

PROCEEDINGS
OF THE
ENTOMOLOGICAL SOCIETY
OF PHILADELPHIA.

VOL. 1. SEPTEMBER AND OCTOBER, 1861. No. 3.

STATED MEETING, SEPTEMBER 9.

President NEWMAN in the Chair.

Twelve members present.

REPORT OF COMMITTEE.

The Committee on Dr. Horn's paper read August 12th, reported in favor of its publication in the Proceedings of the Society.

DONATIONS TO CABINET.

40 specimens of *Hemiptera*, 22 *Hymenoptera*, and 5 *Orthoptera*, presented by Dr. George H. Horn.

52 specimens of *Coleoptera*, embracing many rare and beautiful species, among which is a fine specimen of *Cicindela abdominalis* Fabr., presented by James H. B. Bland.

22 specimens of *Diptera*, presented by Dr. T. B. Wilson.

4 specimens of *Hymenoptera*, 1 *Orthoptera*, and 1 *Coleoptera*, presented by William Evelt.

Total.—147 specimens.

DONATION TO LIBRARY.

Proceedings of the Society for June, July and August, from the Publication Committee.

On the CYNIPIDÆ of the North American Oaks and their Galls.

BY BARON R. OSTEN SACKEN.

The study of the galls or deformations produced by insects on different plants, is one of the most interesting subjects in entomology and this interest belongs especially to the numerous and varied galls produced by the *Cynipidæ*, principally on the oak. Still, the difficulties attending the study of the habits of the *Cynipidæ* are so great, the peculiarity and, I may say, the intricacy of these habits is so extraordinary, that the most important questions concerning them remain as yet unsolved. This is so true that it is not yet positively known, for instance, whether a considerable portion of the species of *Cynipidæ* have any males or not, or what their mode of reproduction is.

The chief reason of the difficulty of this study is the close and persistent observation of nature it requires. Here, it is not sufficient to collect at random, in order to work out at leisure the materials thus obtained; here one has to watch the growth of the gall on the tree for weeks and months; in order to be enabled to make certain observations, one is bound to a certain season of the year and a certain locality and if the season is missed or the locality cannot be reached at the requisite time, one has to wait a year before the observations can be renewed. Few entomologists are so favorably situated as to pursue a study of this kind for a sufficiently long period of time and with such success, as to give the results thus obtained a shape of relative completeness and the knowledge of the galls of *Cynipidæ* would make but little progress, if the gradual accumulation of single and scattered observations of different observers did not supply in some measure the place of a persistent and systematic study. Such scattered observations are therefore of the greatest value and entomologists cannot be too much encouraged to publish them, or to communicate them to others for publication. The value of such single observations depends chiefly on their accuracy; that is, the observer must see well and render *only what he has seen*; a condition much more difficult to comply with, in matters of natural history especially, than is usually imagined.

The aim of the present article is to publish certain observations which the author may not be in a position to continue. At the same time, a synopsis of the previous observations on the North American oak-galls is given.

One of the difficulties which obstruct the study of the *Cynipidæ* is the imperfection of their classification. Notwithstanding the great difference in their habits, the variety in the structural characters seems to be very limited. Up to the present time the chief stress has been laid on char-

acters of a very indefinite nature, namely, the comparative length of the second and third segments of the body and the relative length of the radial area.

Hartig, the monographist of the family, (Ueber die Familie der Gallwespen in Germar's Zeitschrift für Entomologie, Vol. II, and Supplements in Vol. III and IV) has published a mere sketch of a classification, promising at the same time to issue a more detailed work, which however has never been published. Thus, the genera he has established remain very insufficiently defined and are difficult to recognize. I have been hardly able to place a few of the species in my possession in the new genera of Hartig, which circumstance may be only partly accounted for by the peculiarity of the american fauna.

Hartig's principal divisions are these :

- A. Second (*) abdominal segment longer than the others. (*Cynipidæ*.)
 - I. Radial area narrow; areolet opposite its base.
 - II. Radial area broad, short; areolet opposite its middle.
- B. Third (*) abdominal segment longer than the others. (*Figitidæ*.)
- C. Segments of the abdomen of equal length. (Genus *Ibalia*, also belonging to *Figitidæ*.)

In the recently published monograph of the *Figitidæ* by Mr. Reinhardt (Berl. Entom. Zeitschr. 1860) he modifies the characters of the *Figitidæ* by saying : second segment of the abdomen shorter than half its length.

Accordingly, the character of the *Cynipidæ* would be : second segment etc, longer than half its length. *Ibalia* Latr., Mr. Reinhardt separates as a distinct family, *Ibaliidæ* Blanch.

The further subdivision into genera is based principally on the sculpture of the body and the number of joints of the palpi. As stated above, I have not been able to place most of my species in these genera, and have confined myself therefore to indicating to which of the three groups, or sections of the first group they belong. The two sections of the group A (*Cynipides*) are easy enough to distinguish by the form of the radial area and the position of the areolet; still there are cases in which this distinction even is difficult to make.

In my descriptions I have tried therefore to supply my inability to define the genus of most of my species by a careful description of those parts of the body (neurulation, relation of the segments of the abdomen, structure

* Instead of *second* and *third* segment, Hartig calls them *first* and *second*. But in reality, the anterior portion of the abdomen forming a narrow neck or petiole is the first segment. I have followed the more correct terminology in my descriptions.

and number of joints of the antennæ), which are important for classification.

Another division, introduced by Hartig is based upon the habits of the insect only, without a corresponding structural character to distinguish them.

Almost all the insects of Section I (with a narrow radial area and basal areolet) and some of Section II, (with a short, broad radial area and intermediate areolet) are called by him *true gall-flies* (*Psenides*), they being the originators of the galls. A part of the Cynipidæ of Section II, and a few of Section I, are *merely parasites* in the galls produced by the gall-flies of the first division. Hartig calls them *Inquilinæ*. A third division (called *the parasites* by Hartig) is formed of the rest of Section II and the whole group of *Figitidæ*. "The habits of this division, says Hartig, are little known; some, as *Nystus* Hartig (*Allotria* Westw.) live parasitically in *Aphides*; others in larvæ of diptera."

That these differences exist in nature is certain; but a great deal remains to be done yet before attempting a natural distribution of the known genera and species on this basis. It seems hardly probable for instance that species of the same genus (as stated by Hartig about *Neuroterus*), should sometimes be true gall-producers, sometimes parasites.

It will be seen below that I have reared from galls several species, the characters of which are those of *Figitidæ* and which ought therefore to belong to the first or second and not to the third of Hartig's divisions, where the *Figitidæ* are placed. Again about the true relation of the *Inquilinæ* to the *Psenides*, their food, the mode of introducing their eggs into foreign galls etc., nothing is known and *not a single direct observation seems to be extant*. The fact of their parasitism is therefore merely inferred from the circumstance of their having been reared from the same galls.

