

**Article V.—NEW SPECIES AND SYNONYMY OF AMERICAN
CYNIPIDÆ¹**

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PLATES XX TO XXVII

Our present knowledge of the Cynipidæ (Hymenoptera), of the number of species, of species limits, and of species and group relationships, is decidedly incomplete. Students of the gall-wasps have been few, and from large areas of the world practically no collections of this family have been made, e. g., in the Western Hemisphere we have seen very little material from the southern and western parts of the United States, from Mexico, or from Central or South America. In consequence, we are hindered considerably in obtaining an understanding of the peculiar biological phenomena characteristic of these insects. The origin and development of gall production, of agamic reproduction, and of heterogeny especially, may be adequately comprehended only through a careful study not only of the species already described but also of many of these species yet to be described. I count it good fortune to be able to offer descriptions of sixteen new species, several of which are important items in the exposition of the very phenomena above mentioned. These species are distributed among most of the genera of the family, in a number of instances representing groups which have been hitherto the least well known, e. g., *Aulacidea*, *Diastrophus*, and *Disholcaspis*. I have also included some new and corrected synonymy.

Certain genera of the Cynipidæ are founded upon definite morphological characters which are clearly paralleled by biological considerations. But many of the species of oak gall producing Cynipidæ have long been held in groups which are based on the most meager of indefinite morphological characters, and the "genera" thus made are not confirmed by a more careful examination of the morphology and a study of the biology of the species concerned. And, moreover, until both of the alternate generations of dimorphic species can be included by a generic definition, the group remains an artificial creation. In another paper, on the phylogeny of the Cynipidæ, I am discussing this question in more detail and offering data which may be used to draw lines for natural genera. I hope to be able in the near future to revise the genera for the family.

¹Contribution from the Entomological Laboratory of the Bussey Institution, Harvard University, No. 163.

Until that time, it is surely wise not to maintain, in the description of new species, the several "genera" known as *Cynips*, *Dryophanta*, *Callirhytis*, *Andricus*, *Biorhiza*, *Philonix*, et al., species of which groups might all be described under the designation of "*Andricus*." Under that name are now included so many species of very different form and biology that the name is very patently meaningless. In using it, I do not in the least intend to imply anything definite concerning the generic relationship of the species.

This part of my work with Cynipidæ has been done under the supervision of Dr. Wm. M. Wheeler, Dean of the Bussey Institution and Professor of Entomology of Harvard University, and of Professor C. T. Brues of the Entomology Department of the Bussey Institution. To both of these men I am deeply indebted for their continued direction and encouragement.

For the opportunity of studying the material described in this paper I am indebted to the kindness of Dr. Frank Lutz of The American Museum of Natural History, Charles W. Johnson, Curator at the Boston Society of Natural History, and Nathan Banks, of the Museum of Comparative Zoology of Harvard University. The majority of the new species here described were found in the collections of the latter institution. All of the authorities mentioned have been most liberal in offering free access to the important collections under their direction, and as liberal in their interest in and encouragement of my studies.

To Professor Brues I am further indebted for the photographs which illustrate this paper, adding considerably to the value of the work and to the availability of the descriptions.

Rhodites vernus Osten Sacken

Cynips (*Rhodites*?) *tuberculosa* OSTEN SACKEN, 1861, Ent. Zeit. Stettin, XXII, p. 415.

[Description too brief.]

Rhodites verna OSTEN SACKEN, 1863, Proc. Ent. Soc. Phila., II, pp. 41, 45, 47.

Rhodites nodulosus BEUTENMÜLLER, 1909, Ent. News, XX, p. 247; 1914, Bull.

Brooklyn (N. Y.) Ent. Soc., IX, p. 88, Pl. v, figs. 1-5.

Cotype galls and females of both *vernus* and *nodulosus* are in the Museum of Comparative Zoology in Cambridge. The only differences I can see in direct comparison of the two lots of galls is that the type material of *nodulosus* is smaller than the type material of *vernus*. The females seem identical except for darker markings on the hind margins of the abdominal plates—a character which is as liable to variation as is the size of the galls. *R. vernus* is quite a unique species in *Rhodites*, and all the unique characters are to be seen in the *nodulosus* types. The

"large shining area" of the pleuræ described for *nodulosus* is rather dull and not entirely smooth in the types I have seen.

***Andricus punctatus* (Basset)**

Plate XX, Figures 1 and 2

Cynips q. punctata BASSETT, 1863, Proc. Ent. Soc. Phila., II, p. 324.

Cynips q. podagræ WALSH, 1864, Proc. Ent. Soc. Phila., II, p. 492.

Andricus davisii [gall] BEUTENMÜLLER, 1907, Bull. Amer. Mus. Nat. Hist., XXIII, p. 463.

Holcaspis globulus [error] THOMPSON, 1915, Cat. Amer. Ins. Galls, p. 60, No. 127, editor's note.

I have examined type material of *Andricus davisii* in The American Museum of Natural History, the Museum of Comparative Zoology, and in the collection of Mr. W. T. Davis. Mr. Davis has kindly given me specimens of the gall and adults from the type locality. The adults are the inquilines named *Synergus lignicola* Osten Sacken (1865, Proc. Ent. Soc. Phila., IV, p. 374), of which *davisii* must become a synonym. The original description of *davisii* mostly corresponds with the types. But the male antennæ are actually 15-jointed, the female 13-jointed; and no mention is made of the arcuate first abscissa of the radius, the closed radial cell, the longitudinally striate first segment of the abdomen,¹ or other characters which are generic for *Synergus*.

The galls from which these were bred appear to be deformed specimens of *Andricus punctatus*. Walsh (1864, Proc. Ent. Soc. Phila., II, p. 499), Gillette (1889, Psyche, V, p. 185), and Beutenmüller (1910, in Smith's Cat. Ins. N. J., p. 597) record this inquiline from this gall; other inquilines and parasites are commonly bred from it.¹

In studying the Thompson Collection in the Boston Society of Natural History, I find the material of No. 127 of Thompson's Catalogue to be this same gall, with a large part of the insects bred being *S. lignicola*. The gall *davisii* was described as occurring on *Quercus ilicifolia*; the Thompson material came from both *Q. ilicifolia* and *Q. rubra*. Although normal *punctatus* is more often found on *Q. rubra*, *Q. velutina*, or *Q. coccinea*, it is also found normal on others of the black oaks including *Q. ilicifolia* (cf. Beutenmüller, 1904, Amer. Mus. Nat. Hist. Guide Leaflet 16, p. 13; and Viereck, 1916, Hymen. Conn., p. 431).

The parasitized or inquiline-inhabited galls are quite different from normal galls of the species. Compare Figs. 1 and 2 of Plate XX. In-

¹After I had written the above, Mr. Lewis H. Weld drew my attention to similar abnormal galls which were evidently developed from galls of another species of *Andricus*. It would seem that *Synergus lignicola* may affect in similar fashion more than one species of cynipid gall; or it is possible that I am wrong in believing *Andricus punctatus* to be ever involved.

fested galls are usually more or less globular, in groups, but not so completely fused into a single mass as normally. Internally these galls are only loosely woody, with several small larval chambers (without a distinct larval cell-wall) arranged somewhat radially and near the bark. Each portion of the fused mass of the normal gall is woody and will contain toward the center one to three good-sized larval cells with a distinct cell-wall. This is a typical instance of the change effected in the structure of a gall when it becomes inhabited by inquilines. A few other similar instances are well known; it is likely that many others will come to light. A careful study of these might indicate some of the factors which act to produce galls. In *A. punctatus* the "inquiline" seems to be more truly a parasite, for usually gall-wasps are not reared from galls which breed out the *Synergus*, nor is the gall-maker's larval cell found to be developed to any size. It is likely that the *Synergus* does not attack the *Andricus* larva directly, but indirectly by robbing it of the food in the gall.

***Aulacidea abdita*, new species**

Plate XXI, Figures 6 and 7

FEMALE.—Head and thorax dark piceous (not black), face distinctly rufous, a prominent median elevation on the front, abdomen darkest terminally (not dorsally and basally); areolet moderately large. **HEAD:** piceous, the face bright rufous, shading to red or yellowish red at the mouth-parts, coriaceous, with a few short hairs; the face rather irregularly striate, with a moderate median elevation on the face and a separate and prominent median elevation on the front bearing the ocelli. Antennæ 13-(14)-jointed, dark rust-brown, the first two joints reddish brown or bright red; covered with short hairs. **THORAX:** piceous, usually dark, but not black; mesonotum finely rugoso-punctate, covered with short hairs; parapsidal grooves distinct, continuous to the pronotum, widely separated at the scutellum; median groove distinct for a short distance from the scutellum, its further extension being indistinct to a point one-quarter of the way to the pronotum; anterior parallel lines distinct, extending half the way to the scutellum; lateral lines distinct, extending half the way to the pronotum; scutellum finely rugose with the two small foveæ divergent, widely separate, smooth; mesopleuræ shining, aciculate. **ABDOMEN:** shining, smooth, dark red, rufous to piceous terminally, brighter red or yellowish red basally, with a patch of white hairs on each side of the second segment basally. **LEGS:** quite uniformly reddish yellow, the tips of the tarsi slightly darker. **WINGS:** veins brown; areolet distinct, moderately large or large; cubitus hardly reaching the basal vein; radial cell entirely closed; first abscissa of the radius arcuate. **LENGTH:** 1.5–2.0 mm.

MALE.—Similar to the female, but differing as follows: antennæ 14-jointed, third joint curved (but only slightly so), whole antenna reddish yellow, the same color as the legs; median groove less distinct and shorter; abdomen much shorter than in the female, rufous to piceous, and quite dark on the posterior half; wing-veins lighter brown than in the female, the areolet large or very large and elongate on the cubitus toward the basal vein; length, 1.2–1.7 mm.

GALLS.—None. The insect lives in cavities (Figs. 6 and 7) in the pith of the stems of *Lactuca elongata* and most likely of other species of *Lactuca*. There is no

proliferation of the pith-tissue and scarcely any differentiation of the lining of the larval cells. These cells average 2.0 mm. by 1.2 mm. Externally, the stem shows no trace of a gall.

RANGE.—Canada: Quebec (Couper Coll.).

COTYPES.—Thirty-three females, twenty males, and ten pieces of infested stems as cotypes, in the collections of The American Museum of Natural History, the Museum of Comparative Zoology, and in the author's collection. The stems were collected about forty years ago. I cut the cotype adults from the stems and many of the specimens are imperfect or barely mature.

I cut one parasite, an eurytomid, from the same stems.

The insects superficially resemble the adults of *Aulacidea bicolor*, but the two species differ in many respects. The most conspicuous key characters of *abdita* are the rufous face (in *bicolor* only the mouth-parts are rufous or black), the very prominent median frontal elevation (practically absent in *bicolor*), the uniformly yellowish red antennæ of the male (the two basal joints are darker or piceous in *bicolor*), and the large areolet of the male (in *bicolor* the areolet is small or almost lacking). I have bred large series of true *bicolor* and have examined material from many localities and there seems to be no variation of the species toward the characters of *abdita*.

A considerable amount of data which I am bringing together elsewhere shows that the Aulacini are in very many respects the most primitive of the gall-wasps. The biology of species of the genus *Aulacidea* is hardly different from that of "normal" phytophagous Hymenoptera, lacking the remarkable phenomena such as production of complicated gall structures, agamic reproduction, and alternation of generations so characteristic of the higher Cynipidæ. The galls in this genus are all very simple. In this respect the most primitive of all the species we have known previously is *Aulacidea bicolor*: it produces no gall, but lives in the pith of stems. A very few other species of closely related genera match *bicolor* in this respect, e. g., *Phanacis centaureæ*, *Aylax rufus*, and *A. gillettei*. But we have not sufficiently realized that there might be many species of *Aulacidea* with as primitive characteristics, and I imagine that we have carelessly labelled all specimens of *Aulacidea* which have not come from distinct galls as being of the species *bicolor*. The difficulty of locating the insects in a plant which shows no external evidence of its infestation also accounts for the previous neglect to discover these primitive species. By extensive collecting of old stems of *Lactuca* in May and early June, I was able to secure quantities of infested material, breeding large series of insects from it, and I have been surprised at the variety of species obtained. I found true *A. bicolor*, *A. podagræ* very abundantly

(sometimes this species causes a noticeable gall), *A. tumida* (not known previously except from well-developed galls), and still other species which I shall study further before describing. In going over museum material of the same sort I have found the species here described to be very distinct from *bicolor*.

