already spoken of, the quality of the animals and of the salt meat was claimed to be inferior to that of English or Irish production. The southern states supplied more pork relatively than the northern, as it could there be grown cheaper. The English writer above cited significantly adds (page 72): "The banks of the Ohio and Miss'ssippi may in future supply beef for exportation."

There was some exportation of saddle-horses from the North, particularly from New Haven and New York, and it is known that many of them were corn-fed. New York and Philadelphia were the principal places of grain shipment, Philadelphia standing first.

Perhaps one of the most suggestive facts forced upon the attention of the student of our colonial agriculture is the many attempts made at what may be called speculative farming, often on a large scale, and the uniform failure of every such project. Then, as now, the successful farming was the mixed farming of moderate-sized farms. The attempted cultivation of large tracts to some one commercial crop, by which fortunes were to be soon realized, uniformly failed. That farming which was by men who came to make homes and rear their families in independence was the kind that succeeded.

The agriculture of the world, which had stood nearly still for so many ages, was just beginning to advance a little faster at the epoch of the birth of a new nation in the New World. There is ample and evident cause in the facts related why the agriculture of the colonies was, as a whole, somewhat behind that of the mother country; but we see the social, political, and intellectual forces planted here which were to bear fruit so soon as they were free to act, and this was achieved by the War for Independence.

THE SECOND PERIOD.

The Revolutionary War left the young states poor in material wealth, but rich in hope. The war itself had stirred the people into fresh intellectual activity, turned attention to the development of our resources, brought people of different sections into closer acquaintance, lessened that intense provincialism which had characterized the colonial period, and had learned the people much about that co-operation which is necessary to accomplish results which depend upon the action of communities or classes.

Societies of one kind and another were the great means to this end, and they began to be formed immediately after the Declaration of Independence. Men then not only saw the value of such organizations, but they were now free to act; and societies for benevolence, prisoners' and soldiers' aid societies, learned societies, and emigrant societies were started in considerable numbers while the war was still in progress, and when we had conquered a peace and actually achieved our independence, then, and only then, agricultural societies began in this country.

On the 24th day of August, 1785, the Society for the Promotion of Agriculture was founded in Charleston, South Carolina, and was incorporated December 19, 1795 (see *Statutes of South Carolina*, vol. VIII, page 187, for charter; also Ramsay's *History of South Carolina*, vol. II, page 224). The objects of this society, as announced in the act of incorporation, were to "promote the interests of agriculture, to institute a farm for experiments, to import and circulate foreign articles that are suitable to the climate of Carolina, and to direct the attention of agriculturists of the state to useful objects". This was the beginning of the present State Agricultural Society of South Carolina, which still holds the old charter. So far as I have learned, this was the first real agricultural society founded in this country. The records of the society were lost during the late war, and its history, so far as I know, has never been written.

The Philadelphia Society for the Promotion of Agriculture was instituted in the same year, and is still in existence under its original name. In one of its earliest publications, if not the first, a small pamphlet containing a summary of the constitution, it is stated that one of its objects was to promote the establishment of other agricultural societies in the principal places in the country.

The New York Society for the Promotion of Agricultural Arts and Manufactures was formally organized February 26, 1791, and in 1792 published its first volume of transactions, a small quarto. Several volumes appeared, which were so much sought after that a second edition was published in 1801 in the more convenient octavo form, which the numerous official agricultural reports of this country have since followed. This society went through various vicissitudes. Successive charters expired by limitation and new societies were organized, which were, essentially, the old ones under new names, coming down to the present day, and now represented by the New York State Agricultural Society, the changes forming a very instructive history, and illustrating both the struggles and the influence of such organizations.

The Massachusetts Society for Promoting Agriculture was incorporated in 1792. Its premiums and its numerous publications did much to foster agriculture in New England and to disseminate agricultural information throughout the states. It is still in active existence under its old name, and is doing good work.

The Society for Promoting Agriculture in the State of Connecticut was organized August 12, 1794, and published its first volume of transactions, a small quarto pamphlet, in 1802. After existing as a state society for twenty-four years, at the time of a general formation of county societies in Connecticut, in 1818, this was changed by an act of the legislature to the county society of New Haven, which is still in active operation.

During the latter part of the last century, when these few societies began their work in this country, numerous others were organized in Europe. As already stated, only a very few existed previous to 1775, but by the close of the century they had extended to nearly every country and state of western Europe, and scores, if not hundreds, were in existence. Two great causes, one intellectual and the other political, were acting independently of each other to produce this result. The first was that the intellectual progress of the day was taking the direction of the physical sciences. Then chemistry took a definite shape, its application to agriculture was almost immediately recognized, and a definite science of agricultural chemistry began to be pursued. Geology, too, took shape and assumed its position as a science about the same time, and by it new light was thrown on the constitution of soils. Botanical and zoological classification, as instituted by Linnæus a little earlier, began then to work its results, and along with this, but independent of it, experiments in breeding were begun, notably those of Bakewell, which have led to such grand results in improving domestic animals; and in various ways the inductive methods of science began to pervade the methods of agriculture. Secondly, this was a period of startling political events in Europe as well as in America. The French revolution followed our own war for independence, and immediately after it agricultural societies rapidly extended to every department of the new republic, and an abundant crop of agricultural literature began to be produced in every country of western Europe. The social condition of the peasantry, however, prevented the progress there which accompanied similar work in this country.

Although we were a little behind some of the countries of Europe in the actual formation of agricultural societies, yet, when once started, under the influence of our newly-acquired liberty, they spread as they did nowhere else, and did a work which has no exact parallel elsewhere. Their early progress seems slow to us, but it was really rapid when we consider that it took time for people to learn how to form them, how to conduct them successfully, and how to use them profitably. It was with societies much as it has been with improved implements and machines. First, inventions; then a series of trials to adapt them to their special uses, the progress of which was slow; then their introduction into use, which was also slow up to a certain point; and then a sudden spread in general use. Thus it was that so few societies were formed in this country during the last century.

But with the present century came more rapid progress. The experiments made by individual farmers before that time were of comparatively little value to others living outside their immediate neighborhood. There existed no means for the dissemination of the information thus gained, nor for that conference and co-operation of workers which was essential to the spread of knowledge thus acquired, nor for that instruction which should come from mutual discussion of each other's methods. Local agricultural societies were the instruments which were to effect this, and they began only with the present century. If any county societies were actually in existence before that time I have no record or account of them. There are a few allusions to local societies and farmers' clubs, or at least to the desirability of such, found in various old newspapers, but I have no proof that any actually existed.

The five agricultural societies already named, which began in the last century, were more general in their operation. Meetings were held for discussion and the presentation of papers, at some of which tools and implements were exhibited (for example, at the meetings at Albany in 1796 and 1797), and choice varieties of grain were sometimes brought in and distributed by enthusiastic members. These societies extended their influence by the publication of pamphlets, papers, and memoirs. The seventh rule of the New York society provided that it should parcel the state into districts, and have a secretary in each. This led to the formation of county societies in the first decade of the present century, and these spread with wonderful rapidity in the agricultural districts. Exhibitions, cattle-shows, and plowing matches were early instituted, but precisely when and where they began in this country is uncertain. It was largely through these county societies, and by means of their meetings, that a knowledge of improved implements and better processes of tillage became diffused. The differences between good and bad forms of animals were learned at their exhibitions, and, more than all else, farmers came together, compared their experiences, sharpened their wits by intellectual contact with each other and by the discussion of each other's methods, and derived that benefit which comes from the intercourse of men at work in the same vocation. Our political institutions and social customs were eminently favorable for the formation and the profitable working of such organizations, and their effects were particularly beneficent and rapid, as was shown in many ways, but particularly in the general improvement of the agriculture of those districts where such societies were most common and most prosperous. They destroyed the deep-seated prejudice against what had been called "book-farming", and thus opened the way for an agricultural literature to reach the masses, by which the truths of science could be brought quickly and cheaply to the farmer. The societies published books, pamphlets, and papers, and by the dissemination of information in that form prepared the way for the agricultural periodical and newspaper. These publications began in this country during that period, and have now become the greatest disseminators of agricultural information, doing much of the work which the earlier societies had to do. An agricultural press did not exist in this country until the agricultural societies had prepared the soil of the public mind to receive seeds of instruction sown in that way. The agricultural newspaper appeared as soon as the farmers were ready to profit by it.

Another effect of agricultural societies was to put at rest a fear, which existed in many districts of the northern states, that a landed aristocracy might obtain a foothold in this country and reduce the smaller farmers to a socially lower class. Another great influence was in extending the use of improved implements and labor-saving machines. The plow at the time of the Revolution was essentially of the same form that had existed from the days of the

ancients, and the slight improvements which had been suggested from time to time were not generally adopted. Here and there a better implement might be seen, but no general improvement of much importance had taken place. Cast-iron plowshares were exhibited in the last century at the meetings at Albany, and perhaps elsewhere, and a few were used. During the previous fifty years the implement had been slightly improved in various ways in some of the countries of Europe, and in the very last years of the last century and the first years of this the plow became there an object of special interest and investigation, and many essays and papers appeared discussing its construction and its proper shape. So far as this country is concerned, and largely for the rest of the world, the first really great improvement in the plow as an implement was the result of studies made by President Jefferson, who made a mathematical investigation of the shape of the mold-board. This led to a better implement in every way. Models were made and distributed, both in this country and in Europe, and there, particularly in France (where prizes had been offered and many essays written on the best form of the mold-board), Jefferson's work attracted much attention, and he received a gold medal from the Agricultural Society of the Department of the Seine. His labor resulted in giving a shape to the implement which made it more effective, doing much better work, and using the power more economically. The introduction of the cast-iron plow into common use marked an era in agriculture, and led directly to many other improvements. Its extensive and wide adoption in the form given it in this country is unquestionably due to the influence of agricultural societies and of the exhibitions and the plowing matches which they inaugurated. Many other improved implements came into use during this same fifty years, of which the two most important in connection with American grain-growing were the grain-cradle for cutting the crop and the fanning-mill for cleaning it after it was thrashed. The sickle was common, though not in universal use at the time of the American Revolution. It was rarely used when that century closed, and had ceased entirely as an implement for cutting other cereals than Indian corn before the close of this period. The fanning-mill also came into use, was improved and brought to perfection during this period, and at its close the hand-fan, previously used, was no longer seen.

Another result, brought about largely through the influence of agricultural societies during the latter half of this period, was to concentrate farming to the cultivation of the more profitable crops by the elimination of many which had long been under experiment, but whose cultivation was, on the whole, unprofitable. The attempts to grow lucerne, vetches, spelt, rape, spurry, poppies, madder, woad, and so on, continued in New England and in the middle states until the present century, and the early publications of these societies contain numerous papers on the cultivation of these crops; but the very fact of such publication, and the discussion it caused, tended to bring out more strongly their unprofitable character in American agriculture. Some of them had been on trial two hundred years before they were absolutely dropped, and under the condition of things as they existed before the beginning of the present century they would have been on trial still. It was a conference between cultivators, the comparing of experiences, the introduction of scientific methods into this art, which tended to eliminate the least profitable crops and taught farmers how to profit by the experience of others. For further information pertaining to the growth and influence of agricultural societies during this second period, see *Report of the Connecticut Board of Agriculture for* 1880, p. 98.

The beginning of this period, then, found agriculture merely an art, and practically where it was four thousand years before. The end found the art enormously advanced, using improved implements and machines, and with a science of agriculture well founded.

The most noted features of this period were: First, the political movement which led to greater liberty of the individual; second, the spread of societies and associations for the diffusion of knowledge; and third, the growth of several of the physical sciences, especially chemistry and geology.

New methods were in use. There were new theories of fertilizers, improved breeds of cattle, and, more than all else, the vocation was beginning to use scientific methods, and those engaged in it were thoroughly awakened. During this period the cotton-gin was invented and the growing of cotton assumed greater proportions. Then began the importation of short-horn and other improved breeds of cattle, and of merino, Southdown, and other improved breeds of sheep. The Louisiana purchase had also added an enormous area of land for future grain-growing, the prairie region had begun to be settled, and the Erie canal was planned and finished.

The cast-iron plow had come into universal use by 1825, in some places somewhat earlier; in others, the wooden implement lingered a little later as a special tool kept for particular uses. Its complete introduction closes this period.

THE THIRD PERIOD.

This period of our agricultural history (1825 to 1855) is marked by the general adoption of improved methods of thrashing and cleaning the grains for market, by improved methods in the cultivation of corn, by the introduction of commercial fertilizers, and by the beginning of the transportation of grain by railroads.

From time immemorial the universal method of thrashing grain was by beating it out with the flail or with some other kind of hand implement, or by the trampling of animals. Machines were devised very early; we do not know how early, but the ancient writers speak of them. Nevertheless, none of importance were devised until

late in the last century. Numerous accounts have come down to us of various attempts at such machines, none of which had proved very successful. Jethro Tull, the inventor of the drill and of horse-hoeing husbandry, is said to have devised a machine early in the last century. A more successful machine was patented by Michael Menzies, a Scotchman of East Lothian, in 1732. In 1776 a machine which was said to thrash great quantities of grain in a short time was presented to the London Society of Arts by Mr. Evers, of Yorkshire. Between that time and the end of the century numerous machines were devised in England, and a few in this country, most of them depending on some system of flails or loose beaters. The foundation of our present machines is said to have been one brought out in 1785 by Andrew Meikle, of East Lothian, in Scotland, in connection with a gentleman named Stein. Since that time all successful machines have had as a basis a cylinder or cylinders running at a high speed and armed with spikes or beaters. As early as 1789 a machine, with rake and fan attached, to clean as well as thrash the grain, was invented, it is believed, by J. Baily, of Chillingham. How early thrashing-machines were devised and made or introduced into this country we do not know. There are various early allusions to them, and the traveler Parkinson speaks of one he saw on the farm of General Washington in 1798. Before the beginning of the present century the flail was used here relatively less, and the trampling of animals more, than in western Europe. The old barns from the Hudson river to Virginia were provided with thrashing floors, and in some places thrashing floors of great size were built out of doors. During the last century a large wooden roller, armed with wooden pins eighteen to thirty inches long, and drawn by horses on the thrashing floor, was brought into use. Mr. Benjamin Sylvester, of Caroline county, Maryland, has been credited with the honor of this invention. This was an improved implement in its day. An account of it was published in the *Memoirs of the Philadelphia Society for Promoting Agriculture* in 1816, and the writer has seen it in use in grain-growing districts as late as 1835 or 1836. There is a very considerable literature relating to the early attempts at thrashing-machines in this country. The first American patent issued for a thrashing-machine was dated March 11, 1791, being the seventh on the records of the office. It was to Samuel Mulliken, of Philadelphia; and several other patents were issued previous to 1800. A more detailed account of these early thrashing-machines may be found in the *Preliminary Report of the Eighth Census*, pp. 92–96, where the statement is made that 9 inventions for thrashing-machines were patented before the beginning of the present century, and over 240 in the next twenty-five years (under the class of machines for thrashing 2,307 patents have been granted up to the close of 1880). During all this time, however, the most of the grain continued to be thrashed by the old methods. In the better farming regions of the middle states early in the present century 8 to 16 bushels of wheat per day were considered a high average for a man to thrash with a flail, although under exceptional conditions the result was sometimes larger. The averages given for Maryland, Virginia, and Delaware are usually less, some writers considering 6 bushels per day a fair average for the winter's work. Thrashing was largely done in the winter season, and where horses were used 23 to 30 bushels per day for three horses, a man, and a boy were common, although sometimes larger results were attained; the average, however, was not much, if any, above the last figures. In a specific case reported to me, on a farm in Duchess county, New York, 1,300 bushels of wheat were thrashed, the grain winnowed, and the straw drawn from the barn to the neighboring field in twelve weeks, two men and five horses performing the work. This was an average of less than 20 bushels per day, and was considered at that time and in that neighborhood good work.

About 1820 thrashing-machines ceased to be a curiosity in the better grain-growing regions of the middle states, but by far the most of the grain was thrashed by the old methods until after 1825. Between that date and 1835 their use spread with great rapidity, and before 1840 comparatively little of the cereal grains was thrashed in any other way in the principal grain-growing regions of the country. At first the machines merely thrashed. Separators were soon added, and before the close of this period almost all of the grain was separated from the straw and chaff by machine, although it was common to pass it once through a fanning-mill before marketing. Steam-thrashers were introduced here and there before the close of this period, but they can hardly be said to have come into common use, horse-power being almost universally employed.

The improved methods in the field culture of Indian corn spoken of were principally through the invention and introduction of a variety of cultivators, horse-hoes, and similar instruments, by which the hand culture of the crop was replaced by animal power. It was during this period that commercial fertilizers were introduced to the world and came into extensive use in Great Britain, and somewhat sparingly here. This was also the period of the extensive introduction of agricultural drainage. This had actually begun long before, and for obvious reasons was extensively done in Great Britain and Ireland before it was here. It began here as early as 1820, but it was only toward the very last years of this period that the manufacture of draining-tiles began in this country, with a machine brought to central New York.