Another unsettled and greatly vexed question with reference to gall-flies is that of their sexes. According to Hartig, all gall-flies of the second and third division (*Inquilinæ* and *Parasites*) and some of the *Psenides*, (the genera *Trigonaspis*, *Spathegaster*, *Teras* and *Andricus*) occur in both sexes. The remainder of the *Psenides* (the genera *Cynips* and *Apophyllus* Hartig, Syn. *Biorhiza* Westw.) are known in the female sex only.

Neuroterus has again an intermediate position; those species of this genus which are gall-producers, were known to Hartig in the female sex only, whereas he possessed a male of one of the species belonging to the *Inquilinæ*.

Hartig says that he examined at least 15,000 specimens of the genus *Cynips*, as limited by him, without ever discovering a male. To the same purpose he collected about 28,000 galls of *Cynips divisa* and reared 9 to 10 thousand *Cynips* from them; all were females. Of *C. folii* likewise he had thousands of specimens of the female sex without a single male.

Hartig observes that if these insects had been obtained by catching, the absence of the males might be explained by their escaping, in some way or other, our prosecution; but, says he, this supposition is not admissible for insects obtained by rearing; he was compelled to conclude, therefore, that these insects were agamous, or, in other words, that the males did not exist at all.

In a communication made to the Academy of Sciences in Philadelphia and which is published in its Proceedings (July, 1861), I have reported on an observation, which, if confirmed, would solve the question of the sexes of *Cynipidæ*. From a singular, spindle-shaped gall on the red oak, I reared a male *Cynips* which is very similar to the gall-fly of the common oak-apple of the red oak, *Cynips confluens* Harris, known in the female sex only and looks exactly as one might suppose the ♂ *Cynips confluens*, if known, ought to look. If it is proved that the *Cynips* of the spindle-shaped gall is the male of the *Cynips* of the oak-apple, and if it is shown, by further observation, that in the genera, supposed agamous by Hartig, the males produced from galls are different from those of the females, then it will be plain how 28,000 galls of the same kind could give 10,000 females and not a single male.

A strong proof in confirmation of my assertion is, that in those genera, the males of which are known, both sexes are obtained from galls in almost equal numbers, even the males, not unfrequently, predominate in number (see Hartig, l. c. IV, 399). Now the gall-flies reared by me from the oak apple were all females; Dr. Fitch also, had only females; and Mr. B. D. Walsh, in Rock Island, Ill., reared (from oak-apples of a different kind) from 35 to 40 females, without a single male. This leads to the conclusion that the *Cynipes* of the oak-apples belong to the genera hitherto supposed to be agamous. If the characters of Hartig's subdivisions were given more in detail, the simplest way of testing the question would, of course, be found in those characters; they would decide at once whether *Cynips confluens* really belongs to Hartig's agamous genera and whether the discovery of a male is a novelty in science or not.

I will state some other questions, deserving the especial attention of future observers.

Most of the gall-flies always attack the same kind of oak; thus the gall of *C. seminator* Harris, is always found on the white oak; *C. tubicola* O. S. on the post oak etc. Still some galls of the same form occur on different oaks; a gall closely resembling that of *C. quercus globulus* Fitch, of the white oak occurs also on the post oak and the swamp chestnut oak; a gall very similar to the common oak-apple of the red oak occurs on the black-jack oak etc. Are such galls identical, that is, are they produced by a

gall-fly of the same kind? I have not been able to investigate this question sufficiently. Again, if the same gall-fly attacks different oaks, may it not, in some cases, produce a slightly different gall? It will be seen below that *C. quercus futilis*, from a leaf-gall on the white oak, is very like *C. quercus papillata* from a leaf-gall on the swamp chestnut oak; I could not perceive any difference, except a very slight one in the coloring of the feet. Both gall-flies may belong to the same species and although the galls are somewhat different, they are, in some respects analogous and might be the produce of the same gall-fly on two different trees.

Some gall-flies appear very early in the season; *Cynips quercus palustris* for instance emerges from its gall before the end of May; these galls are the earliest of the season; they grow out of the buds and appear full-grown before the leaves are developed. May not this gall-fly have a second generation and if it has, may not the gall of this second generation be different from the first, produced, as it would be, under different circumstances, in a more advanced season, perhaps on leaves instead of buds etc.?

A remarkable fact is the extreme resemblance of some of the parasitica gall-flies with the true gall-fly of the same gall. Thus, *Cynips q. futilis* O. S. is strikingly like *Aylax? futilis*, the parasite of its gall. The common gall on the blackberry stems produces two gall-flies which can hardly be told apart at first glance, although they belong to different genera.

I have said enough to show the great interest of the study of the habits of gall-flies and will conclude now by giving some necessary explanations about the terms used in my paper.

The terminology of the venation of the wing which I have used, is that of Hartig. I call *subcostal vein* the first longitudinal vein below the anterior margin; its tip, joining this margin, forms an obtuse angle with the remainder of the vein. The *radial vein* begins at the triangular *arcolet* in the middle of the wing and runs obliquely towards the anterior margin, which it reaches about midway between the tip of the subcostal and the apex of the wing. The area enclosed between this vein, the anterior margin and the tip of the subcostal is the *radial area*. Sometimes the subcostal, instead of stopping at, or just below, the anterior margin, is continued along that margin till it reaches the tip of the radial vein; in this case, the *radial area is closed*. The *arcolet* is connected with the angle or knee of the subcostal by a vein which Hartig considers as a part of the radial vein, (he calls it the *lower radius*) and which Dr. Fitch calls the *second transverse vein*. I have used the latter name. This vein is important, as on its length and direction depends the form of the radial area, on which, as we have seen above, is based the division of the *Cynipidae* in two sections. In the first section, the *arcolet* is nearly opposite the tip

of the subcostal vein; the second transverse vein is then short and frequently angular; the radial area is elongated. In the second section, the areolet is beyond the tip of the subcostal vein; this makes the second transverse vein longer and more oblique and that the radial area more or less triangular. The *areolet* is frequently indistinct, sometimes absent.

The *basal vein* of Hartig or the *first transverse vein* of Fitch, is a stout, always very distinct vein near the base of the wing, starting from the subcostal and running a certain distance across the wing. The *cubitus* is a pale, frequently obsolete vein, which starts from the *basal vein* touches the areolet and disappears long before reaching the posterior margin.

The last longitudinal vein, nearest to the posterior margin, I call the *anal vein*.

The literature of the North American galls is not abundant. Bosc was the first who described 16 galls from Carolina as stated by Mr. Westwood (Introd. II, p. 131). Having been unable to find the work of Bosc in this country, I made an effort to obtain an abstract from Europe; but thus far I have failed.

Dr. Harris, in his Treatise on the Insects of New England injurious to vegetation, has described the galls of *Cynips confluens*, *C. nubilipennis*, and *C. seminator*.

Dr. Fitch (Reports etc. Vol. II) described and figured quite a number of oak-galls, illustrating them in his usual popular and highly attractive manner.