It is very likely that there are, still in existence today, many distinct species of Cynipidæ of primitive relationships and not yet discovered because of their hidden locations in plants. It promises to prove very profitable if we search widely for these wasps among herbaceous plants which have their dead stems persisting throughout the winter, especially pithy stems of Composites of many genera. Though *Lactuca* has proved the most heavily infested thus far, it is very likely that other plants are also thus attacked.

Aulacidea annulata, new species

Plate XX, Figures 3 to 5

FEMALE.—Antennæ golden brown, the second joint almost black; abdomen bright red with two black bands dorsally at the base; areolet small; first abscissa of the radius slightly angulate; length 3.5 mm. **HEAD:** black, the mandibles rufopiceous, their tips black; coarsely aciculated, the aciculations radiating somewhat from the mouth; face with a prominent, broad median elevation; entire face covered with grayish hairs. Antennæ 13-jointed, brownish with a reddish tinge, joints three to thirteen longitudinally striate, slightly pubescent, first joint bright red or rufous, second joint and basal half of third joint piceous or black. **THORAX:** entirely black; mesonotum punctate, covered with short, grayish hairs; parapsidal grooves distinct, smooth, reaching the pronotum; median groove distinct, rather deep, extending one-third or more of the way to the pronotum; anterior parallel lines distinct but not deep, extending one-third or more of the way to the scutellum; lateral grooves distinct, about as long as the median groove; scutellum rugoso-punctate, the two foveæ large, shining, but not smooth; the pronotum, lower edge of the mesopleuræ, and metapleuræ densely hairy; the mesopleuræ shining, deeply aciculate. **ABDOMEN:** bright red, shining, two-thirds of the second segment dorsally and basally, and the dorsal and anterior half of the third segment almost or quite black; abdomen very finely and microscopically punctate, a very few hairs at the base of the second segment laterally, at the top of the seventh segment, and on the ventral edge of the hypopygium; the abdomen large, about oval, with the second segment very short, no longer than the third, these two segments together only a little more than one-half the total length of the abdomen. **LEGS:** golden to reddish brown, the coxæ bright red or slightly suffused with piceous, the hind femora darker than in the other legs, the last tarsal joints in part and all of the tarsal claws dark brown or black; legs entirely punctate, pubescent. **WINGS:** clear; all the veins dark brown; areolet usually small or lacking but variable in size; cubitus apparently not reaching the basal vein, but a colorless trace of the vein may in certain lights be seen extending the rest of the way to the basal vein; radial cell entirely closed; first abscissa of the radius quite arcuate but with a suggestion of an angle or rarely an actual projection at a point slightly above the middle. **LENGTH:** about 3.5 mm., and all of the cotypes are remarkably uniform in length.

MALE.—Similar to the female, but differing in the following respects; antennæ 14-jointed, reddish or golden brown, joints 1 and 2 dorsally dark rufous to piceous, third joint curved; abdomen rufous to piceous, darker dorsally, almost black basally on the dorsal surface; areolet averaging larger than in the female; length, 2.5–3.2 mm.

GALLS.—Terminal swellings of a stem (Figs. 3 to 5), more or less club-shaped and somewhat bent and twisted, the enlargements gradual from the stem, of greatest diameter at the summit. Very much like some galls of *Aulacidea tumida*. Averaging about 70 mm. long by 18 mm. in greatest diameter. Under the bark the plant tissue is twisted, resembling the trunk of a wind-beaten tree. Many leaf petioles or stems of flower clusters are grouped at the summit of the gall, their bases involved in the swelling. Internally the galls are filled with pith, scattered through which are many larval cells, each oval, averaging 3.5×2.5 mm. The cells are merely cavities in the pith, without a separable or even distinct tissue to form them (the cells are often lined with the cast pupal skins of the insects). On *Lactuca* or possibly *Prenanthes* (the dead stems not exactly determinable).

RANGE.—Massachusetts: Sharon.

COTYPES.—One hundred and four female, sixteen male, and six gall cotypes in the collections of The American Museum of Natural History, of the Museum of Comparative Zoology, of Mr. Lewis H. Weld, and in the author's collection. The adults were all bred from galls which I collected from a single cluster of plants.

The adults emerged from June 5 to 12, 1919, the eggs undoubtedly having been deposited in the young plant in the previous June, the pupæ overwintering in the dry stems of the host plant. Almost all of the males emerged before any of the females appeared; after thirty-six hours the females began appearing and the resulting ratio was 84 per cent females to 16 per cent males. Two parasites were bred from the galls.

The adult of this species is somewhat like that of *A. tumida*, but *annulata* is readily distinguished by the key characters given at the beginning of the description.

The galls of *annulata* are not much different from some of those of *A. tumida*, although the adult is distinct. It is quite likely that there are many species in this, a primitive genus of the Cynipidæ, which are not yet known, being mistaken for other species with similar galls. These galls are simple swellings of the stems of herbaceous plants, with some proliferation of the pith-cells, but with the resulting deformations all so slight (comparatively) that the galls of different species are not distinguished as completely as are the galls of the higher cynipids.

***Diastrophus tumefactus*, new species**

Plate XXI, Figures 10 and 11

[No name, gall only] JARVIS, 1909, 39th Report Ent. Soc. Ont., p. 79.

FEMALE.—Length under 2.0 mm.; thorax mostly black, legs and antennæ uniformly golden brown; wings without areolet. HEAD: rufo-piceous, almost black on the vertex, reddish toward the mouth-parts; mandibles large, brownish; head finely coriaceous except for a smooth median elevation and the usual aciculated cheeks

and fan-shaped striations toward the mouth; face sparsely hairy, hairs longer toward the mouth; antennæ quite uniformly light golden brown, only very slightly darker toward the tips, 14-jointed, hairy. THORAX: black, the pronotum, scutellum, and sides piceous or black; mesonotum smooth, shining, finely rugose laterally, with a very few, scattered, short hairs; parapsidal grooves deep, continuous to the pronotum, widely separated at the scutellum, and almost parallel; median groove very faint but extending almost one-third of the way to the pronotum; anterior parallel lines barely indicated by slight depressions; scutellum rounded posteriorly, deeply rugose, and in large part striate, the striæ distinctly converging (more so than in other species of the genus) at the ridge separating the foveæ and at the sides of the foveæ, the foveæ large, deep, shining, with a few faint cross-striations; pronotum broad, rugoso-striate; mesopleuræ rufous to piceous or black, evenly aciculated. ABDOMEN: reddish piceous, darker dorsally and posteriorly, entirely smooth and shining, the second segment dorsally extending over one-half the length of the abdomen, but very small in lateral extent. LEGS: quite uniformly golden brown, covered with short hairs; claws toothed. WINGS: entirely clear, only very microscopically pubescent; veins dark gold or light brown, without any cloudings; areolet entirely absent; cubitus extending to the basal vein; radial cell rather broad, open; first abscissa of the radius slightly arcuate, not at all angulate. LENGTH: 1.7-2.2 mm.

GALLS.—Nodular swellings of the stem (Figs. 10 and 11). Polythalamous or agglomerate, i. e., many separate cells near together in a single stem. Each swelling averages about 15 mm. long by 10 mm. in diameter, but several swellings will fuse to make one gall 7 cm., more or less, in length; it is covered with the smooth bark of the stem, but has scattered, very minute, blunt spines. The larval cells within are distributed irregularly through the pith which proliferates somewhat about the chamber, but this cell is not separable, nor is it formed of a distinct layer. On the stems of *Potentilla monspeliensis* var. *norvegica* (Linnæus) Rydberg.

RANGE.—Canada: Quebec (Couper); Ontario (Jarvis).

COTYPES.—Nine female and one gall cotypes in the collection of the Museum of Comparative Zoology and in the author's collection. The adults were cut from the type gall collected by Couper about forty years ago.

The gall of this species was mentioned by Jarvis but the adults have not been described previously. The gall is a very simple and primitive sort of plant deformation, being more primitive than in most of the species of *Diastrophus*. *D. fusiformans* and *D. fragariæ* approach it in this respect. The adults are typical of the species of the genus and are readily separated by the key characters given in the description.

It is interesting to find another species of *Diastrophus* occurring on *Potentilla*. About half of the known species of that genus of gall-wasps are found on *Potentilla*, instead of being restricted primarily to plants of the genus *Rubus* as the first observations indicated. Thorough searching of the various species of *Potentilla* may disclose still other gall-wasps. Though *tumefactus* is known from only the one variety of plant, *norvegica*, which is confined mainly to the eastern part of Canada and the northern United States, it is possible that the same gall-wasp occurs on the typical

form of the plant, *monspeliensis*, which ranges from Alaska south into the District of Columbia and New Mexico. Or possibly still others of the larger-stemmed, shrubby species of *Potentilla* will have the same gall.

I also cut a parasite out of the gall—a species of *Eurytomidæ*.

***Neuroterus thompsoni*, new species**

Plate XXI, Figures 8 and 9

Neuroterus rileyi [error] THOMPSON, 1915, Cat. Amer. Ins. Galls, p. 7, Pl. III, fig. 173.

FEMALE.—Almost entirely black, the antennæ ringed with light yellow at the second to third joint; length under 2.0 mm. **HEAD:** black, mouth-parts reddish brown; antennæ 13-jointed (inclined to curl in dried specimens), joints one and two stouter than the following joints though not as globose as in most species of *Neuroterus*, first joint dark brown, part of the second joint and the proximal tip of the third joint very light yellow, joints three to thirteen dusky brown-black. **THORAX:** piceous black; mesonotum microscopically cracked, without grooves; sides of the thorax lighter reddish black. **ABDOMEN:** piceous black, subpedicellate, rather angulate in outline; ovipositor apparently short. **LEGS:** light brownish yellow, the hind femora and tibiæ dusky brown except at the joints; tarsal claws almost black. **WINGS:** veins brown, the cubitus reaching the basal vein below the midpoint, the areolet rather large, the radial cell long, narrow, open. **LENGTH:** 1.7 mm.

MALE.—Differing from the female as follows: antennæ 14-jointed, uniformly yellowish; thorax reddish amber; abdomen elongate, pedicellate, yellowish brown, pedicel light yellow; legs uniformly yellow but with the tarsal claws black; length, 1.7 mm.

GALLS.—Pustulate swellings under the bark (Figs. 8 and 9), each swelling oval, about 2 × 3 mm., and elevating the bark about 1.0 mm.; usually many galls are confluent, around the twig and along it for a length of 2–12 cm. Larval cells, distinct but inseparable, lie in the wood, near the bark, 1–5 to each pustule, and each about 0.7 mm. in diameter. On young twigs of *Quercus prinoides*.

RANGE.—Massachusetts (M. T. Thompson Coll.).

COTYPES.—Twenty-three females, two males, and 6 galls, distributed in the collections of The American Museum of Natural History, the Boston Society of Natural History, of Mr. W. T. Davis, and in the author's collection.

The galls form in May.

Dr. M. T. Thompson mistook this material for *Neuroterus rileyi*, a middle-western species which *N. thompsoni* in general resembles, but the two are really quite distinct. *N. thompsoni* is only about half as large as the other species, both in the gall and the adult; the coloring of the antennæ and legs will distinguish *thompsoni*.

Through the kindness of Mr. C. W. Johnson, Curator at the Boston Society of Natural History, I have had an opportunity to study cynipid material in the Thompson Collection of galls and gall-insects. Though this collection was made in but a single season, the number of species therein represented is surprisingly large and is a credit to the thoroughness with which Dr. Thompson worked. I am glad to be able to give his

name to a species based on material of his own collecting. We shall profit considerably from the work he did and regret it was so prematurely stopped by his death in 1907.