The transportation of grain by railroads also began and rapidly changed the aspects and conditions of agriculture in the western states, and gave it an impetus it never had before. This, of course, brought with it increased cereal export, but as yet the steam transportation of grain on the ocean had not been practiced on any considerable scale. The repeal of the corn laws in Great Britain during this period also had a marked effect on grain-growing in this country. The Erie canal, which was finished in 1825, at just the beginning of this period, had put all the lake region within reach of the sea-coast, and with the flow of grain eastward began that change in New England agriculture which has entirely transformed it since.

THE FOURTH PERIOD.

Reaping-machines, like thrashing-machines, had been devised quite early, but were not made practicable, and had not attracted much attention until the exhibition of American machines at the World's Fair at London in 1852 brought them prominently before the world, after which they spread very rapidly into use. By 1855 so many were in use at different points that they had ceased to be a curiosity, and from that time on they were adopted about as rapidly as they could be manufactured. Railroads made it possible to economically transport grain from far inland, while the reaper made it possible to harvest larger areas than before. This made the necessity for more rapid thrashing, and steam-power came into common use. The history of progress in agriculture is so well illustrated by the methods of harvesting and of thrashing grain that we may summarize them here.

It is probable that the ancient Egyptian could thrash and clean his grain as fast and as well as the European could 3,000 or 4,000 years later, when 6 and 12 bushels per day per man was considered a good day's work, or, by the treading of horses, a man could double or treble this amount. Then came the horse-power thrasher, thrashing first 100, then 300, then 500 or 600 bushels per day under good conditions and cleaning it for market. Then came the steam-thrasher, the limit of whose work is so high that it is only reached on the largest farms and under the best conditions. Steam-thrashers in common use in California, traveling from farm to farm, will thrash from 40,000 to 100,000 bushels of grain in a "season" of three months, and many single machines in use in that state will thrash 2,000 bushels per day each, reaching a maximum of over 6,000 bushels.

The same thing is shown in harvesting. The sickle, as already stated, brought into use by the ancient Egyptians, remained almost stationary as to form and method of use until the middle of the present century. In Stevens' *Book of the Farm*, one of the highest authorities on Scotch agriculture, published as late as 1850 and 1851, the methods of reaping are described in detail (vol. II, pages 331, 332, etc.). He states that the "bandwin" of seven persons will cut, bind, and put into stook (shock) two acres of grain per day. In America the cradle came into general use before the present century. In heavy grain an expert man would cut two acres of wheat, and another man rake and bind it into sheaves in a day, the two doing the work of about six with sickles. In light grain more could be done, but the average day's work was less than two acres. Then came the reaper. Such reapers and harvesters as are used east of the Missouri river will cut, on an average, 12 to 16 acres per day, according to the nature of the ground and the weight of the grain. The 16-foot headers used in California will average 30 or more acres, this process culminating in the machines coming into use in that state, which cut, thrash, clean, and sack the grain at one operation, in which 35 or 40 acres per day are harvested, four men attending the machine, as described more at length under wheat production.

Great as the progress has been in harvesting and cleaning grain, it is still greater in grain transportation. Before steam transportation it was rare that grain could be carried by land more than 100 miles, although it was sometimes done. It is now carried from Chicago to New York by rail for a less price than it costs the average farmer to haul it 25 miles by team and wagon on ordinary roads, and a steamship is loaded by elevator in a day. The enormous development of our grain trade has only been possible because of these mechanical improvements in the harvesting, cleaning, handling, and transporting of grain, which improvements belong to this last period, and now wheat grown on the plateau of eastern Oregon and Washington, 500 miles from the sea, is carried to various ports in Europe, a distance by the shortest sea route equal to over five-eighths of the circumference of the globe at the equator. Food is carried so far, and flows in the channels of commerce so freely with the slightest pressure of demand, that local failure of crops no longer means famine, or even specially high prices. The rich and poor alike can now eat wheat bread, and this means a happier life to future generations. The changes wrought by this new condition of things is greater with the poor than with the rich. It now seems eminently probable that our agriculture, correlated as it is with our political and social institutions, is destined to work indirectly as great results in the social and the political condition of Europe as its economic features have wrought in economical relations there. Were we considering the history of American agriculture in all of its branches this division into four periods would not be applicable, and still less so if we consider it specially in respect to either tobacco, cotton, sugar, or live-stock production. With tobacco there has been no such marked eras, but rather a continual progress; in cotton production the two great eras were, respectively, the invention of the cotton-gin and the rebellion of 1861; and in live-stock production the history has been still different. The introduction of merino sheep in large numbers, and the recent spread of stock-growing over the western plains, are the more marked eras.

FACTS AND CONDITIONS PERTAINING TO CEREAL PRODUCTIONS.

Several matters pertaining to food production in general and to cereal production in particular in the United States, some of which have been already noticed more than once, need to be noticed again in certain other relations for a better understanding of the present condition and the future prospects of our agriculture. These are more especially the relations of mixed farming to grain production, a comparison of this with other productive industries, its relations to land tenure, to live-stock, to modern agricultural machinery, and to the social and political factors existing here.

MIXED FARMING.

Inasmuch as agriculture is an industry absolutely essential to civilization, it cannot be killed in any country by any process short of the destruction of its inhabitants. It is, and of necessity must be, an eminently adaptive industry, conforming its processes, methods, and products to every changing condition of soil, society, or markets, sensitive to every influence, and responding to it; it is perfectly plastic, receiving its shape from every surrounding pressure, whether physical, industrial, commercial, social, political, or moral. This must be kept in mind in every discussion of agricultural economy here or elsewhere.

As before stated in several connections, the most of the grain in the United States is grown in mixed farming, and this is continually changing in its details, in obedience to that law of adaptiveness already spoken of. Just now some of the changes are going on rapidly, chiefly because of the new methods and facilities for transportation, the use of improved machinery and implements, and the greater specialization of production.

This adaptiveness is most marked in mixed farming, and, as mixed farming is a necessity where there is a dense agricultural population, or where there is much subdivision of the land, it must increase in this country; for, although in such a region special farms devoted to a single product may exist, yet mixed farming must constitute the occupation of most of the farmers. In a new and sparsely populated region, or in one having very exceptional facilities for manuring, it may be otherwise. Under such circumstances large tracts may be devoted to the cultivation of some one or two grains, but the more dense the farming population the greater the necessity of mixed farming, growing out of natural laws of the relation of population to land. In mixed farming, and with relatively small farms, the aggregate agricultural production is greater because of several reasons.

By the succession and rotation of crops the land will produce a much greater aggregate product and the quality of the crops will be better.

The waste materials of one product or crop may be used for the production of another, as the unmarketable grain and straw may be used as forage for domestic animals, and animal refuse be used for manure. There is, therefore, a more complete utilization of the material.

If crops grown on the land are sold off, then exhaustion takes place; but by a rotation of crops this is delayed, and by manuring with home-made manures it is still more delayed.

There is a better distribution of labor. The crops are planted at different times, grow at different seasons, are harvested in different months, and the successive work on such a farm can be better done than if all came at the same time. Where any one crop is grown in undue proportion in respect to the others in any region or district, the labor necessary for the production of that crop is dearer, because it is not continuous, and agriculture becomes an intermittent industry, with all of the evils attached to that condition.

The crops are not all liable to the same mishaps. Each crop has its preference of weather, each its own possibilities of danger, each its own enemies, diseases, and mishaps, and it is rare that in our climate a drought or other untoward condition of the weather is so prolonged as to interfere seriously with all the crops. A mishap attending any one may not extend to all, and the failure of any one crop through climatic or accidental causes not unfrequently brings with it increased production of the others. A good year for one crop is not necessarily a good year for another, and each and every one fails sometimes; but by a proper combination the business, as a whole, goes on, and the success of one mitigates the losses by another. Moreover, the mishaps which may occur to any one crop can be very often lessened by the farmer if the relative amount of this crop be small. For example, if rust strikes his wheat before it is ripe, it may be cut early, and the loss in that way be reduced to its least; if an early crop is killed by a late frost, a crop of a later kind may be put on the land, and so on through a multitude of adaptations possible where the acres are not too many and the productions are sufficiently varied. In a variety of ways mishaps which would be total disaster in a region growing but one or two crops are relatively much less of a calamity in a district of smaller farms and of more varied production.

The yield per acre on small farms pursuing mixed farming is greater than on large ones. Greater care can be, and usually is, taken in the selection of seed, in the cultivation of the crop, in the preparation of the soil, in manuring, and in harvesting, and on lands of the same value the interest account of such farms is lessened as the production is increased, and all this induces thrift. Small and large farmers are more nearly on the same footing than small and large operators in any other industry.

There is, of course, a limit of smallness as well as of greatness to profitable grain-growing farms. When too large, the crops do not receive that careful cultivation which is necessary for profitable production in the long run; when reduced too much, the use of labor-saving machines becomes so much reduced that the greater amount of hand-labor required may more than compensate for the advantages I have enumerated. Precisely where the limit is cannot be empirically stated. It must depend upon many conditions arising from the physical character of the country itself—from the climate, the markets, the agricultural traditions and customs of the district, the business capacity of the man, and other causes. Farming on a large scale is much more practicable in a level prairie region than in the more varied soils and hilly regions of the eastern states, and because of the climate and physical characters of the country this is still more true of California. What would be a small farm in one region might be a large one in another.

As has been noticed when speaking of the history of agriculture, there has been in modern times a specialization of production in agriculture as in manufacturing. This shows itself in a variety of ways, and one phase of it is seen in the exclusive growing of some single crop that we find in certain new regions, as wheat-growing in the Red River region of Dakota, or under special physical conditions, as in California. But specialization is as truly applicable to mixed farming in an older region, and where it manifests itself in a variety of ways. As previously stated, the number of kinds of crops grown in any district is less now than formerly. At present only those crops which experience has proved to be most profitable in that region and under that system of farming are cultivated, and the cultivation of these is more highly specialized. More care is taken in the selection of varieties; better implements are used for cultivation. Frequently special machinery is devised for special crops; special machines for the harvesting, cleaning, or preparation; in short, while the number of crops, as a whole, has diminished, those that are grown are produced by improved methods. In any region where the most of the farming is mixed farming there may be some one, two, or three crops specially predominant, for the cultivation of which very special facilities may be afforded, while here and there may be a still greater specialization, where farms are devoted to some one object, under the care of a man who, having special fitness or taste for some single product, makes that successful and profitable. Facilities for transportation tend to this specialization, and develop wheat production as the leading crop in one place, barley in another, dairy farming in another, without destroying the features which give value to mixed farming. For the highest success in any system, however varied or however specialized, the first requisite is freedom as to methods and as to products. The intelligent farmer must be perfectly free to produce what he will, and by such methods as seem to him best, only subject to, and controlled by, the physical laws of nature and the equally inexorable laws of trade.

This perfect freedom of action, in turn, depends chiefly upon the systems of land tenure and on the social and political status of the farmers.

LAND TENURE.

The methods of agriculture in any country are, of necessity, based upon its system of land tenure. Local systems of land-ownership and land-holding, and even traditional customs not compelled by statute law, but which become a sort of unwritten law, are not easily changed, even if very faulty; but when changed agriculture adapts itself to the new conditions with comparative ease, although usually not quickly. Fortunately for us feudalism never existed here, and has not, therefore, left its evil influence on our land laws, or on the sentiments and traditions connected with agriculture, or on the political and social life of either land-owners or farm laborers. Our homestead and pre-emption laws have made it possible for each man to become a land-owner upon actual occupation and settlement, and our land laws secure to the proprietor perfect title, absolute ownership, complete control, and easy sale or transfer. Land has here neither social nor political value, but merely its agricultural value, and it is placed as nearly as is possible on a level with other property as to title, ownership, transfer, in the burdens it bears and the privileges it confers.

This simplicity of tenure and the abundance of cheap or new land have made it possible for every able-bodied man of average capacity to satisfy that desire which has become instinctive in our race and own a home. A natural result is that in the grain-growing districts the great majority of farmers own the land they till, and that as the population becomes more dense the improved lands become more divided and the average size of the holdings is smaller. We see this going on in every state. The effect of this diminution in the average size of the farms upon agricultural production is not as simple as might at first seem, and, owing to the special conditions, the evils resulting from extreme subdivision in some portions of the Old World do not exist here, where the subdivision has nowhere reached any such figures as it has there. At the census of 1870 the least average size of the farms in the chief grain-growing states was over 100 acres, while the arguments that are so often quoted against subdivision in the Old World apply mostly to farms of from 2 to 15 acres. In all of the states growing much grain a farm of 50 acres, or even one of 80 acres, is called a "small farm". The cases of France and Ireland are most frequently cited as showing the evil effects of extreme subdivision in the Old World, but neither case is at all parallel with ours. In both countries the land is tilled by a peasantry, and the subdivision there is much greater than here. The French people own their land, and the country is, as a consequence, a highly productive one. The

scale of farming is low, the animals are usually of poor breeds, but the crops are good and of excellent quality. It is in the production of domestic animals and in the use of labor-saving machinery that small farming stands at the greatest disadvantage. In America there is no peasantry, and, moreover, there is no distinction of class among land-owners. The small owner is socially equal to the large owner, the only difference being that which comes from a difference of wealth, which is vastly less in the country between large and small farmers than in the cities between men doing a large business and those doing a small business. In France the small farmers are peasants, in Ireland not only peasants but tenants, and in both cases without either the aspirations or the incentives which a small American farmer has. The difference of previous history, local traditions, and social customs is so great that no parallel can be drawn.

The difference in the density of population also regulates the intensity of the farming. Where the population is very dense, and must be fed from the soil, there farming must be intense, no matter how much it costs, or the people will starve. In this country the abundance of new land, and the ease with which it may be acquired, has prevented an intense farming. It is this, and not a lack of either intelligence or of enterprise, that gives us a low average yield of grain per acre, compared with that of the more densely populated agricultural districts of Europe. Wherever it pays to farm more intensely American farmers are not slow to see it, but it is curious to see how many who discuss this matter entirely ignore the great natural law that as the methods of farming become more and more intense the increase of crop is not proportionate to the increase of cost in producing it.

A given soil will easily produce a certain average of crop with a certain amount of labor and expense. We may increase the labor and expense, and for a time get a more than corresponding increase of crop. If we continue in the same direction, we soon reach a point beyond which the increase in yield is not proportionate to the increase in expense, but grows less and less, and at last a point is reached beyond which no amount of additional expense will increase the average yield. In short, there is no limit to the expense that may be applied to the production: there is a limit to the average yield, and even to the possible yield, and the ratio of cost to production varies all along the line. We have our droughts and our mishaps, but our less intense system of agriculture, under our system of land tenure, is more flexible, and can stand shocks another system might not sustain.

The agriculture of the United Kingdom is just now of especial interest to us, because of the contrast it presents with ours, the agricultural distress now existing there, and also because they are so largely our customers and feel so keenly our competition.

The system of land tenure, the density of population, and the social and political factors involved, slowly brought English agriculture up to an intensity which could not stand the pressure of the recent bad years. It had too many fixed points in it to meet the emergency and stand the strain while adjusting itself to new conditions. Land had acquired a value it could not hold—no new thing of late years.

A similar thing has happened in some localities in New England, where many farms have fallen in value at some time during the past thirty years as much as in the worst cases in England, the result being due largely to western competition. But here the land-owner and the farmer are one and the same person, and as the causes were working gradually the value of the land and the cost of production imperceptibly readjusted themselves to each other. This new adaptation went on slowly by a perfectly natural process, guided only by the laws of production and of markets. There was decreased profit during the change, but no "distress", and practically no bankruptcy. The system of land tenure made it possible and easy for any one dissatisfied with the condition to sell out, if he chose, at any time on the best terms that offered and "go West", if he wished, before bankruptcy befell him, and give way to some one else who could and would utilize such advantages as the old place afforded. All this was a purely economic problem for each one to work out for himself. There were not two or three antagonistic classes in interest involved on each farm, each increasing the actual loss by trying to crowd so much of it as possible on the other, and there were no social or political factors involved. In places the actual effects have been so great that lands once tilled have been turned back again into woodlands, and the population of numerous farming towns has actually decreased; but this has gone on without either social or political disturbance, the laws of adaptation pertaining to this industry have been free to act, and the problem quietly solves itself.

But in countries where farmers, as a rule, must rent the land, and two different classes, economically and socially, are involved, whose interests are antagonistic, the farmer feels the pressure first, because he has not perfect freedom to adapt his methods and his production to varying conditions as rapidly as the conditions themselves vary. The agriculture of those countries will adapt itself to the new condition of things in time, because, as already shown, the industry itself will not and cannot be killed. It will shape itself anew, in conformity with the new pressure exerted upon it, but so long as the present difference of system of land tenure prevails that now exists the agricultural competition of the Mississippi basin must produce very different effects in the United Kingdom, France, and Germany from those produced in the parts of the United States which suffer from the same competition. The farmer working lands belonging to another, by methods and under a system which has regard to another's interest even more than to his own, and on a scale of intensity fixed in previous years and under other economic conditions, without that absolute freedom to manage and control his own business in such ways as his own judgment suggests or his own tastes prompt, must work at a disadvantage in competition with another farmer who has this freedom.