All the galls, described below, have been found in the environs of Washington, unless otherwise mentioned. Besides the gall-flies (*Psenides*, *Inquilinæ*, and *Parasites*), numerous other hymenopterous parasites have been reared from the galls; but their description is reserved for some future occasion.

The number of galls recorded in this paper can be but a very inconsiderable fraction of the total number of the oak-galls of this country; and the history of many of these even is but imperfectly known.

I would be very thankful to all entomologists or observers of nature who would communicate me their observations.

R. OSTEN SACKEN.

WASHINGTON, D. C.
Russian Legation,
August 25, 1861.

SYNOPSIS OF THE OAK-GALLS.

I. On leaves.

- A. Formations of a definite, constant form, fastened to the leaf by a very small portion of their surface (except No. 10) *and which can be taken off without carrying a portion of the leaf with them*; fastened (except No. 7 and 8) to the underside of the leaf.

Globular galls, consisting of a smooth shell with a single kernel in the centre; the space between both being filled with a spongy, or cellular substance, or with filaments radiating from the kernel to the shell.

With the spongy substance; diameter of the gall about 1.5.

1. Red oak; gall of *Cynips confluens*, Harris.

Black oak; } analogous galls; gall-fly also very sim-
Black-jack oak; } ilar; is it different?

With the cellular substance; diameter of the gall 0.15—0.2.

2. Live-oak; gall-fly unknown.

With the filaments.

Diameter about an inch; filaments not very dense, without silky gloss.

3. Red oak; gall-fly unknown, perhaps *C. confluens* Fitch (non Harris).

Diameter three quarters of an inch or less; filaments silky.

4. Post oak; *Cynips quercus centricola* O. S.

Subglobular galls with a thick hard shell and with a network of lines on the surface; diameter 0.25—0.4.

5. White oak; *Cynips quercus pisum* Fitch.

Cylindrical, tubular gall, with spines on the outside.

6. Post oak; *Cynips quercus tubicola* O. S.

Spindle shaped, petiolate galls, the petiole being the prolongation of one of the leaf-veins; frequently on the edge of the leaf.

7. Red oak; *Cynips quercus calcebs* O. S. (the supposed male of *C. confluens* Harris.)

8. White oak; *Cynips quercus fusiformis* O. S.

Wooly excrescences.

Rounded, wart-like; apparently with a single kernel.

9. Post oak; *Cynips quercus verrucarum* O. S.

White oak; } distinct from the former; gall
Swamp chestnut oak; } flies unknown.

Irregular, with numerous seed-like kernels.

10. White oak; *Cynips quercus lanæ* Fitch.

Post oak; gall-fly unknown.

AA. Galls more or less intimately connected with the substance of the leaf, projecting generally on both its sides (except No. 17), they cannot therefore be detached without carrying a portion of the leaf with them.

On buds or very young leaves.

Globular, hollow gall, with a single, whitish, cocoon-like kernel, rolling freely about within the shell.

11. Pin oak; *Cynips quercus palustris* O. S.

Similar galls on other oaks.

On the blade of the leaf.

With a single kernel.

Globular, of the size of a hazelnut or grape, a third of the sphere projecting on the upper side of the leaf and the remainder opposite, on its underside.

12. Red oak; *Cynips nubilipennis* Harris.

With two and three kernels.

Rounded on both sides of the leaf.

13. White oak; *Cynips quercus futilis* O. S.

Nipple-shaped, with a reddish aureole on the underside of the leaf.

14. Swamp chestnut oak; *Cynips quercus papillata* O.S.

With a variable number of kernels or cells; gall varying in size and form accordingly.

Irregular, flattened gall of a cellular substance; surface uneven and microscopically hirsute.

15. Post oak; *Cynips quercus irregularis* O. S.

Irregular, small, hard gall, abruptly rising on the upper side of the leaf, somewhat subconical on the opposite side.

16. Red oak; *Cynips quercus modesta* O. S.

On the midrib of the leaf.

Swelling of the midrib on the underside of the leaf.

17. Black-jack oak; *Cynips quercus nigræ* O. S.

Red oak; similar swelling; gall-fly unknown.

Woody, rounded or club-shaped gall on the leaf stalk, at the origin of the leaf, or on the midrib, near the basis of the leaf.

18. Swamp chestnut oak; gall-fly unknown.

11. On limbs, twigs, etc.

A. Formations of a different substance than the limb, which can be taken off without carrying a portion of the limb with them.

Globular, corky galls with a single kernel.

19. White oak; *Cynips quercus globulus* Fitch.

Post oak; }
Swamp chestnut oak; } gall-flies unknown.

Oblong, smooth gall, spongy inside; single kernel.

20. Spanish oak; gall-fly unknown.

Wooly mass, surrounding the twig and containing very numerous seed-like kernels.

21. White oak; *Cynips seminator* Harris.

Bladder-like, hollow galls, packed together in numbers round the limb.

22. White oak; *Cynips quercus ficus* Fitch.

AA. Swellings of the limbs, twigs, leafstalks, which cannot be detached without breaking the limb.

At the tip of limbs and twigs.

23. Willow oak; *Cynips quercus phellos* O. S.

24. White oak; *Cynips quercus arbos* Fitch.

25. White oak; gall-fly unknown, perhaps identical with the preceding.

Distant from the tip of limbs or twigs.

26. White oak; *Cynips quercus batatus* Fitch.

27. White oak; *Cynips quercus tuber* Fitch. (*)

* The singular woody knots, emitting pale yellow, conical, brittle projections, which occur in great numbers on the pin oak, if they are produced by a *Cynips*, should be referred to this section.

1. QUERCUS RUBRA. *Red Oak. Large, smooth, globular gall on the leaves, filled, when ripe, with a brown, spongy mass.* Diameter about 1.5.
CYNIPS CONFLUENS Harris.

It is described by Dr. Harris (Treatise etc. p. 433).

These galls are more than one inch, sometimes almost two inches in diameter. "They are green and somewhat pulpy at first, says Dr. Harris, but when ripe, they consist of a thin and brittle shell, of a dirty drab color, enclosing a quantity of brown, spongy matter in the middle of which is a woody kernel about as big as a pea. A single grub lives in the kernel, becomes a chrysalis in the autumn, when the oak-apple falls from the tree, changes to a fly in the spring and makes its escape out of a small round hole which it gnaws through the kernel and shell. This is probably the usual course, but I have known the gall-fly to come out in October."

I am more inclined to agree with Dr. Fitch who supposes that there are annually two generations of this fly. They are not rare around Washington, but I have never found them so abundantly as they seem to occur in other localities. On the first of June I found balls of this kind already ripened, measuring one inch and a half in diameter, of the usual drab color and somewhat greenish only at its base. One of them, which I opened contained a larva. On the 13th of June another gall was opened, it contained the perfect insect, but with wings yet wet and folded and evidently not quite ready to escape.