***Andricus concolorans*, new species**

Plate XXII, Figures 12 and 13

- Cynips cicatricula* [gall] BASSETT, 1881, Can. Ent., XIII, pp. 101, 113. PACKARD, 1881, U. S. Ent. Comm. Bull., VII, p. 57; 1890, 5th Report U. S. Ent. Comm., pp. 107, 109. ASHMEAD, 1887, Trans. Amer. Ent. Soc., XIV, p. 129.
- Andricus cicatricula* [gall] BASSETT, 1890, Trans. Amer. Ent. Soc., XVII, p. 80.
- DALLA TORRE, 1893, Cat. Hymen., II, p. 82. MAYR, 1902, Verh. Ges. Wien, LII, p. 289. DALLA TORRE AND KIEFFER, 1902, Gen. Ins., Hymen., Cynip., p. 62; 1910, Das Tierreich, XXIV, p. 542. VIERECK, 1916, Hymen. Conn., p. 413.
- Callirhytis cicatricula* [gall] BEUTENMÜLLER, 1904, Bull. Amer. Mus. Nat. Hist., XX, p. 25.
- Andricus cicatriculus* [gall] THOMPSON, 1915, Cat. Amer. Ins. Galls, pp. 12, 31, Pl. III, fig. 171. FELT, 1918, Bull. N. Y. State Mus., CC, p. 79, Pl. I, fig. 1.
- [*Andricus cicatriculus* (Bassett), male and female, belongs to *Ceroptres* Hartig, and is an inquiline in the gall of *Cynips concolorans*.]

FEMALE.—Mostly reddish piceous, the wing-veins very light amber, and antennæ and legs mostly rich golden brown. **HEAD:** piceous, the vertex almost black, coriaceous to finely rugose, the cheeks and face with a sparse, white pubescence; antennæ 14-jointed, uniformly rich golden brown, the third joint not much longer than the fourth. **THORAX:** piceous to black; pronotum striate, mesonotum finely and regularly shagreened, not heavily pubescent; parapsidal grooves continuous, fairly deep, well separated at the scutellum, sharply curving apart at the pronotum; median groove extending about one-third the way to the pronotum; anterior parallel lines smooth, shining, extending half-way to the scutellum; mesopleuræ striate, with a large shining area; scutellum black, finely rugose, sparsely pubescent, with the foveæ separated, not large, divergent, shining. **ABDOMEN:** reddish piceous, darker dorsally and posteriorly, second segment polished, extending almost to the tip of the abdomen; ovipositor sheaths extending above the tip of the dorsal line. **LEGS:** golden brown, all the coxæ and the hind femora and tibiæ darker; claws simple. **WINGS:** large; veins light amber; the cubitus very faint but extending well toward the basal vein; first abscissa of the radius angulate though not sharply so; the areolet moderately large; the radial area open. **LENGTH:** 1.3–2.2 mm.

MALE.—Similar to the female, but with the antennæ 15-jointed, the third joint curved; abdomen dark, slender, elongate; areolet small; length, 1.2–2.0 mm.

GALL.—Figs. 12 and 13. "Polythalamous galls on the midvein of the leaves of *Quercus alba*, [*Q. Prinus*, *Q. prinoides*, Thompson Coll.] never more than one on a leaf, and situated sometimes at the base, but usually from one-fourth to one-half way from the base, rarely above the middle. They project one-third below and two-thirds above the surface of the leaf. On the under side of the leaf they are rounded and on the upper cone-shaped. The gall is solid and somewhat fibrous, and in its shorter diameter measures about one-half inch and in the longer from five to seven-eighths of an inch. The larval cells radiate in all directions from the center of the gall and are quite numerous. There is at or near the summit of the cone a small scar or indentation. . . ." Bassett, 1881, p. 101.

RANGE.—Massachusetts: Marthas Vineyard. Rhode Island: Providence (Thompson). Connecticut: Waterbury (Bassett). New York: Ellenville (in Coll. Amer. Mus. Nat. Hist.).

COTYPES.—Forty-five females, seventy-four males, in the collections of The American Museum of Natural History, the Boston Society of Natural History, the Museum of Comparative Zoology, in the author's collection, and elsewhere. The adult material was bred by Millett T. Thompson, No. 185 of his collection which is at the Boston Society of Natural History. The galls of the Thompson Collection are in poor condition, so I should designate my Marthas Vineyard material of galls as type galls for this species.

Thompson found the adults emerging late in June.

The type material of Bassett's *Andricus cicatriculus* in The American Museum of Natural History contains one female of *A. concolorans*, and a number of specimens of an inquiline. The description of the adult *cicatriculus* agrees with the inquiline to which that name must be applied; it would appear to be a *Ceroptres*. The material from the Thompson Collection matches the single female (undescribed) of the Bassett types. Thompson also bred the same inquiline.

Inquiline species are very often quite similar to their gall-maker hosts, and consequently most students of Cynipidæ have repeatedly described inquilines as true gall makers. But Homer F. Bassett was a careful enough worker to have avoided almost entirely such mistakes, and to find the instance here described lends emphasis to the fact that in *Andricus concolorans* and *Ceroptres cicatricula* the identity is unusually remarkable. The generic differences are quite apparent, but the specific details show few differences. The main points of difference, all generic (or even family) characters are:

	CYNIPID	INQUILINE
Radial cell	Open	Closed (not open as Bassett stated)
Radius, first abscissa	Angulate	Arcuate
Antennæ, female	14-jointed	13-jointed
Abdomen, first segment	Insignificant	One-fifth the length of the abdomen (separation from segment 2 not always visible)

The two species agree quite closely (though of course not exactly) in the following respects: general color of head, thorax, abdomen, antennæ (part), legs, wing-veins; length of body and of wings; sculpture of thorax (not exactly); relative prominence of wing-veins. This leaves very few specific characters of difference.

Contemplating such close resemblance of species of different genera, we are wont to consider again how such "mimicry" may have arisen. Mimicry among inquilines in cynipid galls is of especial interest because of the absence of anything like a struggle for existence between the two

organisms or an active struggle of these adults with any other organism. The inquiline usually reaches maturity and emerges from the gall, enjoying its first moment of a free or active life, some time after the brief adult life of the gall-wasp has been completed; often the inquiline does not appear until a half-year after the death of the gall-wasp. Since there is no meeting of the two adults and since there are practically no enemies of the adults of either species—nor could either adult offer any sort of resistance to an enemy, beyond that afforded by minute size, rapid running, or very feeble flight—it is hard to conceive of any advantage gained by the mimicry, and consequently hard to believe that natural selection has had any place in effecting the similarity. Nor is it possible that each species of inquiline has originated separately from its host species, for the differences, as pointed out, are largely generic or family characters.

I wish to note, without comment, that the larvæ of inquilines and hosts live in closely identical environments. Though the two do not usually come into actual contact and do not interfere in any way with each other, they do spend all but the very later part of their lives within a millimeter or less of each other and subsist most likely on the same sort of food—plant-cell contents, mainly sugars, or whatever it may be, supplied by the same individual plant and in the very confined and specialized part of that plant, the gall.

It has seemed worth noting this much, although I have not yet accumulated data enough to warrant generalizations. It would seem that with this group of insects there are conditions especially favorable for obtaining, by further observation and possibly through experiment, interesting evidence as to some factors producing some sorts of mimicry.

Andricus furnaceus, new species

Plate XXII, Figures 14 to 16

FEMALE.—Head, thorax, legs, and antennæ reddish to dark piceous, abdomen reddish yellow; mesonotum deeply reticulate, entire thorax and legs covered with whitish hairs; cubitus not reaching the basal vein. HEAD: reddish, shading to piceous or black on the face, irregularly rugose and rather sparsely covered with yellowish hairs; head broadened behind the eyes, with the cheeks broad; antennæ uniformly reddish brown to reddish piceous, 14-jointed, the first joint broadly obconical, the third not much longer than the fourth, the following joints gradually shorter, the fourteenth joint one-third longer than the thirteenth. THORAX: dark reddish piceous, almost black on the scutellum, reddish piceous to black on the pleuræ and pronotum; the mesonotum rather deeply rugoso-reticulate, with a not sparse covering of yellowish white hairs, the sides of the pronotum and the metapleuræ more densely covered with longer hairs; parapsidal grooves deep, not especially convergent at the scutellum, and continuous to the pronotum; a pair of smooth, rather widely separated anterior parallel lines, slightly divergent anteriorly, extending half the way to the scutellum;

shallow but distinct lateral grooves extending almost parallel to the parapsides three-quarters of the way to the point where the parapsides meet the pronotum; median groove lost in the deep rugosities of the mesonotum; scutellum rather elongate, deeply rugose, hairy, with a very broad, rather deep depression at the base, with conspicuous, divergent ridges, but hardly defining distinct foveæ; mesopleuræ shallowly punctate, with long, appressed, yellowish hairs. ABDOMEN: reddish or yellowish red, brighter basally, smooth, with a few hairs at the sides of the second and on the edge of the third and following segments, the second segment somewhat projected dorsally to two-thirds the length of the abdomen; ovipositor sheaths short. LEGS: reddish brown to reddish piceous, shallowly punctate and entirely hairy, the tarsal claws toothed. WINGS: one-third again as long as the whole body, clear, regularly covered with short, dark hairs; all of the veins brown, the subcosta and radius the heaviest; areolet fairly large; cubitus not extending to the basal vein; radial cell open; the first abscissa of the radius curved very nearly at the midpoint to form an angle which is only a little greater than a right angle. LENGTH: 2.0-3.2 mm.

GALL.—A light grayish brown, rather regular swelling (Figs. 14 to 16) around small twigs, resembling a baked potato. Polythalamous, a single gall containing fifty or more larval cells. Usually a single, regular mass, rarely somewhat convoluted as though several portions had been fused; varying from a spherical to ovoid shape, usually somewhat concave where the twig enters the gall; 4.5×6.0 cm. or less in diameter; matted, light brownish gray in color, resembling the skin of a baked potato, with scattered flakes or patches of a loosened, dark brown, "burnt" skin. The whole interior is hard, compact-granular, with very little solid woody fibre; the larval cells average 2.5×4.0 mm., formed of a layer distinct from but closely embedded in the surrounding tissue, the cells scattered irregularly throughout the gall, but more abundantly nearer the center. Surrounding and surmounting the young twigs (preventing their further growth) of *Quercus* sp.

RANGE.—Mexico: San Luis, Potosi (Schaffner, Palmer Coll.).

COTYPES.—Thirty-seven female and ten gall cotypes in The American Museum of Natural History, the Museum of Comparative Zoology, and in the author's collection. The insects were cut from one of the galls collected by Schaffner in 1880.

The same species was collected in 1878 in the same locality by Dr. Edward Palmer, and adults emerged from these galls in the summer of 1879.

This belongs to a group of several species from Mexico which are similar in coloring and general characters of pubescence, sculpture, wing venation, etc., and which produce, as far as known, similar galls which are large, woody swellings of twigs. Inasmuch as these species are so confusingly similar, it seems worth giving the following key for distinguishing them.

WOODY GALLS, MEXICAN SPECIES OF *Andricus*

1. Head or thorax or both with some reddish coloring, abdomen without any black; parapsidal grooves complete. 2.
- Head and thorax entirely black, ovipositor sheaths black; parapsidal grooves obliterated posteriorly. *A. championi* Ashmead.

2. Cubitus continuous to the basal vein. 3.
 Cubitus not reaching the basal vein. 5.
3. Length 3.5 mm. or more; foveæ at base of the scutellum are very large, broad, and rugose. 4.
 Length 3.0 mm. or less; two small foveæ at the base of the scutellum; antennæ entirely rufous. *A. montezumus* Beutenmüller.
4. Antennæ dark rufous; median groove continuous; areolet very large; length 4.0–5.0 mm. *A. dugesi* Beutenmüller.
 Antennæ with first two and last few joints bright rufous, the other joints almost black; median groove scarcely perceptible in the rugosities of the thorax; areolet only moderately large; length 3.5–4.2 mm. *A. peredurus*, new species.
5. Length under 3.2 mm.; thorax entirely hairy; no median groove, but deep and continuous parapsidal grooves; abdomen with hairs on the sides at the base. *A. furnaceus*, new species.
 Length 4.0 mm.; median and parapsidal grooves indistinct; abdomen smooth (head and thorax not described as pubescent) *A. durangensis* Beutenmüller.