Fixity of tenure, the right to hold possession so long as the pecuniary ability or the taste of the possessor determines, and the freedom to sell at the best advantage when he will and to whom he will, is another element the political and social effects of which are probably even greater than the economical ones. If insecurity of tenure be combined with great subdivision of land, then we see the worst effects, of which Ireland is a conspicuous example. In the voluminous evidence taken last year (1880) before the commission instituted to consider the agricultural situation in Great Britain and Ireland the many evil effects of insecurity of tenure are brought out in a strong light in the testimony of various witnesses examined, who represented the several classes involved. The social and political factors there are so unlike ours that comparisons are liable to be misleading, but of interest is the testimony relating to the connection between the turbulence in Ireland and the land question, and the testimony of a land agent that "the low state of civilization" (in which many of the peasantry live, even those who have money) "is brought about by the uncertainty of their tenure and the uncertainty of their rents being raised, the moral effects of which remain long after the legal cause is removed" (*Minutes of Evidence taken before Her Majesty's Commissioners on Agriculture*, p. 952, London, 1881).

The economic phase of our system of land ownership which most directly and immediately affects grain production, the one which has been so much dwelt upon, is the perfect freedom the system gives the American farmer to adapt his methods to suit his own special conditions and to specialize his productions as best suits his own tastes.

We are as subject to great fluctuations in the yield of our crops by climatic uncertainties as other lands are. Droughts are as liable to come here as wet seasons are in England, and in such times our chief and great advantage lies in the freedom which our system of land tenure allows, by which the farmer, in an unfavorable year or series of years, can make the most of his means by any adaptation which his intelligence may suggest or ingenuity devise.

The relation which this industry bears to the political system of the country is no less important than the immediately economical ones, for agriculture and land tenure bear peculiar and special relations to social progress and political stability. From the nature of the vocation its problems must always be specially related to political problems and its progress to political progress.

RELATIONS TO OUR POLITICAL SYSTEM.

It has already been shown that our agricultural history has been exceptional and intimately correlated with our political system. It has been the leading industry of the country from its settlement, while our people have been working out one of the greatest political problems the world has yet seen. Dangers to republican institutions come from cities and from aggregations of men in other vocations, and the stability of our own government is most intimately connected with its agricultural system.

Our progress has been heretofore intimately correlated with our agriculture. What would have been the history of this country had its agriculture at the start been consigned to a peasantry, whether owning their own land, as in modern France, or a tenantry, as in Ireland, I will not attempt to say; but that the nation would not be what it now is we can surely say. What it might have been we have an inkling of in some of the countries of this continent where the agriculture was consigned to a peasant class. Indeed, the wooden plow, and the primitive, non-progressive method it suggests, are still in use in at least one territory of the United States, where an ignorant peasantry tilled the soil before annexation, some of whom still live and perpetuate the methods of a previous age. The peasant system of old Spain, transmitted to New Spain, has left its effects as truly on the political history of Mexico as on its agricultural methods.

The agricultural features of political significance in this country are:

First, that we never had a peasantry in the sense in which that word is used in the Old World, and that we have no agricultural class. Whether a man tills the farm, practices law, preaches the gospel, manages a factory or a mine, is a matter of personal choice, and not of caste or class.

Second, that the tillers of the soil mostly own the lands they till, and get the benefits of the improvements they make and the wealth they create.

Third, that agricultural land has only an agricultural value; that its ownership confers no privileges and imposes no burdens which are not common to other forms of property; that it can be bought and sold as other property can; that its ownership is as absolute as that of other property, no more and no less.

On these three features are founded our strongest confidence in the stability of our political institutions and our brightest hopes for future progress.

The progressive element in a country like ours, and, indeed, in any country, is in that portion of its population which is neither very poor nor very rich. This is the stratum in which originates the most of that quality of intellect by which mankind has made its greatest achievements. From this class comes practically all of that kind of intellectual genius which manifests itself in literature, art, discovery, and invention, in business sagacity and social reform, and our agricultural system has been eminently adapted to breed and develop this class.

For the conservation of political institutions and the creation and preservation of material wealth it is best that as large a proportion of the whole population as is possible own real estate, particularly their own homes, and this our system of land tenure and land ownership encourages. For peace and the suppression of the warlike impulses, as well as for thrift, it is best that as large a proportion as is possible of the population be at work for

themselves, rather than for hire, and for this our agricultural system furnishes the opportunity. Also, that as large a proportion of the population as possible have facilities in their vocation for the education and rearing of families in virtue, intelligence, industry, and thrift.

For the last no other industrial occupation is so pre-eminent as farming, as it has been carried on in a larger part of this country. In no other vocation is there exercise for so great a variety of talent and so much sound judgment as on a farm growing a variety of crops, producing domestic animals, and using the latest machinery and devices. The causes which have placed an intelligent class on the farms have been sufficiently commented upon. This from the start gave a tone to the vocation in this country it has had nowhere else in the world, and has resulted in keeping the farmers more intelligent than any other men who have so much actual manual labor to perform.

Combining the offices of owner, overseer, and manager of the business with that of the skilled workman, he is at once employer and laborer. He must be personally familiar with a greater variety of manual operations than any other laboring man or mechanic is required to know; he must exercise his judgment in a greater variety of ways; must be a keener observer of nature and of nature's laws, and be brought in contact with a greater variety of things, animate and inanimate; and this, from the nature of the vocation, with less contact with other business men than is the rule in other vocations. All this not only educates and trains his judgment, but gives him a certain robust independence of character and confidence in his opinions and beliefs which is of especial value to a man who is a voter. The industry is a notoriously conservative one; the very nature of the vocation makes it so; and this sturdy but intelligent conservatism has its especial value to our political institutions.

No other place is so favorable for the education of the young as the moderate-sized farm. Here the child has a greater variety of object-teaching than can possibly occur in any other common form of home life. There is so much to see that instructs: crops grow, animals must be reared, so many natural laws and natural phenomena are related to the work and the business, the seasons have more significance than that of mere heat and cold, and the weather means more than merely pleasant skies or gloomy days. In no other vocation can the child be so trained to habits of industry without detriment to his health or intelligence; no other is so well adapted to the sound education for intelligent and independent citizenship of the actually working portion of our population.

The very large proportion of men in this country who have become eminent in the various walks of life, who have originated on farms or plantations and received their early training there, is the natural result of the influence of this vocation on the education and intellectual development of people who belong to an intelligent stock naturally.

Reasons in abundance might be given why this is so and must be so, and why, under our political and social system, it is undoubtedly better that as large a proportion as possible of its farm laborers should be independent farmers, conducting their own business, even if it be in an humble way, and educating their children into their vocation, than if the same number of men were employed on larger farms as employés, even though in that case better machinery might be used and a better organized system of labor might be practiced. The fact is, that the total agricultural production is increased by the subdivision into smaller farms, each managed by its owner.

A study of the tables of production will bring this out as no mere verbal description can, and will show that the great increase in grain production has been in the regions of moderate-sized farms—those small enough to admit of a close supervision by the owner and large enough to allow of the use of improved implements and machines. The agricultural and political welfare of our country is intimately related to, if not absolutely bound up in, the ownership and management of those farms which range in size from 80 to 320 acres—that is, from an eighth to a half section.

CONTRAST WITH MANUFACTURES.

The statement relating to relative aggregated production on large and small farms again brings us back to contrasts between agriculture and manufactures, which have been glanced at in another connection.

It has thus far been the experience of the world that the agricultural production of a district is larger and more certain if the farms are of moderate size than if large, and also is more where the farms produce some considerable variety of product than of a district where the farms are large, producing but one or two kinds of product.

In manufactures the reverse is true, and in these modern times cheapness of production, excellence of quality, and uniformity of result have gone hand in hand with the increase in the size and capital of the establishments, the specialization of labor, and the use of machinery. Latterly it has become a popular belief that the same principles govern agriculture and can be as successfully applied, and that under the present, or at least the coming order of things, the old rule, which has heretofore been the experience of the world, will no longer hold good, especially as applied to cereal production, and that the production will be increased, cheapened, and made more certain by making the farms larger instead of smaller.

There are four great classes of industrial production which furnish all the material products of civilization, namely, agriculture, manufactures, mining, and the fisheries. These classes are as essentially unlike in their principles of production as in their methods of work. The differences between agriculture, mining, and the fisheries are sufficiently obvious; but with the introduction of labor-saving machinery so largely into both agriculture and manufactures, and with the modern application of commercial fertilizers, these two classes of industries seem much

nearer together than formerly. Nevertheless, they remain as essentially distinct in their principles of production as ever. In manufacturing, each part of the process is more under control than are the processes of agriculture, and when these processes are not under control the results can be predicted. In a manufactory it can be calculated with reasonable accuracy how much labor a man can perform in a given time, what can be made or done by this labor, how much a machine can do in a given time and with a given power, what the wear and tear of the machine will be, what the power will cost, and so on through all the processes. The raw material is bought in the open market, in which all manufacturers of the same product fare essentially alike, and the products of all are sold under conditions so uniform that all similar establishments are placed on essentially the same level. All of the processes are under similar control, and all the conditions are so much alike, except within very narrow limits, that all of the establishments are in a common competition. With a given amount of capital the amount of raw material that can be bought, of work that can be done, and of product that may be expected, and the cost of that product, can be very closely computed in advance. All of the manufacturers of the same products are equal rivals, working under the same conditions and relations of competition; and, except for fire or flood, or very special disaster, all similar establishments in any one country work under essentially the same conditions. The greater the subdivision of labor the greater the specialization of machinery, and the greater the quantity of materials handled the cheaper all can be done. For example, shoes are made cheaper when the leather is bought by the ton, and twenty skilled workmen are employed on the different processes of the same shoe, than when the simple shoemaker buys his leather by the side, measures the foot of the customer, cuts and makes every part of the shoe himself, and carries it to the customer when done. Here every step in the process is related to labor, and the relative production or cheapening is due simply to the specialization of labor, the use of machinery, and to the magnitude of the business transacted.

All this is different in farming. The farm itself, its machinery and its live-stock, may be considered as capital. Some of the work, particularly that done by machinery, can be calculated with considerable exactness as to cost, rapidity of operation, and certainty of results; but with most of the processes there is an uncertainty and non-uniformity of cost, and of all the products there is an absolute uncertainty as to the quantity and quality produced such as never accompany manufacturing operations. From the beginning to the end scarcely an item of the cost of production can be calculated or predicted with an accuracy at all comparable with that possible in manufactures. Even in so simple a process as that of plowing, if done by the farmer himself, the cost varies exceedingly at different times. A rain coming at an opportune time may greatly cheapen the process and lessen the wear and tear of his implements; an unusual drought or other circumstances may make the plowing slower and the cost of feeding his teams and the wear of his implements greater. Time may be lost through bad weather, and the same cause may prevent the grain from being sown at the time most favorable for the greatest yield, or prevent the intended crop being sown at all, in which case another must be substituted later. All through the time of the growth of the crop it is subject to such possible dangers that its ultimate yield cannot be computed or its ultimate quality predicted. Droughts may pinch it or rains injure it early in its growth; mildew or disease may attack it later; insects or other enemies may plunder it; and frosts or other atmospheric causes may affect it. It may promise well until nearly grown, and then be shriveled by too much sun or drought or mildewed by too much shade or wet. It may grow well until harvest and the yield be abundant, but the uncertainty is not passed. Bad weather may prevent the proper curing, and the quality may be injured after the crop is grown. Such absolute uncertainty of product is unknown in manufacturing operations. In manufacturing we have nearly full control over most of the processes; in agriculture we have but partial control over any of them. In manufactures we have almost complete control over the results; in agriculture we have almost absolutely no control. In manufactures, where we have no control, we can usually predict the result and be prepared for it; in agriculture the results lie mostly entirely beyond either control or prediction. The varying conditions must be met as they occur, and, if unfavorable, their influence must be lessened as much as possible.

They are alike only in this: that labor-saving machinery can be employed in both, and that business sagacity in the management is rewarded by greater profits. In their principles of production they remain essentially unlike.

JOINT-STOCK FARMING.

Intimately related to the resemblances and contrasts with manufactures are the modern schemes for joint-stock farming.

Farming by companies is no new thing. As a speculative venture to grow some commercial crop, there has been a fascination connected with it from early colonial days, but latterly it has been revived under a new shape. Along with the wonderful development of joint-stock companies for so many things it is not strange that attempts should be made to apply to farming those principles which have been so eminently successful in manufacturing. Where but one commodity is produced, as wheat, cotton, sugar, sheep, or cattle, the problem of joint-stock farming is much simpler than where general or mixed farming is the object, and in this country the tendencies are more in the direction of stock-growing on the wide expanses of the great West, although it has been more than once proposed for grain-growing on a large scale, and has been approximated in special cases.

In England joint-stock farming is proposed as a solution of some of their present difficulties. In that country, where there is an especial horror of the subdivision of land, and where various causes have tended to put the

land into large ownerships, with a system of renting, joint-stock farming is proposed as a probable solution of the problem of how to make farming pay, upon which so many there are now at work. The impersonal character of a company is tempting to many landholders who could not, as individuals, deal hardly with their tenants.

This process has now actually begun, but of its practical success we have as yet no data from experience. Judiciously managed, almost anything will succeed; but it remains to be seen whether the more systematic management of such a concern, and the means of using the very best machines and appliances for each part of the work, will compensate for the loss of the interest which the individual has in working his own farm. Then, too, as a rule, companies favor rather lavish expenditures for striking experiments and conspicuous improvements. If their stock is in the market, there is a special temptation to make a good showing, and how all this is to affect the success it will be interesting to watch. A company of farmers, with limited liability; with directors, a president, manager, secretary, and treasurer; its stock in the market, and fluctuating with each change in the prospects of the crop; when each shower becomes a bull and each grasshopper a bear, is indeed a thing the world is not yet used to. These considerations make the experiment one of the most interesting now before the world, the more so as this industry has thus far especially resisted co-operation in all of its forms.

AGRICULTURAL IMPLEMENTS AND MACHINERY.

As regards agricultural tools and machinery the experience of the United States has also been peculiar and exceptional. The original population belonged largely to a class from which most mechanical inventions arise, few such occurring among the very poor and ignorant on the one hand, or among the very rich on the other. This led quite early to a certain kind of improvement in the implements of tillage. While the tools and implements of the colonies before the Revolution and of the states immediately after were perhaps inferior to the best in England, there was a tendency to greater simplicity here than there. The most marked feature was that implements, tools, or machines already in use or devised elsewhere were improved in this country and made lighter and cheaper and more simple in construction. Eliot tells us (*Fifth Essay on Field Husbandry*, 1754, p. 116) that "Mr. Tull's wheat drill is a wonderful invention", but that it was intricate, expensive, and "consists of more wheels and other parts than there is really any need of; therefore I applied myself to the Rev. Mr. Clap, president of Yale College, and desired him, for the regard he had for the publick and for me, that he would apply his mathematical learning and mechanical genius in that affair, which he did to so good purpose that this new model easily can be made for a fourth part of what Mr. Tull's will cost".

This experience doubtless had its counterpart before, and it has been a common one since that machines that were complicated or heavy or expensive were here simplified in construction, cheapened in cost, and made lighter to use. American field implements are lighter than those used in any other country, and, to use an Americanism, are "handier". This lessens hand-labor and makes it more effective, and saves time in nearly all agricultural operations.

The fact that so large and intelligent a portion of the population were at work on the farms, together with the scarcity of laborers on hire, led to the devising of implements and machinery to lessen agricultural labor to a greater extent than has taken place elsewhere. There was combined here as nowhere else an incentive to lessen labor, and an intelligence on the farms to devise machines to that end. The influences at work to cause the spread of useful inventions have already been discussed, and there never has been any active opposition to the introduction of any labor-saving agricultural machine, such as has been frequently seen in Great Britain and on the continent, nor has there been a class of ignorant farm laborers opposing the introduction of any improvement brought about by machinery. Every incentive has existed for the improvement of machinery, and every condition for devising it and extending its use. I have asked the honorable Commissioner of Patents for a list of the patents issued in the various departments incidental to the production of grain up to the end of 1880. From this I compile the subjoined statement relating to patented inventions pertaining directly to grain-growing:

PLOWS.—Total number of patents issued, 5,585. This "class" is divided into 36 sub-classes. Of these there are: Plows, 700; steam plows, 56; wheel plows, 818; wheel cultivators, 1,200. The list includes 201 patents for plows for cotton cultivation especially.

HARROWS AND DIGGERS.—Total number of patents issued, 1,746. Of this, 8 sub-classes relate to implements not especially used in grain production. The other 12 sub-classes, with 1,045 patents, are of implements the most or all of which are related to grain production.

SEEDERS AND PLANTERS.—Total number of patents issued, in 13 sub-classes, 2,314. This class embraces 36 sub-classes, of which 23 relate to implements not used in grain production, only the 13 sub-classes mentioned above specially pertaining to this department. Of these there are: Broadcast sowers, 543; corn-planters, 1,029; grain-drills, 310.