On examining the specimens of this gall in my collection, I notice two varieties of it. The one, the surface of which is glossy, occurs on the smooth leaves of the red oak; the other, with a more opaque, almost downy surface, always occurred on tomentose leaves. I am unable to tell at present from what kind of oak the latter leaves were taken and hence, whether the gall is a different one or only a variety. I know that the same gall is said to occur on the black oak (*Q. tinctoria*); I found a similar one on the black-jack oak (*Q. nigra*) and by cutting it open, obtained a gall-fly closely resembling *C. confluens*. But it would require a larger number of specimens to settle the question of their identity or diversity. (*)

* My manuscript was already presented to the Entomological Society, when I received from Mr. Benj. D. Walsh in Rock Island, Ill., two specimens of a gall-fly, which he had reared abundantly from a gall answering exactly Dr. Harris's description of the gall *C. confluens*. He took these specimens for the true *C. confluens*, in which I cannot agree with him, as the words of Dr. Harris's description ("head and thorax with little pits") do not answer to them. It seems to be therefore a different kind of gall, very like the preceding, but producing a very different insect, as the ♀ has 14-jointed, and not 13-jointed antennæ. I add the description of this *Cynips* as follows:

C. aciculata n. sp. ♀.—Black; antennæ 14-jointed, pitch-black; face pubescent,

The insect of this gall is:

Cynips confluens Harris. ♀ "Head and thorax black with numerous little pits and short hairs; the hind body is smooth and of a shining pitch color; the legs are dull brownish-red and the fore wings have a brown spot near the middle of the outer edge; length 0.25; exp. of wings 0.6." (from Harris's description). My specimens measure 0.21. To my knowledge, females only have been found and described.

The male, either of this species, or of *C. quercus inanis* (No. 3), has been reared by me from the spindle-shaped gall, described under No. 7 (*C. quercus calebs* O. S.).

From the oak-apple I have also reared the following fly, belonging to the section of *Inquilinæ* Hartig. I am not certain about the genus, but place it under the head of *Synophrus* Hartig on account of the structure of its abdomen. (Yet it is to be observed that *Synophrus* is located by Hartig among the true gall-flies.)

Synophrus? læviventris n. sp.—Head reddish-brown, vertex darker, antennæ brownish-yellow, 14-jointed (♀), thorax black, moderately glossy, finely punctate, slightly pubescent; scutellum gibbous, with a recurved, elevated margin and slightly reddish at tip; pleuræ black, punctate anteriorly, polished and glossy under the insertion of the wing, aciculate below; abdomen shining, chestnut-brown or black, paler below, consisting apparently of a single segment, all the following being concealed under this; its anterior portion or neck is tumid and striate; feet brownish yellow, tips black, hind femora sometimes infuscated; wings hyaline, veins pale, radial area closed by the prolongation of the subcostal vein along the anterior margin of the wing; cubital vein very slender, almost obsolete; areolet small. Length 0.07.

2. **QUERCUS VIRENS.** *Live Oak.* *Small, globular galls on the underside of the leaf.* Diameter 0.15—0.2.

Pale brownish when ripe; filled inside with a spongy, cellular mass, which is more dense than that of the preceding gall and not unlike the

with numerous, dense little grooves (as if scratched with a needle) converging from the eyes towards the mouth; vertex with dense little pits and wrinkles. Thorax finely pubescent, with a distinct, flat, longitudinal furrow in the middle and on both sides with numerous little grooves, similar to those of the head, running obliquely towards the central furrow; pleuræ with dense longitudinal grooves; scutellum with two large, flat pits at the basis, a longitudinal groove in the middle and numerous little pits on both sides. Abdomen pitch-black, shining, with an extremely minute, microscopical punctation near the hind margin of the segments, but not quite reaching this margin, which is smooth; feet brownish-red, coxæ black; last joint of the tarsi infuscated; wings with a dark brown spot at the basis of the radial area; tips of the veins not reaching the margin of the wing; areolet triangular, distinct. Length 0.25.

Besides the 14-jointed antennæ, the more distinct areolet, the aciculated thorax etc., this species is distinguished from *C. confluens* by the form of its abdomen, which is less rounded above and more abruptly truncated behind.

pith of a reed in texture. Single kernel in the centre.

I am indebted for these pretty galls to Dr. Foreman, who brought them from Georgia, and although I do not know the fly, I have no doubt, from the structure of the gall, that it is the produce of a *Cynips*.

3. *QUERCUS RUBRA*. *Red Oak*. *Large, smooth, globular brownish-yellow gall, attached to the underside of the leaves, inside with whitish, delicate filaments radiating from the kernel to the shell.* Diam. about an inch.

Very like gall No. 1, at first glance, but smaller, the specimens in my possession measuring an inch or a little more in diameter. It is also fastened to the leaf by a small point of its surface. The outside of this gall shows no other difference from the oak-apple of the red oak but the size.

The inside on the contrary distinguishes them at once; instead of the spongy, brown mass with which the other gall is filled, this one is almost empty, the kernel being kept in its central position by a certain number of whitish filaments which radiate from it to the shell. I have found several specimens of this gall near Washington, without obtaining the insect.

My attention has been called by Mr. B. D. Walsh, to the fact that this gall has been erroneously taken by Dr. Fitch (Reports, Vol. II, No. 317) for *confluens* Harris. Judging from some expressions in Dr. Fitch's description, it may really be so. In this case, the insect described by Dr. Fitch as *C. confluens* would be a new species, very like the former; for which I propose the name of *Cynips quercus inanis* (Syn. *C. confluens* Fitch, non Harris). In the same case, I would be much inclined to think that my *C. quercus caelebs* is the male, not of *C. confluens* Harris, but of *C. quercus inanis*.

4. *QUERCUS OBTUSILOBA*. *Post Oak*. *Smooth, globular gall, attached to the underside of the leaves, inside with dense, white, silky filaments radiating from the kernel to the shell.* Diameter three-quarters of an inch or less. *CYNIPS QUERCUS CENTRICOLA* O. S.

Easily distinguished from the two preceding by its smaller size, and its more even surface. The inside is very like that of the preceding gall, only the white filaments are much more numerous and dense and have a silky gloss. In autumn I found these galls brownish-yellow, with numerous pale, or brown or reddish spots; in winter the dry galls are of a uniform color, not unlike that of yellow peas.