***Andricus incomptus*, new species**

Plate XXIII, Figures 17 and 18

FEMALE.—Mostly yellowish rufous, the antennæ shading into dark brown toward the tip; the tarsal claws brown; the areolet large, elongate; two clouded patches in the apical cell. HEAD: yellowish rufous shading into rufous brown on the face and on the tips of the mandibles; coriaceous, and moderately hairy; antennæ 13- or 14-jointed, yellowish rufous, the apical half becoming dark brown, third joint long and slender and fourth almost as long. THORAX: entirely yellowish rufous; mesonotum closely punctate, covered with moderately long, not very dense hairs; parapsidal grooves rather deep, converging at the scutellum, continuous to the pronotum; anterior parallel lines slightly elevated, extending half-way to the scutellum, but punctate similarly to the rest of the thorax and therefore indistinct in most lights; median groove lacking; lateral lines slightly elevated, almost smooth, somewhat darker than the rest of the thorax, and extending over half-way to the pronotum; scutellum long, cushion-shaped, rugoso-punctate, hairy, with two, very broad, moderately deep depressions at the base which, however, do not form distinct foveæ; pronotum punctate, hairy; mesopleuræ not entirely smooth, hairy, the upper third somewhat concave and rugoso-punctate. ABDOMEN: yellowish to brownish rufous, smooth and shining, as deep as long; second segment tongue-shaped, extending dorsally almost to the tip of the abdomen; hairy over the whole of the sides of the second segment, with a large tuft of long hairs at the tip of hypopygium. LEGS: yellowish rufous, slightly lighter than the rest of the body; tips of the tarsi dark brown, tarsal claws toothed. WINGS: veins brown, heavy; first portion of the cubitus, a cloud on the first abscissa of the radius, and two distinct, clouded patches in the apical cell yellowish; areolet large, quite narrow and elongate; the cubitus reaches the basal vein; radial cell open; first abscissa of the radius angulate, the angle obtuse. LENGTH: 2.5–3.2 mm.

GALL.—A mass (Figs. 17 to 18) of golden brown, straggling wool, containing a spherical core which is set with a dense, rich reddish-brown pubescence. Monothalamous. The covering hairs are 5 mm. or more in length, brittle, and rather wavy, forming an "uncombed" mass about 15 mm. in diameter. The central core is

spherical, averaging 7 mm. in diameter, and is covered with a very dense pubescence of dark reddish-brown hairs less than 1 mm. long; this covering is quite distinct from the longer, fewer hairs which form the main covering of the gall. The walls of the central core are almost 1 mm. in thickness, and the rest of the core is taken up with the large larval cell. Singly, or more often in groups of two, on the under surfaces (less often on the upper surfaces) of the leaves of a species of *Quercus*.

RANGE.—Mexico: San Luis, Potosi (Palmer Coll.).

COTYPES.—Two female and twenty-eight gall cotypes, in the Museum of Comparative Zoology, and in the author's collection, and cotype galls in The American Museum of Natural History. I cut the type females from the galls which were collected by Dr. Edward Palmer in September 1878.

The gall is very distinct. The character of the second segment of the abdomen and some other characters of the adult will place it in *Dryophanta* if that genus can be maintained. But for the time, until we have discovered the true lines of relationships, it seems best to describe the species under the meaningless name of *Andricus*.

***Andricus marmoreus*, new species**

Plate XXIV, Figures 22 to 24

FEMALE.—Mostly bright rufous, the sides of the thorax and coxæ piceous to black, the mesopleuræ irregularly coriaceous, the abdomen microscopically but completely reticulate. HEAD: yellowish rufous, darker on the face toward the bases of the antennæ, the tips of the mandibles piceous; irregularly and finely shagreened, with scattered hairs which are longest and densest on the extreme sides of the head and on the face toward the mouth-parts. Antennæ 14-jointed, hairy; joints one, two, and part of three light yellowish rufous, shading into the brown of the following joints. THORAX: mesonotum bright rufous with piceous or black on the very edges, rather regularly coriaceous, sparsely hairy; a median ridge from the scutellum to the pronotum being irregularly coriaceous, only slightly elevated, this becoming a depressed, smooth, very short groove at the scutellum; anterior parallel lines smooth, slightly elevated, and extending half-way to the scutellum; parapsidal grooves fairly deep, extending to the pronotum; lateral lines rather broad, rather smooth, neither elevated nor depressed, extending well forward toward the pronotum; scutellum bright rufous, piceous on the edges and the sides, cushion-shaped, deeply rugose, sparsely hairy, with the two deep foveæ at the base smooth, separated by only a very fine ridge; pronotum bright rufous to piceous, darkest anteriorly, irregularly rugose, sparsely hairy; mesopleuræ piceous to black, the upper third deeply and irregularly rugose, hairy, the lower two-thirds coriaceous, with a spot of rufous red, with few hairs which are longest and most dense at the lower edge. ABDOMEN: quite uniformly bright rufous red, somewhat darker at the posterior edge, very evenly and completely covered with a microscopic reticulation, with a few scattered hairs; the second segment large, covering most of the abdomen; the ovipositor sheaths very narrow and short, hardly as wide as an antenna, hairy. LEGS: coxæ piceous, femora rufo-piceous, tibiæ and tarsi yellowish rufous, the tips of the tarsi black, tarsal claws simple. WINGS: yellowish-tinged, quite hairy; veins brown, heavy, both branches of the cubitus fine and yellowish, a slight cloud on the basal vein and a prominent cloud around the apical portion of the subcosta and the first abscissa of the radius; areolet moderately large, almost an

equilateral triangle; cubitus not reaching the basal vein; radial cell open; the first abscissa of the radius angulate but without any projection into the radial cell, the angle formed being about 120°. LENGTH: 2.5–2.8 mm.

GALL.—A solid, marble-like gall (Figs. 22 to 24), mottled in color, about globular, and smooth, with a blunt tip. Monothalamous. The gall is 9 mm. or less in diameter, subspherical, somewhat flattened vertically, with usually a broad-linear tip at the apex 2–3 mm. long; the surface is light brown, not entirely smooth in dried specimens, the deeper portions colored darker, forming a speckled or evenly mottled design. The gall is solid, although the tissue is not compact, and contains a distinct but not separable larval cell which is about 3 mm. in diameter. Often in numbers, though not densely clustered, on the new shoots of *Quercus* sp.; the wedge-shaped base of the gall is inserted in deep slits in the twig, causing thin layers of the bark to flare slightly around the base of the gall.

RANGE.—Mexico: San Luis, Potosi (Palmer Coll.).

COTYPES.—Two female and fifty-eight gall cotypes in the Museum of Comparative Zoology and in the author's collection, and cotype galls in The American Museum of Natural History. The galls were collected in September 1878 by Dr. Edward Palmer, and I cut the cotype adults from those galls.

The gall is like a typical "bullet-gall" of the genus *Disholcaspis*, except that it does not have a separable larval cell. In anatomical characters the insect shows no relationship to *Disholcaspis*.

***Andricus mexicanus*, new species**

Plate XXIV, Figures 25 to 27

Cynips guatemalensis [galls] CAMERON, 1883, Biol. Centr. Amer., I, p. 71, Pl. IV, figs. 7, 7a. DALLA TORRE, 1893, Cat. Hymen., II, p. 70. DALLA TORRE and KIEFFER, 1902, Gen. Ins., Hymen., Cynip., p. 60. DALLA TORRE and KIEFFER, 1910, Das Tierreich, XXIV, p. 446.

Andricus ? *Mexicana* [galls] BASSETT, 1890, Trans. Amer. Ent. Soc., XVII, p. 78.

Andricus mexicanus [galls] DALLA TORRE, 1893, Cat. Hymen., II, p. 91. DALLA TORRE and KIEFFER, 1902, Gen. Ins., Hymen., Cynip., p. 66; 1910, Das Tierreich, XXIV, p. 557. FELT, 1918, Bull. N. Y. State Mus., CC, p. 115.

?*Andricus mexicanus* [galls] THOMPSON, 1915, Cat. Amer. Ins. Galls, pp. 20, 33.

FEMALE.—Almost wholly bright reddish brown, generally pubescent; areolet large; abdomen covered with fine striations. HEAD: reddish brown, slightly darker toward the mouth, the tips of the mandibles dark brown; entire face with whitish, long, appressed hairs; compound eyes and ocelli shining black; antennæ dark yellow-brown, the second joint shorter than the first, the third as long as one and two and less than half as stout, the fourth little shorter than the third, remaining joints successively shorter, the whole antenna pubescent. THORAX: reddish brown, irregularly and slightly darker on a median line and on the sides, finely and regularly shagreened, with a whitish pubescence which is densest on the pronotum and the sides, parapsidal grooves well defined, extending to the pronotum, somewhat wider and converging toward the scutellum; no traces of anterior parallel lines or of a median groove; scutellum rugose, the foveæ shallow, broad, and separated by a very fine ridge. ABDOMEN: bright reddish brown, very finely shagreened, largely covered with fine striations and pubescent on the sides at the base; the second segment extending dorsally for two-thirds of the abdominal length. LEGS: quite uniformly yellowish

brown, the tips of the tarsi and the tarsal claws dark brown and toothed. WINGS: veins brown, the cross-veins, subcosta, and radius moderately heavy and dark brown; areolet large; cubitus fine but reaching the basal vein; radial cell open, first abscissa of the radius angulate. LENGTH: 2.7 mm.

GALL.—A large mass (Figs. 25 to 27) of wool, about hemispherical, 2.0–3.5 mm. in diameter, lemon-yellow to bright orange-brown; the hairs crystalline, brittle, forming a coating on the central core almost 10 mm. thick; the core polythalamous, of a dense, crystalline material, without separable larval cells. On the midvein, on the upper sides of leaves of an oak, *Quercus macrophylla* Nee? (Prof. Jack det.).

RANGE.—Mexico: "mountains near Guadalajara" (Bassett); Sierra de Nayarit, Jalisco (Diquet Coll.). Guatemala: San Geronimo (Cameron).

COTYPES.—Four females and nine galls, in the collection of The American Museum of Natural History, and in the author's collection. The galls were collected by Mr. L. Diquet in 1900, and deposited in the collection of the American Museum; the females were cut from the galls in January 1919, and consequently none of the insects are perfect specimens.

The gall is a splendid thing and must be very attractive if at all abundant in its range. The recorded stations are over one thousand miles apart, for apparently this is the same species of which Cameron and Bassett have described the gall, though neither obtained the adult. Bassett said that the host of his galls was probably *Q. crassifolia*. The insect belongs to the *Andricus-Callirhytis-Cynips* group of ill-defined genera.

***Andricus pellucidus*, new species**

Plate XXIII, Figures 19 to 21

[No name, gall only] OSTEN-SACKEN, 1873, Hayden Report U. S. Geol. and Geog. Surv., p. 567, No. 1.