HARVESTERS.—Total number of patents issued, 6,235. This includes 30 sub-classes, of which 14, containing 2,466 patents, relate to the harvesting of other crops than grain. The other 16 sub-classes contain 3,769 patents. Among these are 398 self-binders, 954 self-rakers, and 252 corn-harvesters.

THRASHERS.—Total number of patents issued, 2,307. This embraces 30 sub-classes, 24 of which, with 2,138 patents, relate more or less directly to grain. Among these are 206 corn-husking machines and implements and 369 corn-shellers. The remaining 6 sub-classes relate to machines for thrashing other than grain, as clover-hullers and flax-thrashers.

There are various other patents pertaining more or less to grain matters. Thus, of the 241 patents for bagging grain and bag-holders some are of more special reference to use in mills and warehouses, but others are for the use of farmers or with thrashing-machines. So of portable steam-engines, some of which may be used for thrashing as well as for other purposes.

It is, of course, impossible to say precisely how many of this large number of patented devices relate immediately to grain production, as harvesters and thrashers do, or indirectly, as plows, harrows, and fertilizer-distributers do, but it is doubtless within the mark to say that more than 10,000 patents have been granted in this country for implements and machines and their improvements connected directly with the cultivation, preparation, and handling of grain. In the lists from which the above statement has been compiled, after excluding the sub-classes of devices obviously relating to other crops, as cotton-planters, potato-diggers, and clover-hullers, and those probably not used in grain production, as "digging-forks" among the "plows and diggers", and not including such general machines as ditching-machines, tile-machines, steam-engines, and so on, there are still upward of 15,000 patents issued in the classes named; so that 10,000 pertaining immediately and directly to grain production is probably an underestimate.

The various mechanical inventions and improvements which bear immediately on grain production may, for my present purpose, be rudely classed into four groups:

First. Tools, implements, and contrivances that are neither complicated nor expensive, such as plows, harrows, hoes, forks, rakes, grain-drills, cultivators, etc.

Second. The more complicated and expensive machines, used mostly in harvesting the crops and preparing them for market.

Third. Those which relate to the manufactures from grain, as machines for glucose, new milling machinery, etc.

Fourth. Inventions relating to transportation.

EFFECT OF IMPLEMENTS AND MACHINERY ON AGRICULTURE.

Improvements in the first group, the simpler tools and implements, affect small and large farms alike, and influence the production of all kinds of crops. They have certainly more than doubled the effectiveness of human labor, probably trebled or even quadrupled it. That is, in preparing the soil for crops, and after planting and tilling, a given amount of human labor will produce certainly two, and probably three or four times as much as with the tools and implements of the beginning of this century, and this advantage equally accrues to small farms as to large ones; my own belief is, even more.

It is only in the use of machines in the second group that the large farms have any considerable advantage over the small ones, and even here the advantage is less than at first seems, particularly on farms east of the Rocky mountains. Even on the very largest farms, and with the most specialized culture, as on the great wheat farms of the West, about one harvester to each 150 or 160 acres of grain is required, and most farmers growing over 100 acres of wheat find it to their interest to have more than one reaper. Itinerant machines thrash for the small farmer nearly as cheaply as for the larger one, unless the crop is so small as to require less than a day to thrash it.

But under such conditions as pertain to California the differences between the small and the large farmer are the greatest, and the contrasts between the old and the new methods are most marked.

As methods were until the common use of the thrasher and the reaper I think that in harvesting, thrashing, and preparing wheat for the market 4 bushels of wheat for each day's work (human labor) would be a high average, although under good conditions it might reach five or more bushels; that is, from the standing grain to the marketable product, for each day's human labor, 4 bushels.

With the cradle two men would cut, bind, and put into shock two or three acres of grain per day, the latter being a big day's work if the grain was stout. Two acres per day for a *bandwin* of seven reapers was considered good work in Great Britain as late as 1850. The time required to house or stack the grain varies greatly, according to the distance of the field from the stack or barn, the nature of the ground, etc. For thrashing with a flail 4 to 8 bushels per man per day was the average. Deane says (*New England Farmer, or Georgical Dictionary*, Worcester, Massachusetts, 1790, p. 283): "Mr. Mortimer thinks it a day's work for a man with a flail to thrash 4 bushels of wheat or rye, 6 of barley, and 5 of oats, beans or pease; but Mr. Lisle says that a good thrasher assured him that 12 bushels of oats or barley and 5 or 6 of wheat are reckoned a good day's thrashing." The thrashing of 1,300 bushels of wheat by two men and five horses in twelve weeks, cited page 140, is an average of 9 bushels per day per man if they worked every week-day. It is safe to say that it was not above 10 bushels per day of actual work.

So, taken all together, I think that a day's human labor, as then expended, and with the aid of animal power as then used, did not harvest and prepare on an average over 4 bushels of wheat, 5 bushels being reached only when the crops were good and labor was economically applied. A day's wages in harvest was usually a bushel of wheat or its price, for thrashing less, and if on shares usually an eighth; so probably the amount paid for wages from the standing grain to the marketable grain, if hired labor was used, was about one-fifth of the value of the crop.

Let us contrast this with the harvesting as now performed under good conditions in California. Governor Bidwell stated several years ago, in an address reported at the time, that on his farm he had harvested, thrashed, cleaned for the market, and stored in granaries 40,318 bushels of grain (three-fourths of it wheat) in thirty-six days, including all delays, with an average of 22 hands. This is an average of about 50 bushels per day per man.

The crew of 67 men, with the aid of animal and steam power, used by Mr. Hoag on the ranch of Dr. Glenn, as described on page 77, averaged for the season 1,700 sacks (3,825 bushels) of wheat per day in the harvest of 1879. This was an average of upward of 57 bushels per day per hand. The wages paid these 67 men was $130 per day (and board); that is, about 3½ cents (and board of men) per bushel.

In a statement made in the agricultural papers in 1874 as to the cost of thrashing in that state, where a thrashing crew of 18 men was used, whose wages were $43 per day and board, the wages paid for the thrashing (which was done by the farmer himself on his own ranch) was $1\frac{8}{10}$ cents per bushel and board of the hands.

With the combined harvester and thrasher on Mr. Huffman's ranch, described on page 78, four men on the machine and one man with the wagon to pile the sacks of grain averaged 36 acres per day for the crop of 1879. At but 20 bushels per acre, which is much below the average on that ranch for that year, it would be 720 bushels for the five men, or 144 bushels per man per day. The maximum with this machine I understand to be considerably higher.

I need not dwell upon the practical impossibility of harvesting the wheat, barley, and oat crops, amounting for the census year to upward of 911,000,000 bushels, to say nothing of the other cereals, by the methods of sixty years ago; but it is within bounds to say that a given amount of human labor, with the aid it now has of animal and steam power, will prepare the ground and plant an area at least twice as great, and in harvesting and preparing the crop for market an amount nine or ten times as great, and in land transportation a hundred times as great, now as then. And we find, as one result, that the production of grain per head of population has enormously increased, wheat at the successive decades being: 1849, 4.3 bushels; 1859, 5.5 bushels; 1869, 7.8 bushels, and 1879, 9.1 bushels.

The specialization of production and the diminution in rural population of some of the older states have already been alluded to.

Another effect of this specialization has been to make those products which require much hand-labor relatively much dearer and to cheapen wheat bread. Once buckwheat cakes and boiled beans were much cheaper as food than good wheat bread, but for some years this has not often been so, and at the present time (October, 1881) potatoes and beans are much dearer food, considered in respect to their nutritive value compared with their retail price, than the best white wheat bread; economically, the coarse beans, and not the fine bread, is now the luxury.

The change in the density of the rural population is due, in part, to the change in machinery, methods, and transportation, and to the changes in the manufacturing industries, the two working together. Where there has been a diminution in the purely agricultural districts it has been due to four causes; but a decrease in rural population has often, and perhaps has generally, been accompanied by an increase of agricultural production. The four ways in which it has worked are as follows:

First. It now takes fewer people to run the farm, as machinery more and more does the work once done by hand.

Second. In many places less grain is now sown and more land is put into pasture. This requires fewer people on the land. Whether sheep or cattle are raised, this is the common experience.

Third. The change in methods of manufacture has changed the rural population. In olden times every farming neighborhood supported its local mechanics, who made and repaired many of the tools of the farm. There was also the country shoemaker, tailor, harness-maker, wagon-maker, etc. Now, most of these articles are made in great manufactories, which are clustered in the towns and cities, and the rural mechanics, except horseshoers and the country blacksmith, have disappeared from the country road, and their signs now swing in some town.

Fourth. Country stores have in the same way succumbed to the attractions of the city shops, and with them have gone a small professional class, country lawyers, etc.

All these, acting together, have not seldom caused a decrease in a rural population, while the agricultural production has at the same time been increasing, in obedience to that property of adaptiveness already fully discussed.

RELATIONS OF CEREAL PRODUCTION TO LIVE-STOCK GROWING.

The relations of grain-growing to the production of live-stock in the United States present some very interesting features. In most modern civilized countries the aims of agriculture are about evenly divided between the production of crops and the production of domestic animals. In the most highly developed agriculture, and under the most enlightened civilization, these two go together on the same farm. These two departments of agriculture are dependent upon each other and are mutually helpful, and each stimulates and increases the production of the other; but with a lower scale of civilization, and in a ruder state of agriculture, they may be entirely separated, and in such cases are always antagonistic. We cannot say, however, that one is lower than the other. The very lowest savages may till the soil, in that they may grow a few plants for food, but they do not breed domestic animals for food or use to any considerable extent. It is in a higher stage of culture, called the nomadic or pastoral, lying between the lowest savagery and the most enlightened civilization, that we find an exclusive system of animal production the most marked, and here the antagonism between these two systems of agriculture is the strongest. Pastoral people have usually been nomadic, and in all times more warlike than people tilling the soil, and the

conflict which began between the grower of flocks and the tiller of the soil just outside of Eden has continued through the ages, and finds its modern expression in this country in the conflict over fence or no-fence laws in some of our newer regions of the West.

The relations of grain-growing to live-stock production in the United States may be considered in four aspects:

First, in this country there is less hand-tillage for a given amount of production than in any other in the world. Its place is supplied by animal power, and animals furnish all the power used directly in our agriculture, except steam for thrashing. Steam-plowing in the United States has not been successful, at least to the extent of producing any impression whatever upon the whole agriculture of the country. All the plowing, most of the tillage, a large proportion of the reaping, and a considerable proportion of the thrashing is performed by animals. A larger proportion of each of these is done by animal power than is done in the agriculture of any other country. In this respect, then, our great cereal production is immediately dependent upon the production of animals. This is so apparent that it needs no discussion; we will only say, in passing, that horses have performed the larger part of this work as compared with cattle. Writers in the last century, and in the very early part of this, regret that in the United States horse-power is used so exclusively on farms in the place of oxen, it being claimed that oxen were the most economical. This preference for horse-power, however, led to the use of lighter machinery and greater rapidity in the performance of farming operations. Thirty years ago numerous writers expressed the belief that the extension of railroads would be detrimental to horse production in the agricultural regions of the United States. It is, however, an interesting fact that, with the introduction of railroads, has come an increase in horse production. The diminution of the use of horses in staging has been much more than met by their increased use on the farm and for the transportation that is incidental to railroads.

In the second place, by the production of animals on grain farms, a greater variety of crops may be grown with profit, and there is a better utilization of waste material. In the older states the straw forms an important element of forage for the production of beef and wool. The unmarketable portion of the grain crop, the soft corn, the screenings from other grains, are utilized in the production of animal products. This is so evident that it is only under the most favorable circumstances that the grain-grower can afford to throw away the refuse and rely for his profits merely upon the grain produced.

In the third place, and intimately related to the last, is the production of manure on the farm. This assumes especial importance in a variety of ways. Grain-growing cannot be carried on indefinitely without manuring except under those rare conditions where the land receives a supply of fertilizing elements from water, either by artificial irrigation or by natural overflows. The agriculture of any country, to be permanently prosperous, is practically founded on its system of manuring. The difference between the continued fertility and increasing production of the countries of northern Europe, of England, of Holland, of Belgium, and of similar countries, where much live-stock is grown, and the exhausted fertility of the countries lying about the Mediterranean, is due to the difference in the methods of farming and of manuring. In the one case, animals are grown, and the manure which they produce has tended to keep up the fertility of the soil; in the other, which is essentially an agriculture without domestic animals, hand-tillage taking the place of animal-tillage so far as is possible, crops are carried from the soil, and regions that once produced their hundred-fold now scarcely produce five-fold. The competition with the new western states, with their rich virgin soils, however severe, cannot and does not entirely kill grain-growing in the less favored regions of the East, largely because of the greater proportion in which the grain refuse is utilized in the East by feeding and in the use of the manures so produced.

Prof. Manly Miles, of the agricultural college of Michigan, made a study of the relation between wheat-growing and animal-growing in that state from the state returns of 1874 to 1877. A map was constructed by counties, giving statistics of improved land, production, and so on. "With the map once made, it was readily discovered that in most cases those counties having large yields of wheat had a greater number of cattle and sheep than those counties in which the yield was smaller—a discovery that accords strictly with the well-known fact than an abundance of manure is indispensable to the production of good crops. There were some exceptions to the rule, but for all such apparently valid explanations were found."

In the fourth place, American grain production, especially that of corn, is intimately related to meat production, and this phase of the question, although very old, is just now attracting renewed and very great attention. As early as the middle of the last century, and probably earlier, it was the custom to feed animals on corn in New York and in the New England states and ship them to the West India islands. But it is only since the modern methods of the transportation of live and dead meat have been devised that American animal production has assumed the enormous commercial importance that it now has. The American meat product and hog product is most intimately connected with our corn production. It is safe to say that 90 per cent. of the hog production of the West is fattened on Indian corn, and pork, lard, beef, etc., are the concentrated product for transportation. The amount of corn necessary to produce a pound of pork is the subject of considerable discussion, and is not susceptible of accurate statement. Much depends upon the breed of hogs, upon the soundness of the corn, and upon the way in which it is fed. Experiments made at the agricultural colleges of Kansas, at Manhattan, and of Nebraska, at Lincoln, show that from 9 to 14 pounds of pork per bushel of corn may be produced according to the season, the shelter, and the method of feeding. President Welch, of the Iowa Agricultural College, claims that hogs of good

breeding will make 10 pounds of pork from a bushel of corn, which agrees closely with the cited results, and numerous writers have assumed about this ratio of production under good conditions. At a meeting of the Iowa Stock-Breeders' Association, held last winter, it was claimed on the part of speakers that on an average a bushel of corn in the West did not produce more than 5 or 6 pounds of pork, but in exceptional cases it might produce 10, 15, or even more pounds. Certain persons at that convention claimed to have produced in practice as high as 12 pounds per bushel. But even at the lowest rate of 5 pounds, the difference in the cost of the transportation of the 5 pounds of hog product, be it pork or lard, and the 56 pounds of corn is so great that it allows the crop to be grown with a profit in many places where it would not be possible if the grain itself was transported. The usual movement of grain is eastward, but, under particular conditions of the market, corn is bought in Chicago in considerable quantities and carried westward for the feeding of stock, even into the great corn-growing districts of that state. One case is known to me of a large feeder living in the heart of a great corn-growing region who has found it to his profit to buy corn in large quantities in Chicago, transport it to the western part of Illinois, and reship the meat eastward, corn freights westward at the time being very cheap; and I understand that this is by no means an exceptional case. The large meat export to England is intimately connected with this whole question.

The subjoined table, prepared by Mr. Dodge, gives the number and value of living animals exported from the United States from 1870 to 1880, and is here introduced merely to show the rapid increase in value due to the increased exportation of horned cattle and sheep for their flesh:

TABLE LXXX.—NUMBER AND VALUE OF LIVING ANIMALS EXPORTED FROM THE UNITED STATES FROM 1870 TO 1880, INCLUSIVE.