Cynips quercus centricola n. sp. ♀—Head black, opaque, finely pubescent without any visible punctation; palpi pale brown, black at tip; antennæ 14-jointed: first joint of the flagellum longer than the two basal joints taken together; the following joints gradually decreasing in size; the six last joints very short; thorax

black, opaque, finely pubescent with yellowish; two distinct, longitudinal furrows start from the shoulders and converge towards the scutellum; between them two indistinct, glabrous, somewhat concave lines, reaching from the collare to about half the distance towards the scutellum; on each side, between the furrow and the base of the wing, there is a smooth, shining, glabrous stripe, distinctly concave at its anterior end, which is very near the furrow, without however touching it; the interval between the furrows is finely and sparsely punctate, which punctation is somewhat concealed by the appressed pubescence; scutellum semioval, finely chagreened and pubescent, the pubescence converging towards a longitudinal, central line; the two pits, usually found at the basis of the scutellum, are flat, roughly sculptured at the bottom; on each side of them there is a tuft of short, yellowish hairs; abdomen dark brown, shining, finely pubescent on both sides at the basis; posterior margin of the second segment very oblique, the segment being much broader on its dorsal than on its ventral side; feet black, more or less reddish-brown at the trochanters, the knees and the basal joints of the tarsi, especially of the two anterior pairs; wings: basal, subcostal, radial and second transverse veins very stout, dark brown, almost black; the radial one slightly arched, its tip incrassated, almost club-shaped; second transverse vein very stout, angular; areolet distinct, triangular; cubital vein distinct before and beyond the areolet, running, from it in a straight line and without decreasing at all in distinctness towards the posterior margin and stopping at a short distance before it: anal vein likewise straight and distinct: it has a brown cloud a short distance beyond the basal vein; another small brown cloud is in the corner formed by the radial and the cubital vein, just beyond the areolet and a couple of irregular brown marks towards the tip of the wing. Length about 0.17.

I have obtained the only specimens I possess by cutting the gall open (in October).

5. QUERCUS ALBA. *White Oak*. "*Globular gall, resembling a pea, its surface finely netted with fissures or cracks and intervening elevated points, like the surface of a strawberry, on the underside of the leaves.*" (A. Fitch, Reports, Vol. II, No. 319, with a figure). CYNIPS QUERCUS PISUM Fitch.

I found these galls internally exactly as Dr. Fitch describes them, with two cavities, divided by a thin partition. On the 23rd of June they were lemon-yellow, reddish on one side; the larvæ were very small. In autumn the dry galls have the color of a dead leaf and preserve their shape very well on account of their thick, woody shell.

The fly obtained by me from these galls is evidently different from that described by Dr. Fitch. The latter seems to be the true originator of the gall, whereas mine is very likely a parasite. My specimen, apparently a male, has 14-jointed antennæ (Dr. Fitch's *C. quercus pisum* has 15 and 13 joints), and on account of the structure of its abdomen belongs to the *Figitidæ*. The characters of the genus *Sarothrus* as given by Mr. Reinhardt (Berl. Ent. Zeit. 1860) agree with it tolerably well, except that the petiole of the abdomen is striate and not smooth.

Sarothrus? pisum n. sp.—Black, mouth slightly reddish; antennæ 14-jointed.

brownish-ferruginous, base of first joint black; thorax finely pubescent, punctation exceedingly fine and indistinct; lower part of pleuræ smooth and shining; scutellum gibbous, rounded, deeply rugose; metathorax with two parallel, longitudinal carinæ; petiole short, slightly tumid, striate; second segment of the abdomen distinctly shorter than the third, downy on both sides, near the base; third segment very broad, especially beneath, occupying half of the abdomen, or more; the following segments very short; feet pale yellow; base of coxæ and tip of tarsi black; wings hyaline, thick veins pale, areolet present, although indistinct; anterior portion of the cubital vein almost obsolete; second transverse vein very oblique, slightly arched; radial area somewhat elongated, closed. Length about 0.14.

6. *QUERCUS OBTUSILOBA*. *Clusters of yellow, tubular galls with red spines, on the underside of the leaves.* *CYNIPS QUERCUS TUBICOLA* n. sp.

The gall is a perpendicular tube 0.3 to 0.4 long, slightly narrowed at its point of attachment, open at the other end, yellowish and covered on its outer surface with numerous red spines. If cut open longitudinally, its inside appears divided into three compartments like so many floors, by two horizontal partitions; the compartment nearest to the base is empty, the intermediate one contains the insect and the third one is open at the top.

If the red spines are removed with a knife and the surface of the gall examined under a strong lens, it shows dense longitudinal fibres and numerous little pale yellow crystals. The substance of the gall itself is hard, as if crystalline. From 30 to 40 of these galls are found sometimes on the underside of a single leaf. I frequently found them near Washington, in October and obtained the fly soon afterwards, each tube containing a single fly.

Cynips tubicola n. sp.—Chestnut-brown, darker on the abdomen, or, in immature specimens, the whole body reddish-brown; antennæ 13-jointed, basal joints brownish, the remainder black; feet yellowish brown, tips of tarsi black; thorax slightly pubescent; wings hyaline, subcostal and radial vein dark brown, areolet triangular, middlesized; second transverse vein very angular, portion of the cubital vein anterior to the areolet indistinct. Length 0.12.

I obtained numerous ♀ of this fly.

7. *QUERCUS RUBRA*. *Red Oak. Elongated, fusiform, pale green gall, with a pedicel, inserted on the edge of the leaf and being the prolongation of a leaf-vein.* Length about an inch. *CYNIPS QUERCUS CŒLEBS* n. sp.

The pedicel is about 0.15—0.2 long; the gall itself is an elongated, sub-cylindrical body, tapering on both sides, 0.6 or 0.7 long; its apex is slender, about 0.1 or 0.15 long. I have found three specimens of this gall near Washington, in June; two are inserted on the margin of the leaf, not far from the stalk; the third is on the leaf-stalk itself, but so that on the side of the gall the leaf originates about half an inch above its place of insertion, whereas on the other side the beginning of the leaf corresponds exactly to the place of insertion of the gall-stalk. In all the three cases,

the gall is the prolongation of a vein; in the latter case, the vein, in consequence of the growth of the leaf, has become entirely independent of the blade and appears to be growing out of the leaf-stalk. (I am indebted for this explanation of the growth of this gall to Prof. Schæffer, of this city).

The inside of these galls is hollow; each contains a brownish, oblong nucleus, kept in position by woody fibres. On the 17th of June I obtained the gall-fly from one of my specimens; on June 28th a parasite from the other; the third was dry when I found it. The gall-fly is a ♂ and I am inclined to take it for the male of either *C. confluens* Harris or of an allied species. (Compare the Introduction.)

Cynips quercus cœlebs n. sp.—Head and thorax black, opaque, deeply rugose, the latter pubescent; antennæ reddish-brown, paler towards the tip, 15-jointed, as long or longer than the body; feet ferruginous-yellow, posterior femora and tibiæ infuscated; wings with a brown spot on the second transverse veinlet and a pale, almost obsolete brownish shade between it and the anal angle of the wing; the subcostal and radial veins are interrupted before reaching the anterior margin; the arcolet is small, indistinct; the second transverse vein is stout and angular.

Length 0.16.

8. **QUERCUS ALBA.** *White oak. Elongated, fusiform gall on a pedicel, mostly on the margin, sometimes on the surface of the leaf.* **CYNIPS QUERCUS FUSIFORMIS** n. sp.