FEMALE.—Mostly bright chestnut-rufous, the posterior portion of the abdomen rufo-piceous; thorax with distinct parapsidal grooves, but other lines essentially absent; wings with brownish patches in the apical cell, the radial cell short, rounded, clear, cubitus reaching the basal vein but without any thickening at the point of union. HEAD: bright chestnut-rufous, ocelli of the same color, mouth-parts slightly darker, compound eyes black; head very unevenly rugose, or variously sculptured, with a few whitish hairs; antennæ 14-jointed, mostly of exactly the same color as the face, but somewhat darker at the tips. THORAX: of the same chestnut-rufous color as the head (yellowish rufous in one specimen), the entire thorax quite uniformly colored or only slightly darker on the sides; mesonotum punctate, and with some other irregular sculpturing, and hairy; parapsidal grooves distinct, convergent at the scutellum, continuous to the pronotum; median groove absent, anterior parallel lines and lateral lines absent or with only faint traces discernible; scutellum small but elongate, irregularly rugose, sparsely hairy, with two large and broad fovæ at the base which are shining but rugose, only narrowly separated; pronotum irregularly rugose; mesopleuræ rugoso-striate with a small area which is almost smooth. ABDOMEN: smooth, shining, rufous, the posterior half, especially dorsally, a rich rufo-piceous, the second segment with a few scattered hairs basally and laterally, and a tuft of long hairs on the tip of the hypopygium; the second segment tongue-shaped,

produced dorsally for three-quarters the total length of the abdomen. LEGS: rufous, only slightly lighter than the thorax; tips of tarsi darker, quite hairy; tarsal claws toothed. WINGS: tinged with yellow, and covered with rather long yellow hairs, the veins dark translucent brown, the basal vein, distal half of the subcosta, and the radial veins darkest and heaviest; the areolet of moderate size or moderately large; the cubitus reaches or almost reaches the cross-vein (but without becoming brown and heavy at the point of union as in *Dryophanta bella* and *D. nubila*); apical branch of the subcosta almost lacking; first abscissa of the radius angulate, the apex of the angle being thickened and high up on the vein, almost at the point of union with the subcosta; second abscissa of the radius arcuate, making the radial cell broad and short; two or three irregular, rather indistinct, brownish patches in the apical cell, a trace of one in the discoidal cell, and a small, clouded spot on the discoideus not far from its union with the basal vein. LENGTH: 2.5–3.2 mm.

GALLS.—Globular (Figs. 19 to 21), smooth, dull or somewhat shining, thin-shelled, yellowish to pinkish, translucent galls, monothalamous, 8–15 mm. in diameter, empty except for a few, very fine, radiating fibers which hold the larval cell central in the gall; in size the larval cell is about 2×3 mm. On the under surfaces of leaves of a species of *Quercus*, attached to a vein.

RANGE.—Colorado: Colorado Springs (Carpenter Coll.).

COTYPES.—Eight female and eight gall cotypes in the collections of The American Museum of Natural History, the Museum of Comparative Zoology, and in the author's collection. One of the adults was bred; the others I cut from the galls collected by Lieut. W. L. Carpenter, September 25, 1873.

The material from which this species is described is that referred to by Osten Sacken in Hayden's report for 1873, the U. S. Geological Survey. Most of the adults had emerged from the larval cell but were found dead within the outer wall of the gall.

The gall is very pretty, being even thinner than the galls of *Dryophanta bella*, *D. dugesi*, and *D. rubra*, which it resembles. The insect, in having spotted wings, and in other respects, is similar to the adults of those same species, but is completely differentiated by the key characters given in the description. *A. pellucidus* belongs to a natural group containing the species mentioned above, *Dryophanta (Disholcaspis) centricola*, et al., and this is one of the groups which must be separated from other unrelated things now included in the genus "*Dryophanta*." Until complete revision of the cynipid genera can be made I give this species the meaningless name of *Andricus*.

***Andricus peredurus*, new species**

Plate XXV, Figures 28 and 29

FEMALE.—Head, thorax, and antennæ rufous and black, the abdomen reddish; thorax hairy and deeply reticulated; cubitus extending to the basal vein. HEAD: dark rufous, shading almost to black around the ocelli and mouth-parts; compound eyes black; whole head very rugose, with a covering of rather long hairs; antennæ 14-jointed, rufous black, the first two and the last four to six joints brighter rufous

these last six joints being subequal in length. THORAX: mesonotum bright rufous, piceous between the parapsides in their anterior parts, and piceous on the lateral grooves, deeply rugoso-reticulate, with rather long, rather dense yellowish hairs; parapsidal grooves deep, convergent at the scutellum, continuous to the pronotum where they are widely divergent; anterior parallel lines not entirely smooth, extending half the way to the scutellum; median groove evident but largely lost in the rugosities of the mesothorax; the lateral grooves distinct, smooth, and extending half the length of the thorax; scutellum black, somewhat rufous toward the elevated central area, deeply rugose, sparsely hairy, with a broad depression at the base which is similarly rugose, not defining entirely separate foveæ; pronotum and mesopleuræ rufous, shallowly punctate, covered with dense, closely appressed, long hairs. ABDOMEN: rich rufous-brown, slightly darker in places dorsally and toward the sides of the more posterior segments; hairy on the sides of all the dorsal plates, the hairs longest on the edges of the posterior segments. LEGS: bright rufous, the tibiæ very slightly darker except the hind tibiæ which are piceous or black; coxæ rufous; claws toothed. WINGS: very clear, only microscopically pubescent; veins brown, the areolet rather large, the cubitus not heavy but extending to the basal vein, the radial cell open, the first abscissa of the radius angulate, almost forming a right angle. LENGTH: 3.5-4.2 mm.

GALL.—A large, dark brown, irregular, woody mass (Figs. 28 and 29) surrounding a small twig. Polythalamous, often containing fifty or more larval cells. The whole is formed of very many distinct but thoroughly fused masses, forming a rather spherical gall 8 mm. more or less in diameter; the surface is very rough, completely cracked as though it were burnt leather, the raised portions polygonal, averaging 2 mm. in diameter, dark, blackish brown, the separating lines being much lighter or yellowish. Internally the gall is composed of a dense, somewhat granular tissue which becomes more compact-woody close to the margin and immediately around the larval cells. The gall is quite too hard to cut through with a knife. The larval cells are about 3 mm. in diameter, but elongate, and are closely surrounded by the woody tissue; they are scattered quite irregularly throughout the gall. Surrounding the young twigs of *Quercus* sp.

RANGE.—Mexico: San Luis, Potosi (Palmer Coll.).

COTYPES.—Ten female and three gall cotypes, in The American Museum of Natural History, the Museum of Comparative Zoology, and in the author's collections. The galls were collected in September 1878 by Dr. Edward Palmer; some of the adults emerged from the galls and others were recently cut out.

Dr. Hagen, who received these galls from Dr. Palmer, noted that pupæ and adults were alive in them in October 1879 and also in December 1879, i. e., almost a year and a half after the galls had been collected. It is likely that it is two or three years after the egg is laid before the insect reaches maturity. The tissue of the gall is about as hard as that of any gall I have examined. The species belongs to a group including several Mexican species which produce similar woody galls, and a key to separate these insects was included in the discussion of *A. furnaceus*, new species. The adult of this species shows some little variation in the shades of the colors.

Andricus tecturnarum, new species

Plate XXV, Figures 30 to 33

FEMALE.—Mostly bright rufous, the tips of the antennæ and the posterior edge of the abdomen darker; hairy; foveæ at the base of the scutellum distinct, deep, smooth. **HEAD:** deep rufous, the mouth-parts only slightly darker; finely coriaceous, and hairy; antennæ 13-jointed (less often 14-jointed), rufous, hairy, the last one or two joints dark brownish. **THORAX:** entirely bright rufous, coriaceous, hairy; parapsidal grooves distinct, not very convergent at the scutellum, extending to the pronotum; anterior parallel lines rather smooth but not very distinct, extending half-way to the scutellum; median groove practically lacking but with a trace of a slightly differently colored median line; lateral lines distinct, rather broad, smooth, extending well forward; scutellum rugose, hairy, with the two foveæ at the base deep, smooth, divergent, almost at right angles, separated by only a narrow ridge; pronotum finely rugoso-punctate; mesopleuræ shining but very finely aciculate. **ABDOMEN:** shining rufous, darker posteriorly and dorsally, with a few hairs at the sides of the second segment and on the hypopygium; the second segment somewhat tongue-shaped, produced dorsally to cover two-thirds of the abdomen. **LEGS:** rufous, hairy, only the very tips of the tarsi dark; tarsal claws toothed. **WINGS:** veins brown, the second abscissa of the radius and the cubitus finer and lighter, with something of a cloud on the first abscissa of the radius; areolet not large; cubitus not quite reaching the basal vein; radial area open; first abscissa of the radius angulate. **LENGTH:** 2 mm. or slightly less.

GALLS.—Buff or reddish brown, woolly masses (Figs. 30 to 33) containing scores of closely clustered, hollow, urn-shaped galls. Each gall is monothalamous, about 10 mm. long by 3 mm. in diameter, consisting of a tube, which is rather conical, but compressed by contact with the other galls, thin-walled, crystalline, the upper half hollow and open at the end, a partition separating this space from a cavity which occupies the lower half of the gall and in which the larva lives. Each gall bears straw-colored to buff or reddish brown, crystalline hairs which are most dense near the summit, and which make of the cluster a single, oval mass often 35×25 mm. in size. The galls are all attached to the midribs, on the under surfaces of leaves of a species of *Quercus*.

RANGE.—Mexico: San Luis, Potosi (Palmer Coll.).

COTYPES.—Eight female cotypes and three clusters of galls, in the collections of The American Museum of Natural History, the Museum of Comparative Zoology, and in the author's collection. The galls were collected in September 1878 by Dr. Edward Palmer; some of the cotype adults were bred then from the galls, and others I cut out of the galls.

The individual galls are not unlike those of *Andricus crystallinus* or *Callirhytis tubicula* in structure, but they are entirely different in details of form and in being clustered in the large, woolly masses.

Disholcaspis fungiformis, new species

Plate XXVI, Figures 37 to 39

FEMALE.—Antennæ 13-jointed, head and thorax bright reddish brown, black on the area between the anterior parallel lines, on the lateral lines, and in the foveal groove of the scutellum; abdomen dark rufous-brown. **HEAD:** bright reddish brown,

dark brown at the base of the antennæ and on the mouth-parts, coriaceous or finely rugose, the cheeks and the lower half of the face rather densely hairy; antennæ 13-jointed, hairy, brown, darker than the rest of the head, the first two joints stout and somewhat brighter in color. **THORAX:** entirely bright reddish brown except for a decidedly black area between the anterior parallel lines, around the lateral lines, and in the foveal groove at the base of the scutellum; mesothorax regularly punctate, at the sides rugose, covered with long, whitish hairs; parapsidal grooves deep and smooth at the scutellum, extending less than half the length of the mesothorax; median groove lacking; anterior parallel lines rather smooth and distinct, extending half-way to the scutellum; lateral lines broad, smooth, sinuous, extending beyond the middle of the thorax; scutellum cushion-shaped, rugoso-punctate, hairy, the foveal groove at the base well-defined, moderately deep, rugose, with a slight indication of a separation into foveæ; pronotum and mesopleuræ darker in color. **ABDOMEN:** rich, dark rufous-brown or reddish piceous, lighter at the base, shining, smooth except for a few, indistinct, irregular striæ at the posterior edges of the segments; patches of hairs at the base of the second segment at the sides, and a tuft on the tip of the hypopygium. **LEGS:** of the same color as the thorax, uniform in color, hairy; the tarsal claws toothed. **WINGS:** long, clear, the wing-veins yellowish brown, second cross-vein the heaviest, a slight clouding at the base of the first abscissa of the radius; areolet large, cubitus extending only a little more than half-way from the areolet to the basal vein; radial cell open; first abscissa of the radius angulate. **LENGTH:** 3 mm. or less.

GALLS.—A very curious cluster (Figs. 37 to 39) of brownish, mushroom-shaped, twig galls. Each gall is small, composed of three distinct parts: a solid top which is a broad, flattened cone 7–10 mm. in diameter but barely 4 mm. in height, the upper surface irregularly pitted, buff-brown, with the apex dark brown; a small, solid stem not 2 mm. in diameter and 2 or 3 mm. long connecting this cap with the base which contains the larval cell; a base which is a broad, inverted cone, the apex being the point of attachment on the twig, with an irregular, flaring, thin, leaf-like cup extending from this base up and around the cap of the gall, resembling an enormously developed cup at the base of a mushroom. Each gall is monothalamous, the larval cell occupying most of the basal part of the gall, the cell distinct from but tightly enclosed in the surrounding tissue. On the twigs of a variety of *Quercus virginiana*.