Year ending June 30.	Horses.		Mules.		Horned cattle.		Sheep.		Swine.		All others and fowls.	Total value.
	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Value.	
1870	2,121	$177,479	995	$140,350	27,530	$439,987	39,570	$95,193	12,058	$189,753	$2,277	$1,045,039
1871	1,186	173,273	1,930	265,827	20,550	403,491	45,465	86,888	8,770	61,390	28,735	1,019,604
1872	1,722	268,475	2,121	294,402	28,033	565,719	35,218	79,592	56,110	548,153	17,375	1,773,716
1873	2,814	235,365	1,659	172,172	35,455	695,957	66,717	107,698	99,720	787,402	14,853	2,033,447
1874	1,432	169,303	1,252	174,125	50,007	1,150,857	124,248	159,735	158,581	1,025,837	30,531	3,310,388
1875	3,220	242,031	2,802	350,828	57,211	1,103,085	124,416	183,898	64,979	730,215	47,448	2,672,505
1876	2,030	234,964	1,784	224,860	51,593	1,110,703	110,312	171,101	68,044	670,042	24,017	2,436,287
1877	2,042	301,134	3,441	478,434	50,001	1,593,080	170,017	234,480	65,107	699,180	18,895	3,325,203
1878	4,104	798,723	3,860	501,513	80,040	3,896,818	183,995	333,490	20,284	207,259	46,841	5,844,053
1879	3,015	770,742	4,153	530,089	136,720	8,379,200	215,080	1,082,938	75,120	700,202	23,623	11,487,754
1880	3,060	675,130	5,198	532,362	182,756	13,344,195	200,137	892,047	83,434	421,089	16,088	15,882,120

The following table, also by Mr. Dodge, showing the aggregate exports in five years of grains, of spirits manufactured from grain, and of meat products, gives the relative value of these two great methods of concentrating grain for export. The ancient method was to distill it into spirituous liquors; the modern is to turn it into flesh food. The use of grain as a raw material in this and other manufactures has already been sufficiently discussed under Indian corn, page 106:

TABLE LXXXI.—AGGREGATE QUANTITIES AND VALUES OF LIVE ANIMALS, MEAT PRODUCTS, AND SPIRITS EXPORTED FROM THE UNITED STATES IN FIVE YEARS FROM JULY 1, 1875, TO JULY 1, 1880.

Exports.	Quantities.	Value.
Horned cattle (number)	501,110	$28,323,096
Sheep do	898,141	2,714,665
Swine do	320,998	2,757,833
Wheat (bushels)	443,410,425	533,037,861
Flour (barrels)	22,867,643	136,094,048
Corn (bushels)	390,281,782	216,870,250
Corn meal (barrels)	1,982,673	6,185,953
Beef, fresh (pounds)	242,000,209	21,887,377
Beef, salted do	196,770,717	14,327,915
Mutton, fresh do	4,256,065	344,983
Bacon and hams do	2,872,624,354	242,990,992
Pork do	376,107,723	27,091,913
Lard do	1,447,452,964	128,783,444
Preserved meats do		25,220,202
Spirits from grain (gallons)	20,562,387	6,295,837
Total		1,394,136,333

THE MOVEMENT AND THE HANDLING OF GRAIN.

In our own country, and in countries of like civilization, the methods of agriculture have been practically evolutionized within less than a life-time. Of the many causes which have contributed to this result the greatest s found in the modern methods for the shipment and the rapid handling and transporting of grain, which present greater contrast with those of the past than any other operations pertaining to agriculture.

Grain-growing for local consumption is one thing; as a commercial staple for export it is a very different natter. Until within a few years the limitations of commerce in breadstuffs have not been determined by the elative capacities and facilities of production, but rather by the possibilities of inland transportation and by he customs-laws of the importing countries. No matter how fertile the soil, how favorable the climate, or how bundant the crops might be, if there was no way profitably to get the surplus of one region to those who wished it n another, or if hostile laws prevented the consumer from buying where he could buy the cheapest, there could e no export. Of late years these factors have entirely changed in relative importance. The tendencies of the ge are more and more toward free trade in breadstuffs, and steam has revolutionized the matter of inland ransportation and greatly modified the cost of sea-carriage. As regards inland transportation, where there were 'ater-routes grain could be carried fifty years ago almost as cheaply as now, but before the days of railroads grain ould rarely be carried far on land. I have seen it stated that among the semi-barbarous tribes of central Asia 'heat is sometimes carried 400 miles, and on one route even 600 miles, on the backs of camels, but I know of no uch land-carriage among people of our civilization. In the earlier days of this country limited quantities of wheat r flour were transported in wagons long distances to enable the pioneers to buy the few necessities which could ot be produced at home. Parkinson (*Tour in America*, vol. I, page 156) tells of meeting near Philadelphia a 'agon containing nine barrels of flour and two sheep, with which a man had come 350 miles to market, the round ip being estimated to require 23 days; and such, practically, remained the limitations of land transportation of rain and flour west of the mountains until the opening of the Erie canal. The present magnitude of American rain exports is a result of the development of American railroads.

Until grain leaves the farmer's hands (except in rare cases and on the very largest farms) it is handled entirely y hand in bags or sacks and is moved by teams. Special schedule question No. 56 was directed to ascertain the ost of moving wheat over such roads as actually exist in the grain-growing regions and with the facilities possessed y the farmers themselves. The answers returned to that question were more conflicting than to any other one uestion pertaining to cost and prices of wheat production. The estimates ranged from two to twenty mills per ushel per mile; that is, as the farmers haul their grain to market their estimate of the cost to them of carrying ach hundred bushels per mile was from twenty cents to two dollars. About one-fourth of the estimates were t half a cent per bushel per mile (or at the rate of fifty cents for each hundred bushels for each mile carried); bout one-third of the estimates at six to ten mills (sixty cents to a dollar per hundred bushels per mile); the maining (about 40 per cent.) answers were either above one cent per bushel per mile, or below half a cent per ushel per mile. In most of the western wheat regions it is stated that if wheat has to be hauled more than ighteen or twenty miles to reach railroad or water this land-carriage in ordinary years eats up the profits of culture. .ccording to the estimates received, it costs the ordinary farmer more to carry each bushel of wheat a mile than it ow does the ordinary railroad to carry a ton, and, consequently, when we get west of lake Michigan it rarely pays) grow wheat more than twenty miles from rail or water transportation.

On the Atlantic slope, after the grain leaves the farmers' hands it is handled and carried in bulk. At all of ie greater marts it is graded upon official inspection, and from that time on the transactions are for a specified uantity of a specified quality (or "grade"), and not for any specific lot of grain. The first buyer purchases a specific ot from the producer, and nominally sells it as such, but practically, after it has been received, weighed, inspected, nd graded, its specific identity is lost. It goes into storehouses with other lots of the same grade, and thenceforward is treated according to grade, and not according to identity. The next buyer does not receive the identical grain ieoretically bought; he receives its equivalent of the same grade. As money may be deposited in a bank, and, when aid on order or check, the payment is not in giving back the identical coins and notes that were deposited, but simply n equivalent, so grain, once graded and deposited in storehouses, elevators, and warehouses, is drawn upon according) grade, and not according to identity. It is only by means of such a simple system that the great grain business f the country could be conducted without an immense increase in cost. Even in transporting by rail or water onsignors' lots are not kept separate, except upon express stipulation, accompanied by increased cost of handling.

There are in the aggregate some forty grades of all the grains, but that large number is in actual use only at ie greater marts. The grades and rules of inspection differ somewhat in the various cities, each being regulated y local organizations, known as boards of trade, chambers of commerce, produce exchanges, or by other local names.

The great movement of grain is of course from the interior, where it is produced, to the seaboard cities, from hence it is either exported or distributed to those places at home which require it. Vast quantities, therefore, 'avel a thousand miles, some more than two thousand miles, and some even farther still, before reaching the place of s consumption or export.

Everywhere east of the Rocky mountains this movement is in bulk, whether by rail or by water. If by rail, it is carried in bulk in cars constructed for the purpose, each car holding from 350 to 700 bushels (the nominal car-load being usually considered about 400 bushels), and the actual amount in weight from ten to fifteen tons. The tendency is, however, to larger loads, and just now (October, 1881) twenty tons per car (667 bushels) are carried on many roads.

On the Erie canal the most of the transportation is in boats of from 4,000 to 9,000 bushels capacity, 8,000 bushels being a common load. The average capacity, however, is probably below 7,000 bushels. In the lake service the vessels, steamers, and barges vary more, carrying from 8,000 to 75,000 bushels, the most of the actual carrying being in craft of from 15,000 to 60,000 bushels. Much grain is transported from the West to the seaboard in part by water and in part by rail, and in such cases bulk may be broken twice or even three times on the way, and this extra handling is often a benefit to the grain, by airing it. In transporting by rail, bulk is not broken usually between Chicago or Saint Louis and the Atlantic seaports, and frequently cars come from a considerable distance beyond those points without change.

A necessary adjunct to this method is the elevator system, which originated in this country, and is peculiarly American. Elevators, as now constructed, belong to two classes: those which are simply for transferring and weighing grain ("elevating"), and may be fixed upon land or are more often floating, and elevators which store as well as transfer grain. Elevators connected with mills have long been in use, and are said to have originated at Stettin, in Prussia, but the first elevator disconnected from milling for the transferring and storage of grain in transit was built by Mr. Joseph Dart, of Buffalo, in the year 1843. Previous to that the handling of grain in canal-boats, the transferring of it from boat to warehouse or warehouse to boat, or from one boat to another, was done by hand, as it is still done in all other countries. In that particular port, where much grain had to be transferred from lake craft to canal-boats, it was partly done in tubs, barrels, or sacks, but more largely by baskets, into which the grain was shoveled by hand and then carried on the backs of men. In the year above stated Mr. Dart erected an elevator near the mouth of the Buffalo river, so arranged that canal-boats could pass into it—that is, under it—and be loaded and unloaded by elevator. It had a storage capacity of 55,000 bushels and a transfer capacity of 15,000 bushels per day. This was the beginning of a system which grew slowly at first, most of the elevators now in use having been built since 1870, their capacity having perhaps doubled since 1875. Buffalo, where this first elevator was built, had (according to the report of the secretary of the Buffalo board of trade), at the close of the year 1880, 36 elevators, of which 22 also stored grain, with a storage capacity of 8,000,000 bushels, 6 were floating and 8 were fixed transfer elevators. The grain trade of that city that year amounted to 112,000,000 bushels, the "Western Elevating Company" handling 99,000,000 bushels. During the season of navigation the cost of elevating was about five-eighths of a cent per bushel, including ten days' storage, the rate rising at other seasons. The transfer elevators, as their name signifies, are for the mere transfer of grain from vessel to vessel, from cars to vessel, or from vessel to cars, weighing the grain as well as moving it. Many of these are floating elevators, which is the only kind used at New Orleans, where, from the methods of shipment, the fluctuations in the river level, and other causes, they are most convenient; but at most places of shipment, where large quantities of grain are often stored for considerable periods, as at Chicago, Detroit, Buffalo, and the seaports, they are usually situated on the shore, and do their work with marvelous rapidity and efficiency. The grain is automatically taken from the hold of the vessel, or from the car, as the case may be, is weighed automatically with such precision that when weighing 100 bushels at a time the scales readily turn to a single pound and in practice weigh to within two pounds, and is then transferred by spouts to other vessels or cars. By a system of steam shovels, worked by an ingenious arrangement of ropes and pulleys, the grain in the hold of the vessel or car being unloaded is hauled to the mouth of the elevator by steam-power.

The more common form of elevator is calculated to store as well as transfer grain. They frequently have a storage capacity of over a half a million bushels, some over a million, and a few have a reported capacity of two millions or over. The larger are enormous buildings, a hundred or more feet wide, three hundred or more feet long, and one hundred and fifty or more feet high, and are the most striking structures which greet the traveler's eye in approaching the greater grain marts of the country. The building is divided into bins, ten to twenty feet square, and fifty feet or more deep, of various capacities, made of stout lumber, and strengthened with transverse iron rods. All the larger elevators are each built to accommodate a train of cars at a time, or several vessels, if they have to do with vessels. At the larger establishments, such as are seen at Chicago, New York, and Baltimore, large steam-engines are used, sometimes as high as six or seven hundred horse-power, which, by means of suitable machinery, "elevate" the grain to the upper stories, where it is weighed, and is then distributed to the bins. Huge steam shovels, worked by ropes and pulleys and manipulated by a man in the car (if they are unloading cars), are so effective that in the more complete establishments a train of cars is run in and the grain removed and elevated at the rate of a car-load per minute for the actual unloading. Such great rapidity, however, is exceptional, but two hundred and fifty to three hundred cars, carrying 100,000 to 120,000 bushels of grain, are sometimes unloaded in a single day, and steamers, with convenient hatches, will reach the elevator, receive on board a freight of 80,000 to 90,000 bushels, and leave the same day. A suitable vessel on the lakes is loaded with 60,000 or 80,000 bushels in eight hours, and canal-boats at Buffalo of 8,000 bushels' capacity are sometimes loaded in an hour or less time. It is

only by means of such appliances that such enormous shipments of grain take place in short periods as sometimes happens under particular conditions of the market, as, for instance, when 13,600,000 bushels of grain were shipped from a single port for Europe in the month of August, 1880.

The cost of this handling or transfer varies with the season of the year and with the condition of the markets. It may be half a cent per bushel, or even less, including ten days' storage; it generally is less than one cent per bushel, but it may run up to two cents, or even more, under special conditions of the market.

At various points, particularly at Buffalo and Chicago, some of the elevators are provided with arrangements for rapidly drying grain that arrives in too moist a condition, and this frequently is the means of saving from injury large amounts that have been shipped in an unsuitable condition.

All transactions in grain east of the Rocky mountains are in bushels of specified weight, wheat at 60 pounds to the bushel, and other grains at special weights, but in the Pacific states all transactions are in centals of 100 pounds or tons of 2,000 pounds. A ton of grain everywhere in the Pacific states, and nearly everywhere in the United States, means 2,000 pounds, until it is actually delivered on board a vessel for export. All the quotations of ocean freight relate to the long ton of 2,240 pounds, instead of to the short ton of 2,000 pounds. Moreover, in the Pacific states no grain is transported in bulk; it is all sent in sacks; and as a consequence there were no elevators there up to 1880. Sales are mostly by specific lots, each priced upon its own merits. The elaborate system of inspection and grading pursued in the Atlantic markets is not practiced there, and it is not necessary with their system of handling.

The cost of transportation by railroad and by water varies so enormously at different times, under different conditions and on different routes, that only the most general statements of cost need be made here. For obvious reasons the prices are less on the great through routes, where there is an actual as well as a nominal competition, and where grain may be carried long distances without bulk being broken. On the water, rates by sail differ from those by steam. Time is also an object, and time goods have their special rates; so that altogether the practical cost of transportation is complicated and variable.

Lake freights on grain during the season of 1880 from Chicago to Buffalo varied from 3 to 8½ cents per bushel, and freights from Chicago to New York by lake and canal, including Buffalo charges and toll, varied from 9½ cents in the week ending May 1 to 17¾ cents in the week ending November 9. Freights on wheat from Chicago to New York by lake (steam on the lake) and rail varied from 12 to 18 cents per bushel, and on flour from 50 to 60 cents per barrel, and all-rail freights ranged from 30 to 40 cents per hundred pounds, equal to 18 to 24 cents per bushel and 60 to 80 cents per barrel of flour. The average rates for the year from Chicago to New York (according to Mr. Fink, of the joint executive railroad committee) was 32½ cents per hundred pounds, equal to 19½ cents per bushel for wheat.

From East Saint Louis to New York rates varied from 70 to 93 cents per barrel of flour, and from 35 to 46½ cents per hundred pounds of grain, equal to 21 to 28 cents per bushel of wheat.

There are so many ways by which the stream of grain may flow from those large western marts to the seaboard that competition is varied and prices necessarily very variable. At the present time (October, 1881) the rates from Chicago to New York are 20 cents per hundred pounds, equal to 12 cents per bushel for wheat. As a rule, the rate is 16 per cent. higher from Saint Louis to New York than from Chicago to New York; to Baltimore 5 cents lower, and to Philadelphia 2 cents lower than to New York.

Since the opening up of the mouth of the Mississippi the transportation of grain to Europe by way of that river is being revived. For many years previous to 1877 the shipments of wheat from New Orleans were merely nominal, amounting to only about 1,000,000 bushels for the ten years ending 1877. Then it increased, amounting in 1880 to nearly 4,000,000 bushels. Along with this is the enormous increase also in the shipments of corn, and a corresponding increase in the Mississippi river transportation.

During the years 1880 and 1881 the system of transporting grain down the Mississippi river by barges received greatly increased attention, and a steamer, with its barges, taking 150,000 or 200,000 bushels, was not rare, some tows carrying 300,000 bushels. According to the annual report of the secretary of the merchants' exchange of Saint Louis for the year 1880 grain rates from Saint Louis to New Orleans by river varied in that year from 30 to 50 cents per barrel for flour, from 15 to 25 cents per hundred pounds for grain in sacks, and from 7 to 8 cents per bushel for corn in bulk.

Shipments have been made direct to Liverpool this year (1881) from Saint Paul, Minnesota, by way of barge to New Orleans, and thence by steamship, for 25 cents per bushel, exclusive of insurance, the rate between these points at the same time by way of New York, under the same conditions, being 30 cents. Rail charges between Saint Paul and New York vary so much that this particular shipment must be taken as an individual case, from which generalizations cannot be drawn.