Resembles the preceding, but is much smaller. The pedicel is 0.2 or 0.3 long, the fusiform body about 0.15 or 0.2 and ends in a point. The pedicel is a prolongation of one of the leaf-veins. The color of the gall is that of the leaf, that is, it is green as long as the leaf is green and fades with it. This gall was first communicated to me by Mr. T. Glover, at the Maryland Agricultural College. He had obtained a parasitical Hymenopteron from it. In May 1861 I found several specimens of the same gall on a young white oak and succeeded in rearing the gall-fly.

Cynips quercus fusiformis n. sp.—Black; antennæ brownish-yellow, infuscated towards the tip, 13-jointed, third and fourth joints of about equal length, elongated; the following joints gradually decreasing in length; four joints before the last are of equal length; last joint more than twice as long as the antepenultimate; face pubescent below the antennæ, smooth and shining above; thorax moderately shining very finely punctate, somewhat pubescent on the shoulders; two furrows converging towards the scutellum; the beginning of three others, indistinct ones, between them; scutellum more opaque than the thorax, gibbous, with a hardly perceptible, microscopical rugosity; abdomen chestnut-brown, a reddish band near the posterior margin of the second segment; the latter more than three times as long as the third segment; feet yellowish-ferruginous; posterior tibiæ slightly infuscated; wings hyaline; thick veins brown; arcolet moderate, triangular, very distinct; cubital vein somewhat indistinct at its origin, second transverse veinlet somewhat oblique, arcuated. Single female. Length 0.09.

9. **QUERCUS OBTUSILOBA.** *Post Oak. Small, round, pubescent, wart-*

like excrescences on the underside of the leaves. Diameter about 0.08.

CYNIPS QUERCUS VERRUCARUM n. sp.

They occur in numbers on one leaf in the latter part of the summer; when the leaf is dead, the wooly pubescence of these excrescences is pale ferruginous, but earlier in the season, it is I suppose, snow-white, as are similar excrescences on other oaks. I obtained several specimens of a gall-fly, which I call:

Cynips quercus verrucarum n. sp.—Black, shining, mouth reddish, antennæ 13-jointed, somewhat incrassated towards the tip. brownish, sometimes brownish-black, pale towards the base, especially at the tip of the two first and at the third segment; thorax shining, smooth, not punctate, even the usual grooves not perceptible; feet yellow, base of coxæ, middle of femora and tibiæ brown; wings hyaline, thick veins brown, second transverse vein curved, almost angular; areolet rather large, distinct; cubital vein slender, almost obsolete at the basis; feet yellow, coxæ, except at tip, femora and tibiæ in the middle, brown or almost black; (the feet of some specimens might be described thus: brownish-black, with more or less yellow at the articulations; tarsi yellow). Length 0.05.

Four specimens ♀ (?). I am not positive about the sex of my specimens, on account of the shrunken state of their abdomen; the number of joints of the antennæ I saw distinctly only in one specimen.

Similar excrescences, but somewhat larger, occur on the white oak and the swamp chestnut oak; in June and July both were covered with a white pubescence. On the former tree they occurred in rows, on the underside of the leaf, along the principal veins. On the chestnut oak I found them singly. Both are probably the produce of *Cynips*.

10. *QUERCUS ALBA*. *White Oak*. “Round mass, resembling wool, the size of a hazelnut or walnut and of a white or buff color, growing upon one of the principal veins on the underside of the leaf. Internally, numerous hard seeds about the size of grains of wheat, crowded together and attached by their lower end to the vein of the leaf.” (Dr. Fitch’s Reports. Vol. II, No. 316). *CYNIPS QUERCUS LANÆ* Fitch.

I have not found this gall yet and mention it on account of its resemblance with the following:

QUERCUS OBTUSILOBA. *Post Oak*. Very like the preceding, but apparently smaller and of a more irregular form. Those I observed grew at the basis of the leaf, extending about an inch or less along the midrib and sometimes invading the upper side of the leaf. They also contained seed-like kernels, but much smaller than a grain of wheat. I found them in autumn and did not obtain the fly.

11. *QUERCUS PALUSTRIS*. *Pin Oak*. *Globular, hollow galls on the buds and young leaves*. Diameter 0.35—0.4. *CYNIPS QUERCUS PALUSTRIS* n. sp.

Shell green, succulent, hollow on the inside, containing a whitish, globular body, about 0.1 in diameter, which rolls freely about, not being fastened to the shell.

I found these galls quite commonly very early in the spring, on the buds of the oak, before any leaves had appeared. At that early season already, the globular, whitish body contained the pupa. When the leaves came out, I observed the same gall on them, generally close by the leaf-stalk. The fly was obtained from the galls brought home on the 17th of May. In the woods, most of the galls were found empty on the 25th of May. Still, some of them contained the fly yet.

Several galls of this kind were observed on the pin oak; they seem to occur also on other oaks, but I neglected to observe on which, chiefly on account of their appearing before the leaves were developed. The gall shrinks completely when dried, but can be well preserved in spirits.

Cynips (Trigonaspis?) quercus palustris n. sp.—Black, mouth brownish-yellow, palpi brownish; antennæ filiform, 15-jointed in both sexes, 4 to 6 basal joints yellow, the remainder brown (in the ♂ the basal joints are also somewhat infuscated); third joint longer than the others, the following four gradually decreasing in length, the remainder of the same length; in the ♂ this difference in length is not so striking as in the ♀, and the third joint is somewhat thickened, whereas it is almost linear in the ♀; thorax black, smooth, shining; scutellum smooth and shining superiorly, deeply sculptured on its posterior declivity; abdomen black, shining; feet yellow, basis of coxæ brown, tips of tarsi black; wings immaculate, thick veins brown, those of the anterior portion of the wing especially dark; the basal vein sometimes obsoletely clouded; areolet of moderate size, distinct; cubitus distinct on its whole length, not quite reaching the margin. ♂ and ♀. Length 0.08—0.1.

12. **QUERCUS RUBRA**. *Red Oak*. "*Globular galls, of the size of a hazelnut or grape, growing through the leafy expansion of the red oak, a third of the sphere projecting from the upper surface of the leaf and the remainder opposite, on its under side.*" (Dr. Fitch, Reports, Vol. II, No. 318). **CYNIPS NUBILIPENNIS** Harris (*Callaspidia nubilipennis* Fitch.)

The gall-fly is "black, with tawny yellow legs and its wings smoky on their disk and tips, with none of the veins continued into the margin, the antennæ 13-jointed in the female, which is 0.20 long and to the tips of her wings 0.30." (Fitch, l. c. See also Harris, Treatise etc. p. 434.)

This gall never occurred to me in the environs of Washington.

13. **QUERCUS ALBA**. *White Oak*. *Small, rounded galls, projecting on both sides of the leaf*. Diam. 0.25—0.3. **CYNIPS QUERCUS FUTILIS** n. sp.