RANGE.—Texas: Tiger Mills, Burnett Co. (Schaupp); San Carlos (in Coll. Gray Herb.).

COTYPES.—Two females and several clusters containing over fifty gall cotypes, in the collection of the Museum of Comparative Zoology and in the author's collection, and gall cotypes in The American Museum of Natural History. I cut the adults from the galls which were collected by F. G. Schaupp in 1885.

The gall is the most curiously complicated structure I have seen among cynipid productions. It is possible that it is of quite a different form when young and fresh. I find additional specimens of these galls on oak material in the collections of the Gray Herbarium of Harvard University. This material was collected in November 1831 and is from San Carlos, Texas, which is over four hundred miles from the locality of the type material.

The general shape of this gall is very different from that of most of the species of *Disholcaspis*, but the location and character of the larval cell is typical for that genus. The insect is a true *Disholcaspis*.

Beside the two cotype adults from normal galls, I cut from a very small cotype gall a female which is in all respects like the cotypes but that it is generally darker and is very remarkably smaller in size, being only 1.7 mm. in length. I do not recall that I have ever before found an individual of the gall-wasps varying so from the average of length for the species.

Practically every one of the galls I have seen had large exit holes, indicating that a large number of the wasps had reached maturity and had emerged.

Disholcaspis plumbella, new species

Plate XXVI, Figures 34 to 36

FEMALE.—Almost entirely bright reddish brown; antennæ 14-jointed; parapsidal grooves indistinct; anterior parallel lines close together; lateral lines prominent; second segment of the abdomen tongue-shaped. **HEAD:** light reddish brown, small spots near the ocelli and the tips of the mandibles dark brown; very finely granular-rugose, hairy; antennæ 14-jointed, joints one and two stout, third joint long and slender, whole antenna quite uniformly reddish brown, pubescent. **THORAX:** bright reddish brown, only very slightly darker on the parallel lines and the lateral lines; mesothorax much elevated and rounded, as broad as long, finely coriaceous, covered with rather long, yellowish hairs which are shortest and less dense on the midline; parapsidal grooves not very distinct, extending half-way to the pronotum; median groove mostly absent; anterior parallel lines prominent but not smooth, unusually close together, extending more than half-way to the scutellum and diverging slightly posteriorly; lateral lines prominent, free of hairs, not smooth, extending from the scutellum half-way to the pronotum; scutellum finely rugose, hairy, with two large foveæ at the base, shining, but somewhat rugose. **ABDOMEN:** rufous, darker posteriorly, shining but finely punctate, the sides entirely covered with rather long hairs, the second segment tongue-shaped, i. e., produced dorsally. **LEGS:** coxæ of the same color as the thorax. **WINGS:** clear, the veins yellowish brown. **LENGTH:** about 3 mm.

GALLS.—Small, brown, bullet-galls (Figs. 34 to 36), bearing a sharp, projecting point at the apex. Monothalamous. Entirely spherical, 9 mm. or less in diameter, yellowish or reddish brown, the surface of the dried galls shrivelled but essentially smooth, bearing a sharp point at the apex which is about 1.5 mm. long. Internally the gall is filled with a loosely granular, yellow tissue; the larval cell is hardly distinct from this surrounding tissue. On twigs of *Quercus dumosa*.

RANGE.—California: San Diego County (D. Cleveland Coll.).

COTYPES.—A female holotype and three gall cotypes in the collection of the Museum of Comparative Zoology and in the author's collection. The galls were collected in October 1875. The adult which I cut from one of these cotype galls is broken and imperfect.

The galls were sent to the Baron Osten Sacken by D. Cleveland. They are typical of galls of the genus *Disholcaspis* except that the larval cell is hardly distinct from the surrounding tissue; and the adult is likewise a true *Disholcaspis*, although the shape of the second segment of the abdomen is similar to that found in the species included in *Dryophanta*.

***Disholcaspis pruniformis*, new species**

Plate XXVII, Figures 44 and 45

FEMALE.—Generally light reddish brown, black between the anterior parallel lines, on the lateral grooves, and on the transverse groove at the base of the scutellum; antennæ 13-jointed; areolet moderately large. **HEAD:** bright reddish brown, darker between the bases of the antennæ and toward the mouth-parts, slightly and finely rugose, with long hairs which are much less dense on the front. Antennæ darker brown, 13-jointed, pubescent. **THORAX:** mesonotum bright reddish brown, black on and between the anterior parallel lines and on and about the lateral grooves, dark brown in the parapsidal grooves; regularly punctate and dense with a long pubescence; parapsidal grooves wide, deep, and convergent at the scutellum, narrowing and disappearing half-way to the pronotum; anterior parallel lines smooth and extending half-way to the scutellum; lateral lines broad, smooth, and extending a little more than half the length of the mesothorax; scutellum rufous brown, rugose, with a long pubescence, the transverse groove at the base broad, quite deep, black, rugose; metapleuræ densely pubescent; pronotum and mesopleuræ reddish brown, punctate, with a long pubescence, the pronotum black anteriorly. **ABDOMEN:** yellowish to reddish to dark brown, lightest laterally, the entire second segment, the seventh segment, and the tip of the hypopygium hairy; the abdomen is large, but the second segment is very small converging only about one-third of the abdomen; segments three to seven are broadly visible and subequal. **LEGS:** reddish brown, including the coxæ, part of each femur and the whole of each tibia darker brown; punctate, pubescent; claws with a large tooth at the base. **WINGS:** clear, microscopically but densely pubescent, the veins dark brown, the subcosta and cross-veins darkest in color; areolet rather large, cubitus extending only two-thirds of the distance to the basal vein; the radial cell broad and widely open, the first abscissa of the radius somewhat suffused with brown and angulate, the angle about 120° and with its apex above the midpoint of the vein. **LENGTH:** 3.5–4.0 mm.

GALLS.—About the size and shape of a small plum (Figs. 44 and 45), yellow to reddish brown. Monothalamous. Somewhat elongate, broadest nearer the apex, more pointed toward the base, about 2.8×2.1 cm., light yellowish brown, broadly tinged with reddish brown, most likely entirely smooth while alive, but the thin skin becoming slightly rough by shrivelling on drying. Internally filled with a compact, not solid mass of yellowish, crystalline, sawdust-like material, only slightly approaching a woody fiber structure around the larval cell which is central in the gall, thick-shelled, and closely imbedded (at least in the dried gall) in the surrounding tissue. Attached on the side of the young twig, at the one-year node, on "post-oak."

RANGE.—Texas: Tiger Mills, Burnett Co. (Schaupp Coll.).

COTYPES.—Three female and two gall cotypes in the collection of the Museum of Comparative Zoology, and in the author's collection. Number 42 of the Schaupp Collection made in 1884.

The galls, though bearing separate numbers, had been placed together with galls of *Amphibolips ginesi*, and the galls of the species are superficially similar, but the gall of *D. pruniformis* differs in not being perfectly round and in being colored yellowish and reddish brown. The adults are typical of the species of *Disholcaspis*. They agree closely with the description of *D. heynei* Kieffer which was described (1910, Boll. Lab. Zoo. Gen. e Agr. Portici, IV, p. 113) from the adult only. They are to be distinguished from that species by their smaller size, by being bright reddish brown in color (*heynei* is described as rufous with the abdomen blackish brown), by showing a broad transverse groove at the base of the scutellum (this is narrow and indistinct in *heynei*), by having toothed claws (*heynei* was described as having "crochets simples"), and by details of thoracic configuration and wing venation. *D. pruniformis* has a smaller second abdominal segment than most species in the genus.

***Disholcaspis unicolor*, new species**

Plate XXVII, Figures 40 to 43

FEMALE.—Wholly golden rufous, without any black markings on the thorax or abdomen; median groove lacking; anterior parallel lines indistinct; a distinct foveal depression at the base of the scutellum; cubitus not reaching the basal vein but extending seven-eighths of the way to it. HEAD: bright golden-rufous, the tips of the mandibles piceous, rugoso-punctate, hairy, irregularly striate toward the mouth; antennæ hairy, golden rufous, shading into a brown on the last joints. THORAX: entirely golden rufous (without the black markings characteristic of *D. cinerosa*), punctate, covered with rather long, appressed hairs; parapsidal grooves deep, smooth, broad and convergent at the scutellum, becoming narrow and disappearing on the middle of the thorax; median groove entirely lacking; lateral grooves distinct, smooth, almost parallel with and as long as the parapsidal grooves; anterior parallel lines almost as punctate as the rest of the thorax and therefore not visible in most lights; scutellum large, rugose, hairy, with the deep foveal depression at the base less rugose and hairy than the rest of the scutellum and therefore distinct; pronotum punctate, very hairy, the hairs long; mesopleuræ less closely punctate than the rest of the thorax, hairy; metapleuræ largely golden rufous (not dark rufous or piceous as in *D. cinerosa*). ABDOMEN: large, uniformly golden rufous, the sides of the second segment, and the tip of the hypopygium hairy. LEGS: entirely golden rufous, hairy, the tips of the tarsi, especially of the hind tarsi, darker or brown; tarsal claws toothed. WINGS: with the microscopic hairs brown, the veins brown, the cross-veins heaviest; areolet large, almost a right-angled triangle; the cubitus not reaching the basal vein but extending seven-eighths of the way toward it; radial cell open; first abscissa of the radius angulate. LENGTH: 4.2 mm.

GALLS.—Large, globular bullet-galls (Figs. 40 to 43) with a nipple at the apex; rough, with a mealy covering when younger. Monothalamous. 21 mm. or less in diameter. Buff-brown in color when young, dark gray or black when old. Internally quite filled with a solid, woody tissue, the thick-shelled, egg-shaped larval cell separable but tightly enclosed in the younger gall, lying loose in a good-sized cavity in the mature gall. On the twigs of a species of *Quercus*, singly, or several near together.

RANGE.—Mexico: Saltillo Mts. (Palmer Coll.).

TYPES.—A female holotype in the Museum of Comparative Zoology, and 21 gall cotypes, in the collections of the Museum of Comparative Zoology, The American Museum of Natural History, and in the author's collection. The galls were collected in August 1879 by Dr. Edward Palmer; I cut the female from the galls.

Except for its more woody tissue internally, the gall of this species seems quite identical with the gall of *Disholcaspis cinerosa* (Bassett, 1881, Can. Ent., XIII, p. 110), which is known from Texas only. The adult, though very closely related to *cinerosa*, is really very distinct and readily distinguished from that species by the key characters I have given at the beginning of the description of this species. I have examined a large series of adults of *cinerosa* and do not find that it varies toward *unicolor*.

PLATE XX

- Fig. 1 *Andricus punctatus*, normal gall, ×1.
Fig. 2. *Andricus punctatus*, parasitized gall, ×1.
Figs. 3 to 5. *Aulacidea annulata*, new species, ×1.