The question of the effect of shipping grain from the colder climate of the upper Mississippi through the warmer one of the Gulf to Europe has produced considerable discussion, but careful inquiries made in New Orleans do not indicate that there is special danger of injury in that respect where proper precautions are taken. From what has been said when speaking of the hygroscopic conditions of American grain we have an explanation of some of the effects that have sometimes occurred. Grain put into warehouses in Chicago or Saint Paul during an intensely cold period in winter, and allowed to remain there until the next summer, retains the same coldness in large

bins as ice does stored in ice-houses. We have testimony that an iron rod or gas-pipe thrust deep into such a bin in the ensuing June or July and withdrawn is cold enough to be quickly covered with hoar frost. Grain run from such a bin in very warm and damp, muggy weather would condense moisture upon the surface of each individual kernel from the air, as any cold object will in such weather, and, passing into a warm climate, might become damp and injured; but under ordinary conditions, and as the result of actual experience, grain shipped from New Orleans goes, as a whole, in reasonably good condition. Indeed, it is claimed that, as a matter of fact, it goes in an exceptionally good condition, the explanation offered by shippers being that the most of the grain shipped from that port, particularly corn, is grown pretty well south, and is sounder and drier as it comes to the market than the most of the corn grown north of the Ohio. The sudden increase of exports from this port since the opening of the mouth of the Mississippi may be seen in the general tables of grain exports. With milder customs-duties in Mexico the grain trade of New Orleans would undoubtedly increase in that direction. The following table from the annual report of the secretary of the merchants' exchange of Saint Louis for 1880 illustrates this increasing channel of export:

TABLE LXXXII.—SHIPMENTS OF BULK GRAIN BY RIVER FROM SAINT LOUIS TO NEW ORLEANS FOR ELEVEN YEARS FOR EXPORT.

Year.	Wheat.	Corn.	Rye.	Oats.	Total.
	Bushels.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
1880	5,913,272	9,804,392	45,000	.....	15,762,664
1879	2,390,897	3,585,589	157,424	30,928	6,164,838
1878	1,876,630	2,857,956	609,041	108,867	5,451,603
1877	351,453	3,578,057	171,843	.....	4,101,353
1876	37,142	1,737,237	.....	.....	1,774,379
1875	135,961	172,617	.....	.....	308,578
1874	365,252	1,047,794	.....	10,000	1,423,046
1873	.....	1,373,969	.....	.....	1,373,969
1872	.....	1,711,039	.....	.....	1,711,039
1871	.....	309,077	.....	3,000	312,077
1870	66,000	.....	.....	.....	66,000

A great deal of grain and flour is shipped from the interior direct to Europe on through bills of lading by other routes than the Mississippi route which has been spoken of, and large quantities go from Saint Louis, from Chicago, from Saint Paul, and indeed from various interior points, on through bills of lading, via the Atlantic seaports, the prices being somewhat cheaper than the aggregate would amount to if shipped to some seaport and again sold there.

Regarding prices of shipment from American ports to Europe, according to Mr. Nimmo the average freight charge during 1880 for transporting wheat from New York to Liverpool by steamer was $5\frac{7}{8}$ pence, equal to $11\frac{3}{4}$ cents per bushel. From Baltimore to Liverpool by steamer it was $13\frac{1}{8}$ cents per bushel, and the average freight on wheat in iron vessels from San Francisco to Cork during the crop year of 1880–'81 was about 48 cents per bushel, these prices not including marine insurance. According to the same authority, the average rate on wheat from Saint Louis to New York by all rail during 1880 was $36\frac{4}{10}$ cents per bushel, and from Saint Louis to New Orleans by barge it was $11\frac{8}{10}$ cents per bushel. Shipment from San Francisco to Europe is mostly in vessels of between one and two thousand tons, the majority being under 1,500 tons, many being smaller than 1,000 tons, and a few larger than 2,000. As a whole, the larger vessels are not so popular with shippers. The maximum grain cargo, according to local statements, was by the ship The Three Brothers (with a registered tonnage of 3,019 tons), which cleared for Antwerp October 13, 1881, with 90,435 centals (150,725 bushels), and a considerable number of cargoes have been spoken of amounting to 100,000 bushels each. The time of voyages from San Francisco, Portland, and Astoria to the European ports varies from 100 to 180 days, about 130 to 140 days being perhaps the most usual.

Freights vary more from the Pacific to the European seaports than from New York. The form in which freights are expressed is in shillings (English) per ton, the 48 cents per bushel already cited being the quotation of 73 shillings per ton, and the periods are the crop years ending with June.

The fluctuations in prices of wheat-freights for a few years, given on the authority of a local report, is as follows:

TABLE LXXXIII.

Year.	Highest.	Lowest.	Average.
	s. d.	*s. d.*	*s.*
1875–'76	62 6	40 0	50
1876–'77	72 0	37 6	60
1877–'78	50 0	32 6	40
1878–'79	60 0	30 0	50
1879–'80	70 0	39 0	55
1880–'81	84 0	52 6	73

A little earlier the rates were much higher. In 1873–'74 they were as high as 105 shillings, and the year previous they went up to 113 shillings, the average rate for those two years being above 80 shillings.

These grain exports from the Pacific states have an especial interest because of the enormous amount shipped to so great a distance, the theoretical length of the ocean route from San Francisco to Liverpool being about 14,000 miles, and the actual distance sailed being usually somewhat greater. At 50 cents per bushel for freight (which is above the average for 1880), this is but a cent per bushel for each 280 miles of ocean carriage, and during the present year (1881) there will be a trifle over a million tons exported from the Pacific ports. This year a greater number of ships will load at ports outside the bay of San Francisco, particularly at Portland, Astoria, Wilmington, and San Diego, and each port (according to the local newspapers) will dispatch more vessels than ever before.

There are also at times shipments of wheat, flour, and barley from the Pacific to the Atlantic states, and in 1880 considerable barley came across the continent by rail for malting in the interior states, some lots coming as far east as Cincinnati, possibly farther. During the present year (1881) wheat has also been sent across the continent by rail, and preparations are now in progress for shipments in this way on a large scale.

Owing to the length and character of the sea voyage all of the grain shipped from San Francisco and the other Pacific ports is in sacks, shipment in bulk being thus far considered unsafe for the voyage. This is the chief reason why sacks are used in all the inland grain movements on that coast. Methods have lately been devised which so much diminish the liability of grain in bulk shifting its position during a rough sea that doubtless shipments for long voyages will soon be made in that way, but I am not aware that any vessel has yet made the voyage of the Pacific with a cargo of grain in bulk.

The facilities for handling and moving grain, admitting as they do of such large commercial transactions and such rapidity of movement, furnish also special facilities for speculation by both real and fictitious sales, the boundary line between the actual and the nominal sales being very illy defined. The real and the fictitious sales, including those for actual delivery and those for future "optional" delivery, are simply enormous, and the large transactions sometimes quoted are by no means indications of the amount of actual grain handled or even of the "visible supply", which has left the farmer's hands and is actually in storehouses or in transit. The nominal delivery in one day of fifteen, twenty, or more millions of bushels (the newspapers stated it at 32,000,000 bushels of wheat in one day recently in Chicago), bought on margins for future delivery, may involve the handling of a comparatively small quantity of actual grain.

I will conclude this portion of this report with several tables, showing the movement of grain at some of the principal interior points for a series of years. They are upon the authorities of local organizations, and as these vary somewhat in their systems of recording they do not all express precisely the same thing. But they are the best statistics that we have on the subject, and each one is reasonably reliable in itself, the principal differences being as to the time when the year reported closes, and that in some cases grain in transit through a place may have been reckoned which has not been sold or otherwise handled in that place. As in the cases of other tables, extending over a series of years, and which have been published elsewhere, they are repeated here for convenience of reference, and because the originals are scattered in various publications which are usually not accessible to a class of readers who will use this report. It must be remembered that there are a number of other points about the great lakes where there are considerable grain receipts, and numerous interior towns which ship directly to the seaboard.

At the seaboard only the foreign exports are noted, and these are recorded in the general tables of exports, pages 4 to 9.

The following table is prepared by the secretary of the board of trade of Duluth:

TABLE LXXXIV.—GRAIN RECEIPTS AT DULUTH.

Dates.	Amount.
	Bushels.
December, 1870, to December, 1871	1,402,442
December, 1871, to September, 1873	1,630,317
September, 1873, to September, 1874	2,550,001
September, 1874, to September, 1875	1,360,687
September, 1875, to September, 1876	1,725,055
September, 1876, to September, 1877	1,263,024
September, 1877, to September, 1878	2,110,203
September, 1878, to September, 1879	2,475,391
September, 1879, to September, 1880	3,362,851
September, 1880, to September, 1881	3,363,046

The following table from the *Twenty-third Annual Report of the Secretary of the Board of Trade of Chicago* shows the aggregate annual shipments of flour and all kinds of grain from the settlement of Chicago to the present time, compiled from the most authentic sources:

TABLE LXXXV.—SHIPMENTS OF FLOUR AND GRAIN FROM CHICAGO.

Year.	Flour, barrels.	Wheat, bushels.	Corn, bushels.	Oats, bushels.	Rye, bushels.	Barley, bushels.	Total bushels flour reduced to wheat.
1838...	.....	78	.....	.....	.....	.....	78
1839...	.....	3,078	.....	.....	.....	.....	3,078
1840...	.....	10,000	.....	.....	.....	.....	10,000
1841...	.....	40,000	.....	.....	.....	.....	40,000
1842...	.....	586,907	.....	.....	.....	.....	586,907
1843...	.....	688,907	.....	.....	.....	.....	688,907
1844...	*a*6,320	891,894	.....	.....	.....	.....	923,494
1845...	*a*13,752	956,860	.....	.....	.....	.....	1,025,620
1846...	*a*28,045	1,459,594	.....	.....	.....	.....	1,509,819
1847...	*a*32,536	1,974,304	67,135	38,802	.....	.....	2,243,021
1848...	*a*45,200	2,160,000	550,460	65,280	.....	.....	3,001,740
1849..	*a*51,309	1,936,264	644,848	26,840	.....	31,452	2,895,958
1850...	*a*100,871	883,644	262,013	158,084	.....	22,872	1,830,068
1851...	*a*72,400	437,660	3,221,317	605,827	.....	19,907	4,046,831
1852...	*a*91,196	635,996	2,757,011	2,030,317	17,315	79,818	5,820,437
1853...	*a*70,084	1,206,163	2,780,228	1,748,403	82,162	120,267	6,202,233
1854...	*a*111,627	2,306,925	6,837,890	3,239,087	41,153	148,411	13,132,501
1855...	*a*163,419	6,298,155	7,517,625	1,888,538	19,326	92,011	16,032,750
1856...	*a*216,389	8,364,420	11,129,668	1,014,037	501	10,051	21,010,312
1857...	*a*259,648	9,846,052	6,814,615	506,778	.....	17,993	18,483,678
1858...	*a*470,402	8,850,257	7,726,204	1,519,069	7,569	132,020	20,587,169
1859...	*a*686,351	7,166,696	4,349,360	1,185,703	134,404	486,218	16,754,136
1860...	*a*698,132	12,402,197	13,700,113	1,091,608	156,642	267,449	31,108,759
1861...	*a*1,603,920	15,835,953	24,372,725	1,633,237	393,813	226,534	50,481,862
1862...	*a*1,739,849	13,808,898	29,452,610	3,112,366	871,706	532,195	56,477,110
1863...	*a*1,522,085	10,703,205	25,051,450	9,234,858	651,094	946,223	54,287,345
1864..	*a*1,285,343	10,250,020	12,235,452	16,567,650	893,492	345,208	46,718,543
1865...	*a*1,293,428	7,614,887	25,437,241	11,142,140	999,289	607,484	52,268,181
1866...	*a*1,981,525	10,118,907	32,753,181	9,961,215	1,444,574	1,300,821	65,486,323
1867...	*a*2,015,455	10,557,123	21,267,205	10,226,020	1,213,389	1,840,891	55,187,909
1868...	*a*2,399,619	10,374,083	24,770,620	14,440,830	1,202,941	901,183	63,688,358
1869...	*a*2,339,063	13,244,249	21,586,808	8,800,646	798,744	633,753	56,759,515
1870...	*a*1,705,977	10,432,585	17,777,377	8,507,735	913,629	2,584,692	54,745,903
1871...	1,287,574	12,905,440	36,716,030	12,151,247	1,325,867	2,908,113	71,800,789
1872...	1,361,328	12,160,046	47,013,552	12,255,537	776,805	5,032,308	83,364,224
1873...	2,393,490	24,455,657	36,754,943	15,694,133	960,613	3,366,041	91,597,092
1874...	2,396,576	27,634,587	32,705,224	10,561,673	335,077	2,404,538	84,020,691
1875...	2,285,113	23,184,349	26,443,884	10,279,134	310,592	1,868,206	72,369,174
1876...	2,634,838	14,361,950	46,620,035	11,271,642	1,433,076	2,687,932	87,241,306
1877...	2,482,305	14,909,100	46,361,901	12,497,612	1,553,375	4,213,656	90,706,076
1878...	2,770,640	24,211,739	59,044,200	16,464,513	2,025,654	3,520,983	118,675,469
1879...	*b*3,090,540	31,906,780	61,209,376	13,514,020	2,234,303	3,506,401	125,528,379
1880...	*b*2,862,737	22,796,288	93,572,934	20,649,427	1,365,105	3,110,985	154,377,115

a At 5 bushels per barrel. *b* At 4½ bushels per barrel.

The following table is from the *Annual Statement of the Secretary of the Merchants' Exchange of Saint Louis* for the year 1880:

TABLE LXXXVI.—RECEIPTS AND SHIPMENTS OF GRAIN AT SAINT LOUIS, 1851 TO 1880.

Year.	Wheat.		Corn.		Oats.		Rye.		Barley.	
	Receipts.	Shipments.	Receipts.	Shipments.	Receipts.	Shipments.	Receipts.	Shipments.	Receipts.	Shipments.
	Bushels.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
1851....	1,712,776	.....	.....	.....	.....	.....	.....	.....	.....	.....
1852....	1,045,387	.....	.....	.....	.....	.....	.....	.....	.....	.....
1853....	2,075,872	.....	.....	.....	.....	.....	.....	.....	.....	.....
1854....	2,120,272	.....	.....	.....	.....	.....	.....	.....	.....	.....
1855....	3,312,854	.....	.....	.....	.....	.....	.....	.....	.....	.....
1856....	3,747,224	.....	938,546	.....	1,029,008	.....	.....	.....	.....	.....
1857....	3,218,410	.....	2,485,786	.....	1,024,158	.....	30,442	.....	.....	.....
1858....	3,835,750	.....	892,104	.....	1,690,010	.....	45,000	.....	.....	.....
1859....	3,508,732	.....	1,039,579	.....	1,207,024	.....	123,056	.....	.....	.....
1860....	3,555,871	.....	4,249,782	.....	1,832,034	.....	159,074	.....	.....	.....
1861....	2,054,787	.....	4,515,040	.....	1,735,157	.....	117,080	.....	201,434	.....
1862....	3,559,336	.....	1,739,210	.....	3,135,040	.....	253,552	.....	290,025	.....
1863....	2,021,020	.....	1,361,310	.....	3,845,877	.....	205,918	.....	182,270	.....
1864....	3,315,828	.....	2,369,500	.....	4,105,040	.....	140,533	.....	326,060	.....
1865....	3,452,722	67,710	3,102,310	2,591,155	4,173,227	3,083,804	217,508	32,445	846,230	50,000
1866....	4,410,305	635,818	7,233,071	6,757,199	3,568,253	2,624,044	375,417	225,460	548,797	89,751
1867....	3,571,593	321,888	5,155,480	4,318,937	3,445,388	2,244,756	250,704	56,076	705,215	55,720
1868....	4,353,591	542,231	2,800,277	1,611,618	3,259,132	1,925,570	307,961	102,553	634,591	64,426
1869....	6,736 454	1,715,003	2,395,713	1,208,863	3,461,814	2,003,002	266,056	110,947	757,600	57,194
1870....	6,038,253	636,562	4,708,838	3,037,060	4,519,510	3,144,744	210,542	100,254	778,518	70,451
1871....	7,311,910	1,048,532	6,030,734	4,469,849	4,358,099	2,484,582	374,336	138,756	876,217	62,843
1872....	6,007,987	918,477	9,479,387	8,079,739	5,467,800	3,467,594	377,587	150,208	1,263,486	87,500
1873....	6,185,038	1,210,286	7,701,187	5,260,916	5,359,853	3,215,206	359,580	206,052	1,158,615	125,604
1874....	8,255,221	1,938,841	6,991,677	4,148,556	5,206,967	3,027,663	288,743	160,133	1,421,406	227,418
1875....	7,604,265	1,562,453	6,710,263	3,523,074	5,000,850	2,877,035	275,200	134,360	1,171,337	146,330
1876....	8,037,574	2,630,007	15,240,000	12,728,849	3,660,912	1,932,083	390,826	304,102	1,492,985	223,080
1877....	8,274,151	2,410,190	11,847,771	9,309,014	3,124,721	1,550,605	472,907	397,183	1,326,490	188,251
1878....	14,325,431	6,900,802	9,009,723	6,382,712	3,882,276	1,792,801	845,932	757,021	1,517,292	244,799
1879....	17,093,362	7,302,076	13,360,636	8,311,005	5,002,105	2,154,026	713,728	423,720	1,831,507	260,422
1880....	21,022,275	11,313,879	22,298,077	17,571,322	5,607,078	2,541,013	468,755	276,041	2,561,992	155,113

The following tables from the *Twenty-second Annual Report of the Secretary of the Toledo Produce Exchange* show the total grain receipts at that place for a series of years, and the three leading grains for the last three years:

TABLE LXXXVII.—TOTAL GRAIN RECEIPTS FOR 1878, 1879, AND 1880.