Pale green, rounded but not globular, being somewhat flattened; inside with two or three small, seed-like, oblong kernels, kept in position by some whitish filaments. In July some of these galls are found dry; they retain then their size and shape, but have the color of a dead leaf, the rest of

the leaf remaining green. When taken from the tree in their fresh and succulent state, they shrink when dry, become reduced in size and almost unrecognizable. I first noticed these galls on the 14th of May when they were nearly full-grown. On the 15th of June they hardly had changed their appearance, but the larvæ in the kernels had grown to their full size. On June 23rd some of the kernels already contained the pupa and between that date and the 2nd of July the gall-flies began to escape from the galls I had brought home. Besides the gall-fly, I obtained one of the *Inquilinæ*, which may be an *Aylax* Hartig.

Cynips quercus futilis n. sp.—Black; slightly reddish at the mouth; palpi, antennæ and feet yellow; coxæ blackish at base; posterior femora slightly infuscated superiorly; thorax smooth, hardly aciculated; scutellum somewhat punctate; abdomen shining; second segment about four lines longer than the third; following segments very much contracted under the second; antennæ 15-jointed, first joint of the flagellum a little longer than the others, which are of the same length; wings immaculate, thick veins brownish-yellow; areolet extant, small; eubitus distinct, although very slender; somewhat obsolete only at the base. Length 0.06.

Four ♂ specimens.

Aylax (?) futilis n. sp.—Black, mandibles yellowish-brown; antennæ 14-jointed, yellowish-brown, first joint brown, base of flagellum paler; third joint longer than the others, somewhat excised inferiorly; feet brownish-yellow; posterior feet almost brown, yellowish only at the articulations; thorax rugose-punctate, with a short, scattered pubescence; pleuræ with a smooth, shining black spot; abdomen shining, second segment not much longer than the third, the two following very short; wings immaculate, thick veins brownish-yellow; radial area closed, the subcostal being prolonged along the anterior margin of the wing as far as the tip of the radial vein. Length 0.06.

Single specimen, apparently a male.

At first glance, this species looks very much like the preceding, being of the same size and color; but it is easily distinguished by the usual characters of the *Inquilinæ*, the form of the radial area, which is closed, the position of the areolet, etc. I am far from being certain as to the genus to which this species belongs.

14. **QUERCUS PRINOS**. *Swamp-chestnut Oak*. *Small, rounded galls, projecting on both sides of the leaf, somewhat nipple-shaped and enclosed in a reddish aureole on the under side.* Diameter about 0.15. **CYNIPS QUERCUS PAPILLATA** n. sp.

The reddish aureole surrounding the nipple-shaped protuberance on the under side of the leaf is very characteristic. The inside of these galls contains two or three reniform kernels, with a larva in each compartment.

They occur in numbers on the same leaf. In the latter part of June I obtained the perfect insect. It was a single specimen, apparently a male, resembling in all respects *Cynips quercus futilis*, obtained from the

gall on the leaves of the white oak, except that its femora and tibiæ, especially the posterior ones, are infuscated. I call it *Cynips quercus papillata* n. sp.

15. *QUERCUS OBTUSILOBA*. *Post Oak*. *Irregular, flattened galls, projecting on both sides of the leaf, yellow, when ripe and dry, and of a substance not unlike soft wood or pith, enclosing several hollow kernels.*
CYNIPS QUERCUS IRREGULARIS n. sp.

The size of this gall depends on the number of kernels it contains.

One specimen in my possession, about 0.4 long and 0.23 broad, is pierced with 16 holes through which its inmates had escaped; but they may have been small parasites. The average size of these galls is between a quarter of an inch and half an inch in length. Sometimes several of them are packed closely together and separated only by furrows. The color of the galls, when ripe is a light leather-yellow; their substance resembles then the pith of a plant, being softer than wood and still hard enough not to shrink in drying. When examined under a lens of moderate power, the gall appears to be covered with numerous little points or small cones, each bearing a few short hairs on the tip, which under such a magnifying power gives the surface a shaggy appearance. On the 29th of May, when I first discovered these galls, some of them, although yet green, were already pierced with holes. Other galls still contained larvæ much later in the season. The only fly obtained from these galls was accidentally injured, so that I can give only an incomplete description.

Cynips quercus irregularis n. sp.—Head brown, mouth yellowish; antennæ pale yellow, third joint thrice longer than the fourth, slender, somewhat curved, attenuated towards the base, stouter towards the tip; three following joints almost of the same length (the remainder are broken); thorax brownish superiorly, pale beneath, smooth, shining; feet pale, tips of tarsi infuscated; wings somewhat greyish; radial vein almost parallel to the anterior margin; this renders the radial area unusually long, linear; its tip is somewhat rounded; the terminal portion of the subcosta, joining the anterior margin, is also unusually oblique and therefore long; the pale spot on the subcosta, close before the second transverse veinlet, is very distinct; the areolet is distinct, of moderate size; cubital vein distinct; basal vein (or first transverse veinlet) dark brown, with a slight brownish cloud; the other thick veins are of a paler brown. Length 0.08 (?).

This species will be easily recognizable on account of its elongated, almost lanceolate radial area. The unusually pale coloring of my specimen makes me think that it is immature; still the wings are perfect. The structure of the third joint of the antennæ and the size of the wings seem to indicate a male. (The abdomen is broken.)

16. *QUERCUS RUBRA*. *Red Oak*. *Small, irregular, hard protuberance, projecting on both sides of the leaf and not differing from it in color.*

Diameter about 0.15. *CYNIPS QUERCUS MODESTA* n. sp.

The two specimens in my possession are a little longer than broad, rising abruptly on the upper side of the leaf, more subconical on the opposite side. The substance is hard, almost woody. I cut one of my specimens open and found that notwithstanding its small size, it contained five hollows, each producing the comparatively large fly. Three of the flies had already escaped from this gall, the two others, although perfectly formed, were still in their cells; a third specimen I reared from the other gall (end of June). On the whole, this gall has so little peculiar and characteristic about it, that I apprehend it will be somewhat difficult to identify it, unless by the fly.

Cynips quercus modesta n. sp.—Head reddish-brown below and behind the eyes, vertex black; antennæ yellowish-brown, 12-jointed, third joint elongated, the following gradually decreasing in length; the last twice as long as the preceding; thorax black, subopaque, microscopically, but densely punctate, with two moderately deep furrows converging towards the scutellum; abdomen dark brown; feet yellow, middle portion of the femora and tibiæ brown, especially on the posterior pair; tips of tarsi infuscated; wings hyaline, thick veins pale brownish; areolet indistinct or none. Length 0.06.

Three ♀ specimens.

17. *QUERCUS NIGRA*. *Black-jack Oak*. *Irregular, elongated swelling on the under side of the midrib of the leaf*. *CYNIPS QUERCUS NIGRÆ* n. sp.

Found two specimens, in June. One of them extends for about an inch along the vein, the other is shorter; both are greenish, and about 0.2 or 0.3 broad. Each gall contained several flies, which escaped between the 20th and 22nd of June, after which the larger gall appeared pierced with nine holes.