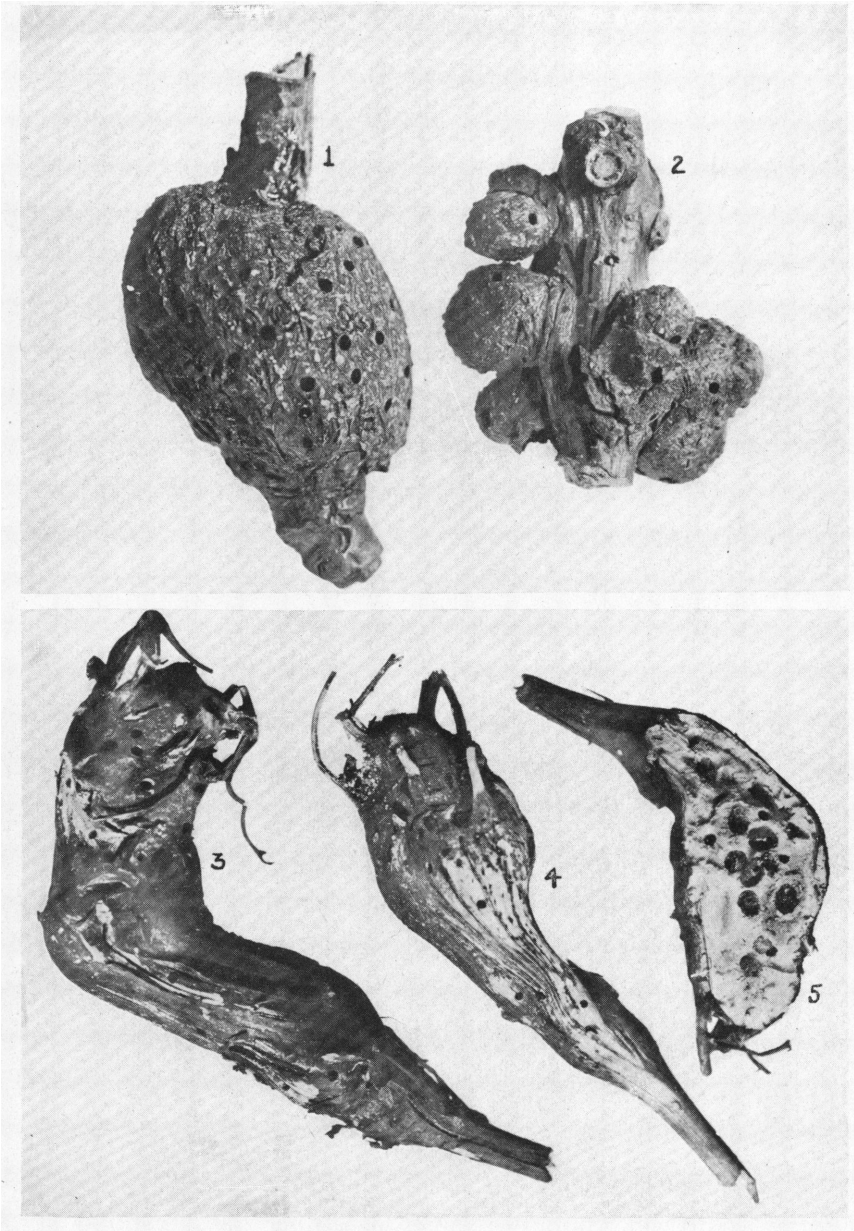


PLATE XXI

- Figs. 6 and 7. *Aulacidea abdita*, new species, $\times 2$.
Figs. 8 and 9. *Neuroterus thompsoni*, new species, $\times 4$.
Figs. 10 and 11. *Diastrophus tumefactus*, new species, $\times 2$.

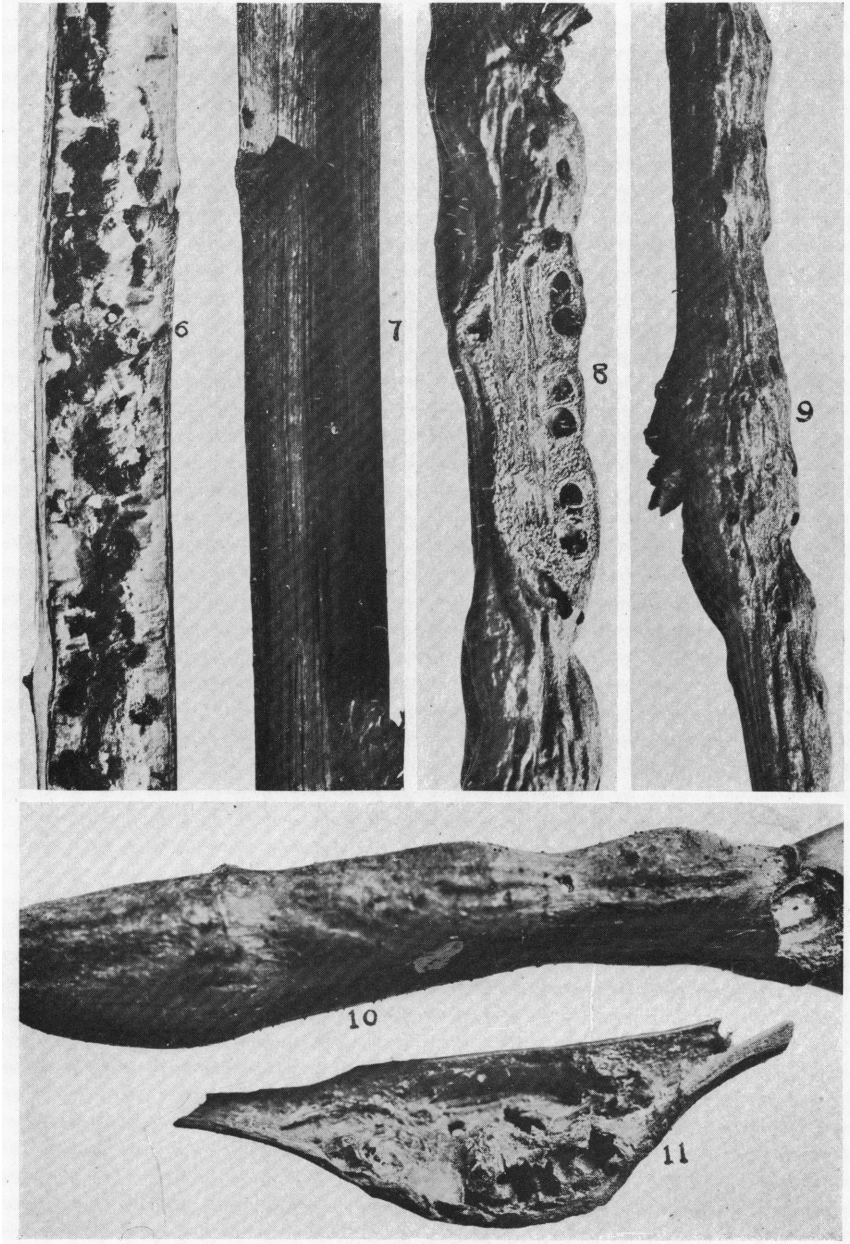


PLATE XXII

Figs. 12 and 13. *Andricus concolorans*, new species, $\times 3$.

Figs. 14 to 16. *Andricus furnaceus*, new species, $\times 1$.

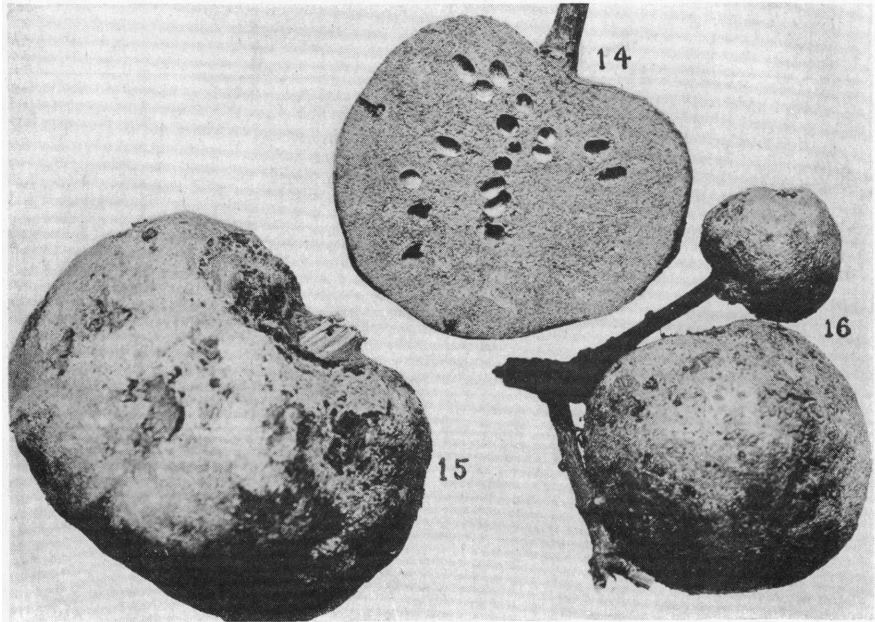
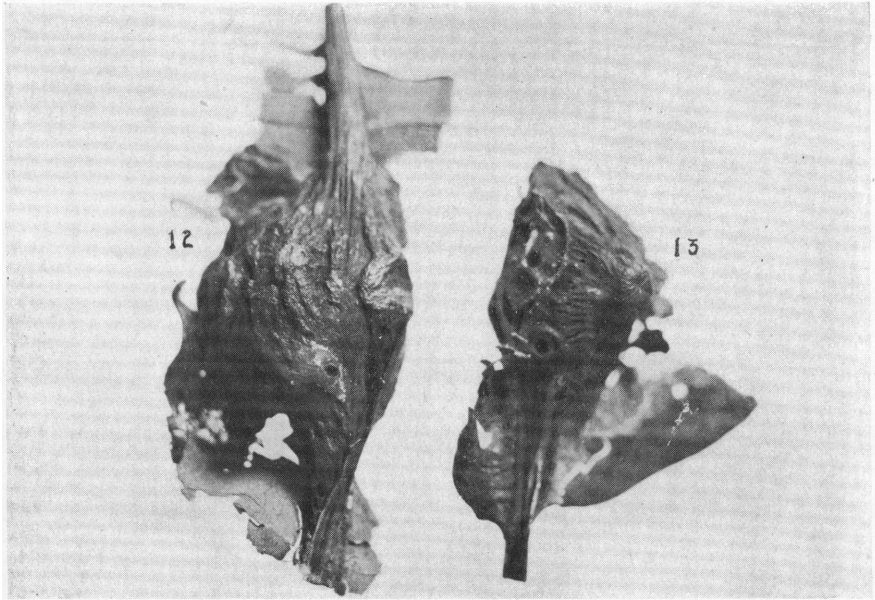


PLATE XXIII

Figs. 17 and 18. *Andricus incomptus*, new species, $\times 2$.
Figs. 19 to 21. *Andricus pellucidus*, new species, $\times 3$.

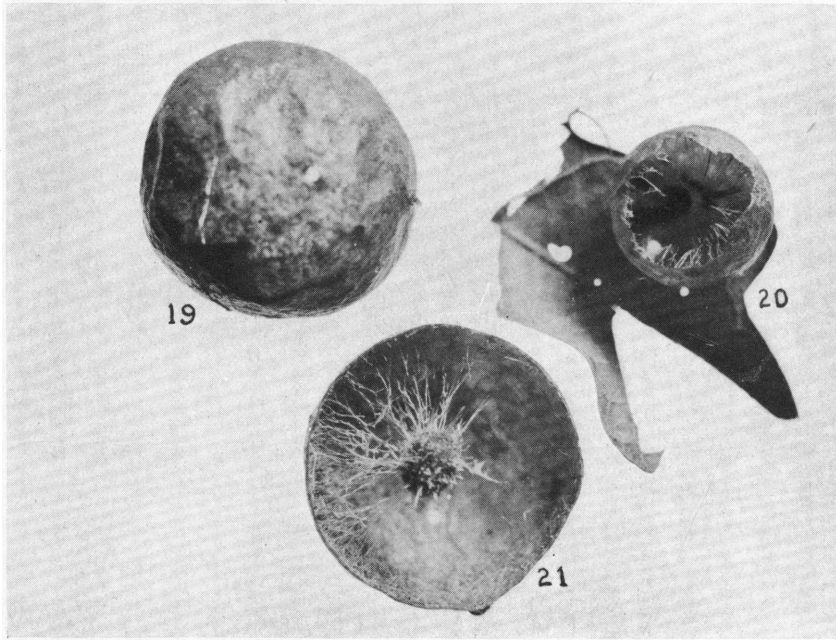
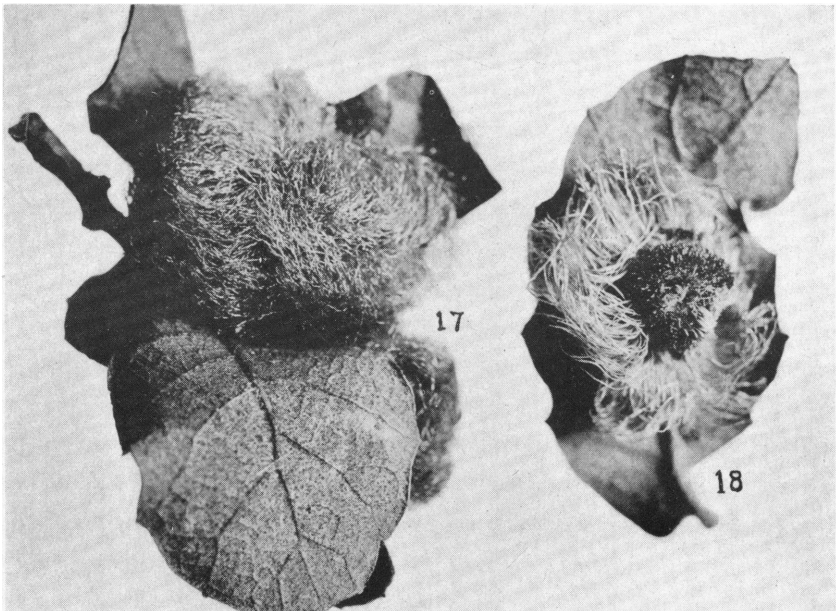


PLATE XXIV

Figs. 22 to 24. *Andricus marmoreus*, new species, $\times 2$.
Figs. 25 to 27. *Andricus mexicanus*, new species, $\times 2$.