Cereal.	1880.	1879.	1878.
	Bushels.	*Bushels.*	*Bushels.*
Wheat	30,047,333	22,501,016	8,151,712
Corn	22,213,016	16,331,728	17,589,558
Oats	4,348,322	4,046,073	2,540.700

TABLE LXXXVIII.—TOTAL YEARLY SUPPLY OF GRAIN AT TOLEDO, OHIO.

Year.	Amount.	Year.	Amount.	Year.	Amount.
	Bushels.		*Bushels.*		*Bushels.*
1861	18,706,500	1868	16,141,990	1875	31,851,727
1862	22,695,401	1869	18,660,940	1876	31,817,682
1863	14,691,193	1870	23,714,510	1877	31,330,256
1864	14,108,993	1871	35,300,220	1878	40,989,837
1865	12,857,250	1872	35,527,285	1879	43,077,612
1866	12,664,404	1873	35,188,794	1880	57,078,602
1867	13,131,905	1874	30,304,891		

The following table is from the *Twenty-second Annual Report of the Secretary of the Chamber of Commerce of Milwaukee:*

TABLE LXXXIX.—SHIPMENTS OF FLOUR AND GRAIN FROM MILWAUKEE.

Year.	Flour.	Wheat.	Corn.	Oats.	Barley.	Rye.
	Barrels.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
1845	7,550	95,510	.....	.....	.....	.....
1846	15,756	213,448	.....	.....	.....	.....
1847	34,840	598,411	.....	.....	.....	.....
1848	92,732	602,474	.....	.....	.....	.....
1849	136,657	1,136,023	2,500	4,000	15,000	.....
1850	100,017	297,570	5,000	2,100	15,270	.....
1851	51,889	317,285	13,628	7,892	103,840	.....
1852	92,995	564,404	2,220	363,841	322,261	54,692
1853	104,056	956,703	270	131,716	291,890	80,365
1854	145,032	1,809,452	164,008	404,999	330,338	113,443
1855	181,568	2,641,746	112,132	13,833	63,370	20,030
1856	188,455	2,761,976	218	5,433	10,398	.....
1857	228,442	2,581,311	472	2,775	800	.....
1858	298,668	3,994,213	43,958	502,067	63,178	5,378
1859	282,956	4,732,957	41,364	299,002	53,216	11,577
1860	457,343	7,568,608	37,204	64,682	28,056	9,735
1861	674,474	13,300,495	1,485	1,200	5,220	29,810
1862	711,405	14,915,680	9,480	79,004	44,800	126,301
1863	603,525	12,837,620	88,989	831,600	133,440	84,047
1864	414,883	8,992,479	140,786	811,634	23,479	18,210
1865	507,576	10,479,777	71,203	326,472	29,597	51,444
1866	720,365	11,634,749	480,408	1,636,595	18,088	255,329
1867	921,663	9,598,452	266,249	622,469	90,822	106,795
1868	1,017,598	9,867,029	342,717	536,539	95,036	91,443
1869	1,220,058	14,272,799	93,806	351,768	120,602	78,035
1870	1,225,941	16,127,838	103,173	210,187	469,325	62,404
1871	1,211,427	13,409,467	419,133	772,929	576,453	208,896
1872	1,232,036	11,570,565	1,557,953	1,323,234	931,725	209,751
1873	1,805,200	24,994,266	197,920	990,525	688,456	255,928
1874	2,217,579	22,255,380	556,563	726,035	464,837	79,879
1875	2,163,346	22,981,020	226,895	1,160,450	867,970	98,923
1876	2,054,028	16,804,304	96,008	1,377,560	1,235,481	220,964
1877	2,286,426	18,208,485	322,823	1,138,530	1,027,891	190,703
1878	2,630,022	17,254,453	460,104	1,554,338	2,220,047	763,905
1879	2,983,430	15,060,222	985,237	1,417,359	2,606,035	849,058

The following tables are from the *Thirty-second Annual Report of the Cincinnati Chamber of Commerce:*

TABLE XC.—ANNUAL RECEIPTS AND SHIPMENTS OF BARLEY AT CINCINNATI.

Year.	Receipts.	Shipments.	Year.	Receipts.	Shipments.	Year.	Receipts.	Shipments.
	Bushels.	*Bushels.*		*Bushels.*	*Bushels.*		*Bushels.*	*Bushels.*
1845-46	90,225	.....	1857-58	400,907	80,226	1869-70	836,331	56,088
1846-47	70,304	.....	1858-59	455,731	119,214	1870-71	800,988	17,730
1847-48	165,528	.....	1859-60	352,829	95,160	1871-72	1,177,306	26,984
1848-49	87,460	.....	1860-61	493,214	58,578	1872-73	1,228,245	37,456
1849-50	137,925	.....	1861-62	323,884	42,052	1873-74	1,084,500	90,688
1850-51	111,257	.....	1862-63	336,176	18,314	1874-75	1,109,693	82,733
1851-52	80,894	.....	1863-64	379,432	18,388	1875-76	1,551,944	232,556
1852-53	226,844	.....	1864-65	542,712	49,556	1876-77	1,258,163	152,412
1853-54	286,536	.....	1865-66	891,883	109,012	1877-78	1,597,481	123,617
1854-55	204,224	.....	1866-67	673,806	65,832	1878-79	1,180,652	264,648
1855-56	244,792	.....	1867-68	602,813	129,278	1879-80	1,555,107	159,769
1856-57	381,060	.....	1868-69	853,182	67,246			

TABLE XCI.—ANNUAL RECEIPTS AND SHIPMENTS OF WHEAT AT CINCINNATI.

Year.	Receipts.	Shipments.	Year.	Receipts.	Shipments.	Year.	Receipts.	Shipments.
	Bushels.	*Bushels.*		*Bushels.*	*Bushels.*		*Bushels.*	*Bushels.*
1845-46	434,480	.....	1857-58	1,211,543	631,630	1869-70	1,195,341	806,775
1846-47	590,809	.....	1858-59	1,274,085	699,848	1870-71	866,459	409,893
1847-48	570,813	.....	1859-60	1,057,118	321,495	1871-72	762,144	323,405
1848-49	385,388	.....	1860-61	1,120,007	525,065	1872-73	860,454	412,722
1849-50	322,099	.....	1861-62	2,174,924	1,203,080	1873-74	1,221,176	783,990
1850-51	288,000	.....	1862-63	1,741,491	1,177,108	1874-75	1,135,388	600,022
1851-52	377,037	.....	1863-64	1,050,759	943,737	1875-76	1,052,952	558,252
1852-53	343,049	.....	1864-65	1,078,395	686,393	1876-77	1,436,851	961,754
1853-54	408,084	.....	1865-66	1,545,802	873,775	1877-78	3,405,113	2,807,082
1854-55	437,412	.....	1866-67	1,474,987	972,982	1878-79	3,834,722	3,383,387
1855-56	1,069,408	.....	1867-68	780,933	406,349	1879-80	4,289,555	3,799,166
1856-57	737,723	394,920	1868-69	1,075,348	702,022			

The following table from the *Twenty-third Annual Report of the Secretary of the Board of Trade of Chicago* shows the aggregate annual receipts of flour and all kinds of grain in Chicago; also the amount of flour manufactured in the city for each year since 1851:

TABLE XCII.—RECEIPTS OF FLOUR AND GRAIN AT CHICAGO.

[Four and a half bushels of wheat equals a barrel of flour.]

Year.	Flour manufactured in the city.	Flour received.	Wheat received.	Corn received.	Oats received.	Rye received.	Barley received.	Total receipts flour reduced to wheat.
	Barrels.	*Barrels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
1852...	70,979	53,337	937,406	2,991,011	2,089,941	21,015	127,028	6,406,508
1853...	82,833	48,207	1,687,465	2,869,330	1,875,770	86,162	192,387	6,928,459
1854...	66,000	158,575	3,038,955	7,490,753	4,194,385	85,691	201,764	15,725,135
1855...	79,650	240,662	7,535,007	8,532,377	2,947,188	68,166	201,895	20,307,702
1856...	86,068	324,921	8,767,760	11,888,398	2,219,087	45,707	128,457	24,512,454
1857...	96,000	393,934	10,554,761	7,409,000	1,707,245	87,711	127,089	21,059,109
1858...	140,403	522,137	9,639,614	8,252,641	2,883,597	71,012	413,812	23,610,293
1859...	161,500	726,321	8,060,766	5,401,870	1,757,696	231,514	652,006	19,372,086
1860...	232,000	713,348	14,927,083	15,862,394	2,198,889	318,076	617,619	37,135,027
1861...	291,852	1,479,284	17,385,002	26,369,989	2,007,018	490,989	457,589	53,427,365
1862...	260,980	1,066,391	13,978,116	29,574,328	4,088,722	1,038,825	872,053	57,050,804
1863...	236,261	1,424,206	11,408,161	26,611,653	11,086,181	865,508	1,280,342	57,660,722
1864...	255,056	1,205,698	12,184,077	13,807,745	16,351,646	1,060,116	1,018,813	49,848,008
1865...	288,820	1,134,105	9,266,410	25,952,201	11,659,080	1,194,834	1,774,139	54,050,114
1866...	445,522	1,847,145	11,978,753	33,543,001	11,140,264	1,679,541	1,742,652	68,396,423
1867...	574,096	1,720,001	13,695,244	22,772,715	12,355,006	1,291,821	2,360,984	66,215,774
1868...	732,479	2,192,413	14,772,094	25,570,494	16,032,010	1,523,820	1,915,056	69,680,283
1869...	543,285	2,218,822	16,876,760	23,475,800	10,611,040	955,201	1,513,110	63,417,510
1870...	443,967	1,766,037	17,391,409	20,189,775	10,472,078	1,093,493	3,335,653	66,432,574
1871...	327,789	1,412,177	14,439,656	41,853,138	14,789,414	2,011,788	4,069,410	83,518,202
1872...	186,968	1,532,014	12,724,141	47,366,087	15,061,715	1,129,086	5,251,750	88,426,842
1873...	264,363	2,487,376	20,266,502	38,157,232	17,888,724	1,189,404	4,240,239	98,035,413
1874...	244,667	2,666,679	20,764,622	35,799,638	13,901,235	791,182	3,354,981	95,611,713
1875...	249,653	2,625,883	24,206,370	28,341,150	12,916,428	699,588	3,107,297	81,087,802
1876...	271,074	2,955,197	16,574,058	48,668,640	13,030,121	1,447,017	4,710,360	97,735,482
1877...	293,244	2,691,142	14,164,515	47,915,728	13,506,773	1,728,865	4,990,379	94,416,399
1878...	308,284	3,030,562	29,718,577	63,651,518	18,830,297	2,490,615	5,754,059	134,086,505
1879...	285,904	3,369,958	34,106,109	64,339,321	16,660,428	2,497,340	4,936,502	137,704,571
1880...	196,041	3,215,389	23,541,607	97,272,844	23,490,915	1,869,218	5,211,536	165,855,370

The three following tables, showing the grain trade of Buffalo for forty-five years, are printed as compiled by the secretary of the Buffalo board of trade:

TABLE XCIII.—GRAIN TRADE OF BUFFALO FOR FORTY-FIVE YEARS (THE RECEIPTS BY THE LAKE SHORE RAILROAD NOT INCLUDED).

Year.	Flour.	Wheat.	Corn.	Oats.	Barley.	Rye.	Grain, as compiled. (a)	Grain, including flour, as compiled. (a)	Grain, as computed. (a)	Grain, including flour, as computed. (a)
1	2	3	4	5	6	7	8	9	10	11
	Barrels.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
1836	139, 178	304, 090	204, 355	28, 640	4, 876	1, 500	543, 461	1, 230, 351	543, 461	1, 230, 351
1837	126, 805	450, 350	94, 490	2, 553	.....	3, 267	550, 660	1, 184, 085	550, 660	1, 184, 085
1838	277, 620	983, 117	34, 148	6, 577	.....	909	974, 751	2, 587, 887	1, 024, 751	2, 412, 851
1839	294, 125	1, 117, 262	.....	.....	.....	.....	1, 117, 262	2, 362, 851	1, 117, 262	2, 587, 887
1840	597, 142	1, 004, 561	71, 337	.....	.....	.....	1, 075, 888	4, 061, 598	1, 075, 898	4, 061, 608
1841	730, 040	1, 035, 000	201, 031	14, 144	.....	2, 150	1, 852, 325	5, 502, 525	1, 852, 325	5, 502, 525
1842	734, 408	1, 555, 420	454, 530	.....	4, 710	1, 268	2, 015, 928	5, 687, 468	2, 015, 928	5, 687, 968
1843	917, 517	1, 827, 241	223, 966	2, 489	.....	1, 332	2, 055, 025	6, 642, 610	2, 055, 028	6, 642, 613
1844	915, 030	2, 174, 500	137, 078	18, 017	1, 617	456	2, 335, 568	6, 910, 718	2, 332, 568	6, 907, 718
1845	746, 750	1, 770, 740	54, 200	23, 300	.....	.....	1, 848, 040	5, 581, 700	1, 848, 240	5, 582, 900
1846	1, 374, 529	4, 744, 184	1, 455, 258	218, 300	47, 530	28, 250	6, 491, 522	13, 306, 167	6, 493, 522	13, 306, 167
1847	1, 857, 000	6, 489, 100	2, 862, 800	446, 000	.....	70, 787	9, 868, 187	19, 153, 187	9, 868, 687	19, 153, 687
1848	1, 249, 000	4, 520, 117	2, 298, 000	560, 000	6	17, 889	7, 396, 012	14, 641, 018	7, 396, 012	13, 641, 012
1849	1, 207, 435	4, 943, 078	3, 321, 651	862, 384	.....	.....	8, 628, 013	14, 665, 189	8, 628, 013	14, 665, 188
1850	1, 103, 030	3, 081, 347	2, 593, 378	357, 580	3, 600	.....	6, 618, 004	12, 050, 551	6, 635, 905	12, 151, 100
1851	1, 258, 224	4, 167, 121	5, 988, 775	1, 140, 340	142, 773	10, 652	11, 449, 661	17, 740, 784	11, 449, 661	17, 740, 781
1852	1, 299, 213	5, 549, 718	5, 136, 746	2, 596, 231	407, 913	112, 251	13, 392, 937	20, 390, 500	13, 892, 859	20, 388, 924
1853	975, 557	5, 420, 043	8, 065, 793	1, 580, 655	401, 098	107, 152	11, 078, 741	15, 956, 525	15, 574, 741	20, 452, 526
1854	739, 756	3, 510, 782	10, 108, 983	4, 401, 730	313, 885	177, 066	18, 553, 455	22, 252, 238	18, 512, 455	22, 211, 235
1855	936, 761	8, 022, 126	9, 711, 430	2, 693, 222	62, 304	209, 591	19, 788, 473	24, 472, 277	20, 788, 673	25, 472, 478
1856	1, 126, 048	8, 465, 671	9, 633, 277	1, 733, 382	46, 327	245, 810	20, 123, 667	25, 753, 965	20, 124, 467	25, 754, 707
1857	845, 953	8, 334, 179	5, 713, 611	1, 214, 760	37, 844	48, 536	15, 348, 930	19, 578, 690	15, 348, 930	19, 578, 695
1858	1, 536, 109	10, 671, 550	6, 621, 668	2, 275, 231	308, 371	125, 214	20, 202, 444	26, 812, 982	20, 002, 034	27, 682, 579
1859	1, 420, 333	9, 234, 652	3, 113, 653	304, 502	361, 560	124, 693	14, 429, 069	21, 530, 722	13, 229, 060	20, 330, 725
1860	1, 122, 335	18, 502, 645	11, 386, 217	1, 209, 594	262, 158	80, 822	31, 441, 440	37, 053, 115	31, 441, 436	37, 053, 111
1861	2, 150, 591	27, 105, 210	21, 024, 057	1, 707, 905	313, 757	337, 764	50, 662, 646	61, 460, 601	50, 579, 302	61, 377, 257
1862	2, 846, 022	30, 435, 831	24, 388, 627	2, 624, 033	423, 124	791, 564	58, 642, 344	72, 872, 454	58, 664, 078	72, 894, 188
1863	2, 978, 089	21, 240, 348	20, 086, 012	7, 322, 187	641, 449	422, 300	49, 845, 065	64, 735, 510	49, 713, 205	64, 603, 650
1864	2, 028, 520	17, 677, 549	10, 478, 681	11, 682, 037	465, 057	633, 727	41, 044, 496	51, 177, 146	40, 937, 651	51, 080, 251
1865	1, 788, 393	13, 437, 888	19, 840, 991	8, 494, 799	820, 563	877, 076	42, 473, 223	51, 415, 188	43, 471, 827	52, 413, 792
1866	1, 313, 543	10, 479, 694	27, 894, 798	10, 227, 472	1, 606, 384	1, 245, 485	51, 820, 342	53, 388, 087	51, 453, 833	58, 021, 548
1867	1, 440, 056	11, 879, 685	17, 873, 638	10, 033, 166	1, 802, 598	1, 010, 693	43, 499, 780	50, 700, 060	43, 499, 780	50, 700, 060
1868	1, 502, 731	12, 555, 215	16, 804, 067	11, 492, 472	637, 124	947, 323	42, 436, 201	49, 949, 856	42, 436, 201	49, 949, 856
1869	1, 598, 487	10, 228, 546	11, 549, 403	5, 450, 347	651, 339	126, 093	37, 014, 728	45, 007, 163	37, 014, 728	45, 007, 163
1870	1, 470, 391	20, 556, 722	9, 410, 128	6, 846, 983	1, 821, 154	626, 154	39, 261, 141	46, 613, 096	39, 261, 141	46, 613, 096
1871	1, 278, 077	22, 606, 217	26, 110, 769	9, 006, 469	1, 946, 923	1, 095, 039	60, 765, 357	67, 155, 742	60, 765, 357	67, 155, 742
1872	762, 502	14, 304, 942	34, 643, 187	6, 050, 045	3, 088, 925	301, 809	58, 447, 822	62, 260, 332	58, 388, 908	62, 201, 418
1873	1, 259, 205	30, 618, 372	28, 550, 828	5, 972, 346	1, 232, 507	906, 947	67, 340, 570	73, 636, 595	67, 281, 000	73, 577, 025
1874	1, 693, 585	29, 778, 572	24, 974, 518	5, 396, 781	1, 154, 948	167, 301	61, 562, 627	70, 030, 552	61, 472, 120	69, 940, 045
1875	1, 810, 402	32, 967, 686	22, 593, 891	8, 494, 124	916, 889	222, 126	65, 194, 716	74, 246, 726	65, 194, 716	74, 246, 726
1876	807, 210	19, 324, 612	26, 939, 853	2, 397, 257	2, 615, 081	761, 795	46, 038, 598	50, 074, 648	46, 038, 598	50, 074, 648
1877 (b)	693, 044	23, 284, 405	33, 302, 866	4, 279, 220	1, 652, 568	1, 155, 003	61, 734, 071	65, 199, 291	63, 734, 071	67, 199, 271
1878 (b)	971, 980	35, 419, 136	35, 193, 853	5, 122, 972	1, 375, 184	2, 135, 007	79, 156, 152	84, 046, 052	79, 186, 152	84, 046, 052
1879 (b)	897, 105	37, 788, 501	32, 990, 993	1, 104, 793	610, 740	1, 884, 802	74, 379, 829	78, 865, 354	74, 379, 829	78, 865, 354
1880 (b)	1, 317, 911	40, 510, 229	62, 214, 417	1, 640, 350	335, 925	743, 451	105, 453, 372	112, 042, 927	105, 453, 372	112, 042, 927