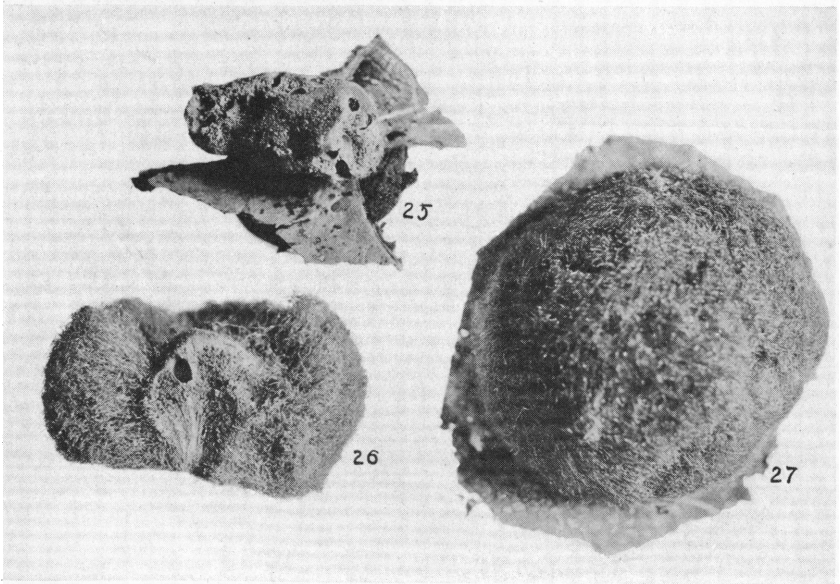
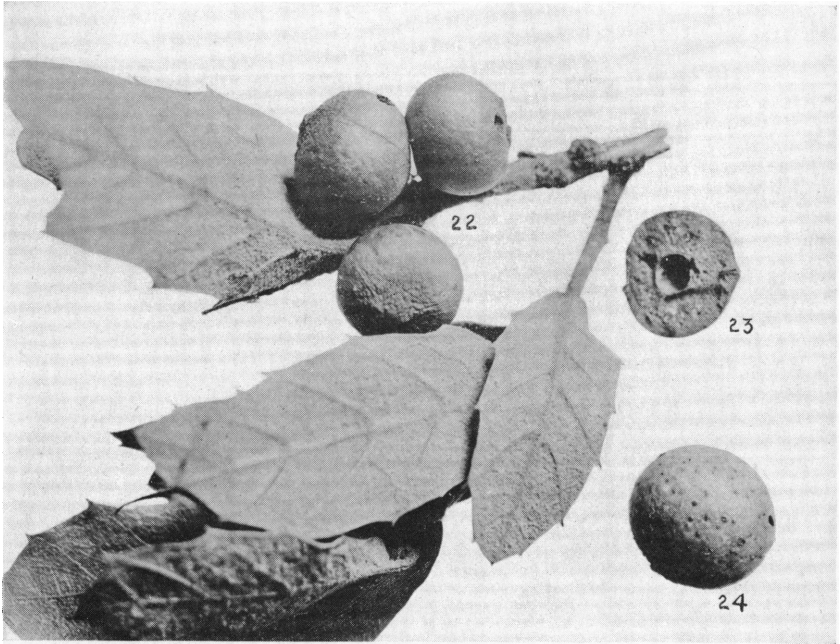


PLATE XXV

- Figs. 28 and 29. *Andricus peredurus*, new species, $\times 1$.
Figs. 30 and 31. *Andricus tecturnarum*, new species, $\times 2$.
Figs. 32 and 33. *Andricus tecturnarum*, new species, $\times 4$.

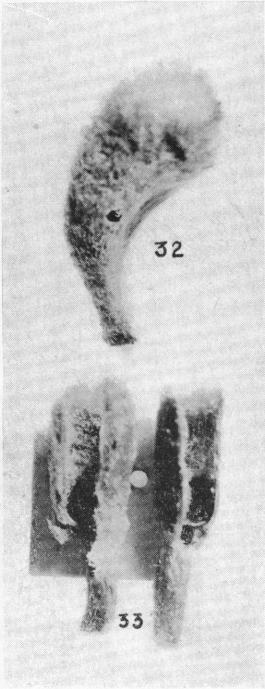
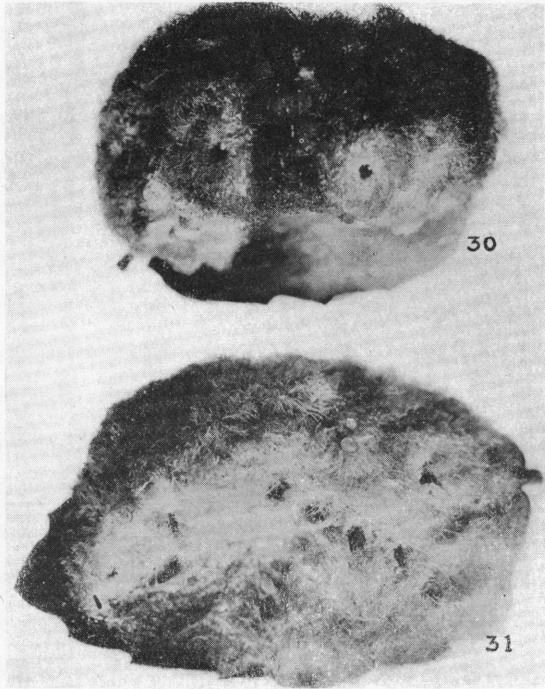
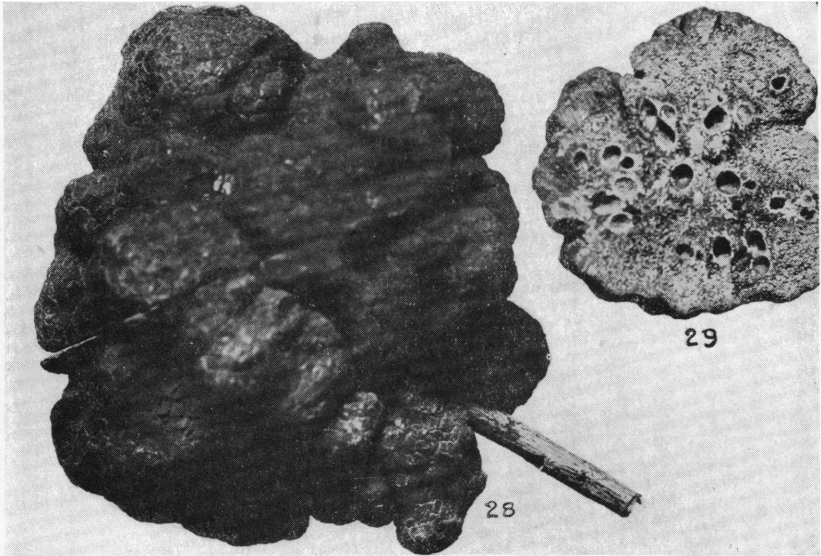


PLATE XXVI

- Figs. 34 to 36. *Disholcaspis plumbella*, new species, $\times 2$.
Fig. 37. *Disholcaspis fungiformis*, new species, $\times 2$.
Figs. 38 and 39. *Disholcaspis fungiformis*, new species, $\times 4$.

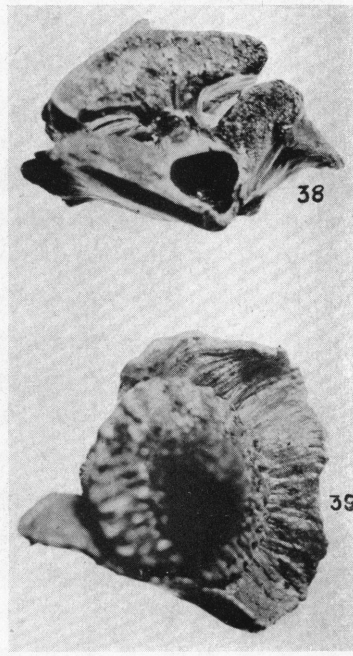
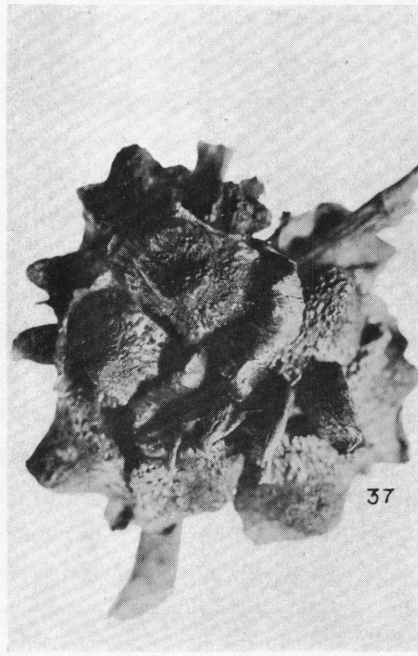
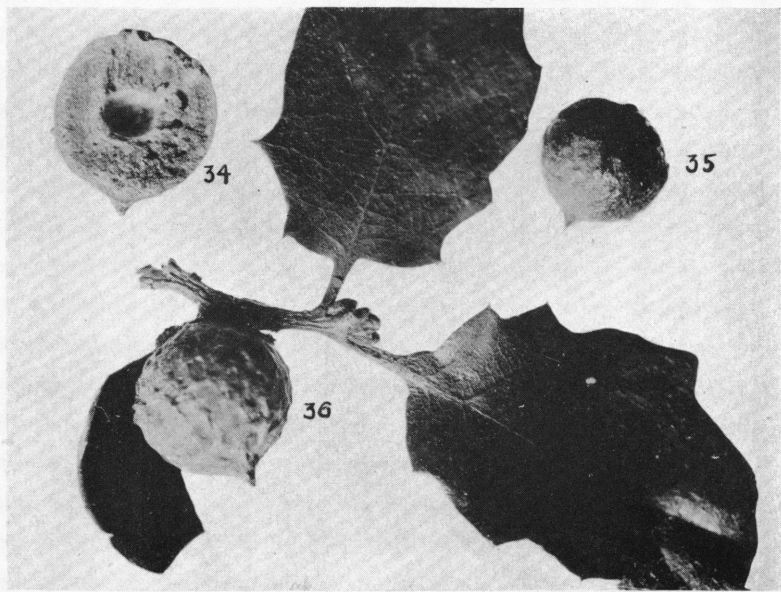


PLATE XXVII

- Figs. 40 to 43. *Disholcaspis unicolor*, new species, $\times 2$.
Figs. 44 and 45. *Disholcaspis pruniformis*, new species, $\times 2$.