a The summary columns 8 and 9, as compiled, having been found to be inconsistent (in some cases materially) with columns 2 to 7, new summaries, columns 10 and 11, have been computed.

b Canadian receipts through the custom-house not included.

TABLE XCIV.—RECEIPTS COMPARED BY DECADES.

Year.	Grain, as compiled.	Grain, including flour, as compiled.	Grain, as computed.	Grain, including flour, as computed.
	Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
1836	543, 461	1, 230, 351	543, 461	1, 230, 351
1846	6, 491, 522	13, 306, 167	6, 493, 522	13, 306, 167
1856	20, 123, 667	25, 753, 967	20, 124, 467	25, 754, 707
1866	51, 820, 342	53, 388, 087	51, 453, 833	58, 021, 548
1876	46, 038, 598	50, 074, 648	46, 038, 598	50, 074, 648

TABLE XCV.—AGGREGATE RECEIPTS COMPARED.

Decades.	Grain, as compiled.	Grain, including flour, as compiled.	Grain, as computed.	Grain, including flour, as computed.
	Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
1836 to 1845—10 years	14, 368, 908	41, 851, 483	14, 416, 121	41, 809, 196
1846 to 1855—10 years	113, 766, 005	174, 717, 437	119, 240, 528	179, 243, 098
1856 to 1865—10 years	344, 213, 324	492, 300, 318	343, 511, 990	432, 768, 955
1866 to 1875—10 years	526, 970, 775	597, 121, 670	526, 767, 784	597, 412, 679
1876	46, 038, 598	50, 074, 648	46, 038, 598	50, 074, 648
1877 (*a*)	61, 734, 071	66, 199, 201	63, 734, 071	67, 199, 271
1878 (*a*)	79, 176, 152	84, 046, 052	79, 186, 152	84, 046, 052
1879 (*a*)	74, 379, 829	78, 865, 354	74, 379, 829	78, 865, 354
1880 (*a*)	105, 453, 372	112, 042, 927	105, 453, 372	112, 042, 927
Total 45 years	1, 366, 107, 034	1, 697, 309, 180	1, 372, 728, 445	1, 643, 462, 180

a Canadian receipts through the custom-house not included.

The following table shows the number of pounds per bushel of the products named, as established by law, in certain states and territories of the United States. The states and territories omitted from this list either have no weights established by law, or inquiries addressed by the Census Office to the secretaries of states have failed to elicit answers:

TABLE XCVI.—PRODUCTS AND NUMBER OF POUNDS PER BUSHEL.

States and territories.	Barley.	Buckwheat.	Corn, shelled.	Oats.	Rye.	Wheat.	Beans.	Onions.	Peas.	Irish potatoes.	Sweet potatoes.	Turnips.
California	50	40	52	32	54	60	.....	.....	.....	.....	.....	.....
Connecticut	48	48	56	32	56	60	60	50	60	60	.....	50
Dakota	48	42	56	32	56	60	60	52	60	60	.....	60
Delaware	.....	.....	56	.....	.....	60	.....	.....	.....	.....	.....	.....
District of Columbia (*a*)	**47**	**48**	56	32	56	60	**60**	**57**	**60**	56	.....	**60**
Georgia	47	52	56	32	56	60	60	57	60	60	55	55
Illinois	48	52	56	32	56	60	60	57	.....	60	55	55
Indiana	48	50	56	.....	56	60	60	48	.....	60	.....	.....
Iowa	48	52	56	32	56	60	60	57	.....	60	46	.....
Kansas	48	50	56	32	56	60	60	57	.....	60	.....	55
Kentucky	47	56	56	32	56	60	60	57	60	60	55	60
Louisiana	50	.....	56	32	54	60	.....	.....	.....	.....	.....	.....
Maine	48	48	56	30	56	60	64	52	60	60	.....	60
Maryland	47	52	56	26	56	60	46	54	60	56	.....	55
Massachusetts	48	48	56	32	56	60	.....	52	.....	60	.....	.....
Michigan	48	48	56	32	56	60	60	54	60	60	56	58
Minnesota	48	42	56	32	56	60	60	57	60	60	.....	57
Missouri	48	52	56	32	56	60	60	57	60	60	.....	52
Montana	48	52	56	35	56	60	60	57	.....	60	.....	50
Nebraska	48	52	56	34	56	60	60	57	60	60	.....	55
New Hampshire	.....	.....	56	32	56	60	60	.....	60	60	.....	.....
New Jersey	48	50	56	30	56	60	60	57	60	60	.....	.....
New York	48	48	56	32	56	60	62	.....	60	60	.....	.....
North Carolina	48	50	54	30	56	60	.....	.....	50	.....	.....	.....
Ohio	48	50	56	32	56	60	60	50	60	60	50	.....
Oregon	46	42	56	36	56	60	.....	.....	.....	60	.....	.....
Pennsylvania	47	48	56	32	56	60	.....	.....	.....	70	.....	.....
Rhode Island	48	.....	.....	32	56	.....	.....	50	.....	60	.....	50
South Carolina (*b*)	60	48	56	32	60	60	60	60	60	60	.....	60
Tennessee (*c*)	48	50	56	32	56	60	60	56	60	60	.....	50
Utah	48	52	56	35	56	60	60	57	60	60	.....	50
Vermont	48	46	56	32	56	60	60	52	60	60	.....	60
Virginia	48	52	56	32	56	60	60	57	60	60	56	55
Washington	45	42	56	36	56	60	60	50	60	60	.....	50
West Virginia	48	52	56	32	56	60	60	.....	.....	60	.....	.....
Wisconsin	48	50	56	32	56	60	60	50	.....	60	.....	.....

a Numbers in plain figures, according to the law of the District; numbers in black figures, according to custom derived from Maryland.

b Weights given are established by custom.

c Weights given are adopted by the "Vegetable and Fruit Growers' Association" of Davidson county, Tennessee, and by the "merchant's exchange", Nashville, Tennessee.

CRANBERRIES: Michigan, 40; Rhode Island, 32.
RUTABAGA: Connecticut, 60; Wisconsin, 56.
SUGAR-BEETS: Connecticut, 60; Montana, 50; Vermont, 60.
MANGEL-WURZEL: Connecticut, 60.
CARROTS: Connecticut, 55; Montana, 50; Vermont, 50.
PARSNIPS: Connecticut, 45.
CORN IN THE EAR: Georgia, 70; Illinois, 70; Indiana, 68; Iowa, 70; Michigan, 70; Rhode Island, 56.
CASTOR-BEANS: Illinois, 46; Michigan, 46.
CLOVERSEED: Georgia, 60; Illinois, 60; Iowa, 60; Michigan, 60; Vermont, 60; Washington territory, 60; West Virginia, 60.
FLAXSEED: Georgia, 56; Illinois, 56; Iowa, 56; Michigan, 56; West Virginia, 56.
CORN-MEAL: Georgia, 48: Illinois, 48; Michigan, 50; New Hampshire, 50; Rhode Island, 50.
TIMOTHYSEED: Georgia, 45; Illinois, 45; Iowa, 45; Michigan, 45; Vermont, 45; Washington territory, 40; West Virginia, 45.
HEMPSEED: Georgia, 44; Illinois, 44; Iowa, 44; Michigan, 44.

DISTRIBUTION OF THE PRINCIPAL CEREALS BY LATITUDE AND LONGITUDE.

TABLE XCVII.—DISTRIBUTION OF THE PRINCIPAL CEREALS IN LATITUDE.

Degrees of latitude.	Wheat.	Indian corn.	Oats.	Rye.	Barley.	Buckwheat.
	Bushels.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
Total	459,479,505	1,754,861,535	407,858,999	19,831,595	44,113,495	11,817,327
25-26	.....	18,900	.....	.....	.....	.....
26-27	.....	208,100	.....	.....	.....	.....
27-28	.....	246,100	2,000	.....	.....	.....
28-29	2,500	668,200	36,100	.....	.....	.....
29-30	80,000	6,615,400	302,400	5,100	2,500	200
30-31	218,900	11,447,900	1,608,100	9,100	7,500	.....
31-32	649,000	15,494,100	2,982,000	12,100	38,700	.....
32-33	1,836,000	28,220,800	4,494,100	38,200	121,200	200
33-34	3,443,000	34,037,400	5,920,700	43,200	362,200	800
34-35	3,504,000	36,849,400	4,051,000	102,600	1,201,400	1,200
35-36	7,886,900	64,030,600	5,037,600	258,600	609,600	24,300
36-37	11,103,300	74,127,900	8,356,000	387,000	1,097,700	119,000
37-38	29,660,700	116,001,660	11,368,000	520,500	4,126,300	90,600
38-39	60,881,100	177,422,900	18,014,400	815,000	3,720,800	164,000
39-40	88,445,405	322,740,400	36,024,200	1,934,600	4,108,900	730,000
40-41	70,171,400	354,057,935	73,408,000	5,786,400	2,665,500	1,517,100
41-42	48,183,200	284,805,500	75,396,000	3,930,200	3,776,700	3,451,527
42-43	43,480,300	159,584,600	75,760,299	3,099,295	8,788,795	3,534,400
43-44	40,909,800	49,139,200	43,281,400	1,575,100	8,112,500	1,055,800
44-45	30,396,400	15,085,100	27,998,300	1,082,900	3,512,400	761,500
45-46	12,223,500	2,610,900	8,464,700	107,600	990,600	118,900
46-47	4,874,600	224,100	3,117,200	35,200	652,100	185,800
47-48	1,307,700	21,100	910,000	7,200	95,000	60,000
48-49	161,200	3,400	636,900	1,700	63,100	300

TABLE XCVIII.—DISTRIBUTION OF THE PRINCIPAL CEREALS IN LONGITUDE.

Degrees of longitude.	Wheat.	Indian corn.	Oats.	Rye.	Barley.	Buckwheat.
	Bushels.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
Total	459,479,505	1,754,861,535	407,858,999	19,881,505	44,113,495	11,817,327
67–68	56,300	700	171,700	1,500	8,800	70,100
68–69	217,800	82,200	705,700	8,700	44,400	204,600
69–70	231,600	322,000	760,100	7,400	116,700	81,700
70–71	165,600	860,000	666,100	23,800	83,000	27,100
71–72	158,200	2,165,200	1,278,500	90,700	106,500	122,100
72–73	421,500	3,923,300	3,550,400	402,300	261,300	352,900
73–74	569,600	6,796,200	8,198,600	1,745,800	160,500	1,236,000
74–75	1,967,000	12,362,700	9,316,200	1,527,100	232,000	1,675,800
75–76	6,848,900	24,389,100	14,674,500	1,730,900	616,200	1,325,500
76–77	11,747,500	29,881,400	15,300,800	1,141,000	2,237,000	1,650,427
77–78	15,043,300	32,427,200	12,062,700	626,300	2,784,300	1,083,300
78–79	7,835,600	19,895,300	9,143,300	581,600	1,663,195	734,700
79–80	5,744,000	20,003,600	12,066,400	563,700	446,600	1,030,700
80–81	6,070,900	27,147,100	11,240,800	297,800	203,900	469,700
81–82	10,141,100	20,415,500	10,334,900	255,300	97,700	157,300
82–83	14,580,700	42,377,000	11,631,300	207,000	526,600	156,000
83–84	25,935,200	70,787,300	14,637,100	343,700	597,700	206,100
84–85	31,063,800	82,094,600	16,006,200	579,200	2,074,600	151,000
85–86	33,109,700	82,108,400	11,794,800	413,100	370,200	148,400
86–87	22,270,200	77,348,200	9,520,800	272,200	129,300	68,200
87–88	20,154,900	80,424,500	16,512,200	659,300	710,300	51,400
88–89	20,354,800	137,078,100	32,965,000	1,403,700	2,694,000	152,400
89–90	27,500,500	146,110,000	30,848,600	2,200,195	1,998,000	155,400
90–91	22,003,605	118,469,500	23,502,200	1,208,300	1,740,600	124,100
91–92	18,207,700	106,822,000	25,053,800	782,500	1,377,300	94,700
92–93	25,033,800	98,718,100	26,287,500	558,200	2,501,500	95,400
93–94	21,017,800	119,714,300	21,966,800	442,000	709,400	43,200
94–95	18,123,800	127,888,100	17,123,400	360,300	674,400	32,600
95–96	15,822,300	111,866,135	11,733,200	406,200	1,231,700	30,500
96–97	12,022,200	65,873,100	8,961,900	306,100	712,700	18,800
97–98	12,402,800	44,063,100	6,368,000	240,900	902,700	9,000
98–99	6,224,800	16,925,800	1,937,300	128,600	464,700	2,700
99–100	1,300,200	3,379,900	323,100	59,500	79,000	1,500
100–101	90,000	434,800	104,200	11,700	9,500	600
101–102	400	15,100	16,900	.....	2,200	.....
102–103	56,200	76,200	101,500	400	10,700	200
103–104	118,200	88,000	160,200	800	28,700	300
104–105	520,100	300,300	241,500	8,600	51,200	.....
105–106	1,080,500	397,700	378,200	10,500	53,000	100
106–107	241,000	176,700	72,500	300	13,500	.....
107–108	132,900	102,700	30,000	.....	14,200	.....
108–109	87,500	80,400	56,800	.....	19,300	.....
109–110	91,300	8,400	126,100	.....	59,700	.....
110–111	145,400	9,600	130,400	.....	85,700	200
111–112	1,175,700	128,300	656,400	6,200	210,300	100
112–113	393,500	46,100	341,600	3,000	102,400	100
113–114	125,000	18,500	133,600	2,800	72,900	.....
114–115	147,200	11,300	111,100	100	97,900	.....
115–116	94,800	17,900	143,400	300	157,600	.....
116–117	396,500	32,600	270,500	3,300	204,500	.....
117–118	1,104,800	313,200	712,200	4,400	745,300	700
118–119	2,082,000	670,000	352,200	3,000	1,172,900	900
119–120	760,300	175,500	220,600	9,100	856,300	300
120–121	2,491,500	187,200	270,200	55,000	1,105,300	500
121–122	15,998,900	428,500	437,500	111,000	6,502,200	16,000
122–123	10,829,000	287,600	2,453,300	19,300	3,370,600	9,400
123–124	4,541,100	121,800	2,049,000	6,500	395,800	2,300
124–125	217,100	12,900	344,700	400	45,200	200
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