Cynips quercus nigræ n. sp.—♀. Reddish-brown on head and thorax; abdomen dark brown, shining; antennæ 14-jointed, brownish-yellow, last joint elongated (viewed in a certain light it appears to have an indication of a 15th joint); anterior feet brownish-yellow, intermediate ones darker brownish on femora and tibiæ; posterior ones still darker brown; all the tarsi brownish-yellow, with infuscated tips; wings hyaline, very transparent, subcostal and radial veins colorless, almost pellucid, *arcolet none*, cubital very indistinct.

♂. Black, abdomen shining, antennæ yellowish, brown at base (? a portion of them in my only specimen is broken), feet pale yellow, femora brownish in the middle, tibiæ of the intermediate and posterior pair brownish; tips of tarsi infuscated; wings as in the ♀. Length ♂ 0.05, ♀ 0.09.

Eight ♀ and one ♂ specimens.

A precisely similar swelling occurs on the red oak and I found several on the 16th of July, but did not obtain the fly.

18. *QUERCUS PRINOS*. *Swamp-chestnut Oak*. *Swelling of the leaf-stalk, at the basis of the leaf, or, sometimes, of the midrib near the basis*.

About 0.4 or 0.5 long.

These swellings are subconical or club-shaped; they are rounded when they occur on the midrib. In June, they were green, but began to become brownish towards the end of this month. Those of the last year were woody and brown and altogether club-shaped, as the leaf round them was broken off. From this gall I obtained numerous parasites and one gall-fly, belonging to the *Figitidæ*. I would consider it as an *Amblynotus* Hartig, but the second segment of its abdomen is much shorter than the third. In all respects, it is closely allied to the gall-fly which I raised from the gall of *C. quercus tuber* Fitch; the antennæ (♀) are 13-jointed, the base of the abdomen is pubescent or downy, its radial area is closed etc. Thus, the true originator of the gall remains unknown, unless it is proved that *Figitidæ* are sometimes gall-producers.

Amblynotus (?) *petiolicola* n. sp.—Black, head and thorax somewhat shining, smooth, slightly pubescent, the latter hardly punctate, scutellum rugose; a slight carina between the antennæ, mandibles brown, palpi yellow; antennæ 13-jointed, yellow, basis blackish; 4 or 5 basal joints of the flagellum elongated; abdomen dark brown, shining; petiole short; second segment short, pubescent at base, third segment more than twice as long as the second; feet infuscated, except at the joints, tarsi pale, tips black; wings hyaline, radial area closed, second transverse vein oblique, arcuated; areolet corresponding to the middle of the radial area. Length 0.07.

19. QUERCUS ALBA. *White Oak. Globular galls of a corky texture on the limbs. Diameter 0.4—0.5. CYNIPS QUERCUS GLOBULUS* Fitch.

“Smooth, globular galls the size of a bullet, growing singly or two, three or more in a cluster, upon white oak twigs, internally of a corky texture, each containing in its centre a single worm, laying in an oval, whitish shell, resembling a little egg, 0.15 in length, producing sometimes a black gall-fly with tawny-red legs and the second veinlet of its wings elbowed or angularly bent backward, its length 0.15; sometimes a smaller fly (*C. oeneratus* Harris) of a clean pale yellow color, almost white, with a broad black stripe on the whole length of its back etc, its length 0.12.” (Dr. Fitch’s Reports, Vol. II, Nos. 312, 313.)

Dr. Fitch remarks that further researches will probably show that the galls from which these two kinds of flies come, grow upon different parts of the white oak and that the galls themselves will present some differences in their structure. Having obtained the same two species from these galls, I can only say that according to Mr. Hartig’s view on the subject, both may be hatched from the same kind of gall. The *Callaspidia quercus globulus* Fitch belongs to the true gall-flies (*Psenides*) of Hartig; the *Cynips oeneratus* Harris, on the contrary, is to be referred, on account of the neuration of its wings, to Hartig’s section of *Inquilinæ*. Its radial area is closed, the subcostal vein being prolonged along the anterior margin of the wing,

and its areolet is more removed from the base of the radial area, on account of the oblique position of the second veinlet; its abdomen consists apparently of one single segment, the second segment being so large as to cover all the others; the petiole of the abdomen is tumid and has fine longitudinal striae. The colors agree with Dr. Harris's and Dr. Fitch's description of *Cynips oeratus*.

My only specimen of the true gall-fly of this gall agrees tolerably well with Dr. Fitch's description of *Callaspilia quercus globulus*, only it is much larger, being about 0.21 long. I doubt therefore whether it is the same species. It certainly is not a *Callaspilia*.

Besides these two flies, I obtained from the same 'galls two coleoptera, *Hydrocera verticalis* Say and *Otidocephalus americanus* Seh. (*Curculionidae*). The larva of the first, sharing probably the predaceous habits of the other *Cleridae*, pierces, I suppose, the gall in order to consume the larva and establish itself afterwards in the kernel of the gall where it undergoes its transformation. It is in this situation that I found the beetle in cutting one of the galls open. The larva of the *Otidocephalus* feeds probably on the corky substance of the gall.

Galls in all respects similar to the gall of *Cynips quercus globulus* Fitch occur on the post oak; there may be a slight difference in the surface which seems to be less smooth; still as both galls vary in the appearance of their surface it is difficult to say whether this difference is constant. The best proof of the identity or diversity of both galls would be afforded by comparing the gall-flies. I did not obtain those of *Q. obtusiloba* and the only insect which escaped from the galls which I had brought home was a pretty fly belonging to the *Figitidae*, of course a parasite in the gall.

Aegilips (?) **obtusilobæ** n. sp.—Whole body black and shining, except the metathorax, which is rugose; antennæ (♀) 13-jointed, brownish-ferruginous, first joint black, except at tip, last joint somewhat infuscated; feet ferruginous-yellow, intermediate and posterior ones infuscated on femora and tibiæ; all the coxæ black, yellowish at tip; scutellum elevated, almost conical; a sharp margin separates its anterior from its posterior side; anterior space of the pleuræ punctate, posterior one distinctly aciculate; petiole of the abdomen almost concealed by the funnel-shaped expansion of the anterior part of the first segment; this expansion is longitudinally striate; the second segment of the abdomen is broader than the third superiorly, but much narrower than it inferiorly, its posterior margin running obliquely downwards; third segment superiorly as broad as the three following together, and still broader inferiorly; wings hyaline, venation exactly like that of *Aegilips* (as figured in the Berl. Entom. Zeit. 1860, tab. IV, fig. 3) radial area triangular, cubital vein and areolet obsolete; thick veins pale yellowish. Length 0.08.

This species does not agree with any of the genera described in Mr. Reinhardt's Monograph of the *Figitidae* (Berl. Ent. Zeit. 1860). It comes nearest to *Aegilips* Halid., from which it is distinguished by the structure of the first segment of the abdomen.

A specimen of a similar gall, but less smooth and less regularly globular was observed by me on the swamp chestnut oak.

20. QUERCUS FALCATA. *Spanish Oak. Oblong, subreniform, smooth galls, somewhat pointed at tip, yellowish-brown, fastened by one end to the twig.* Length three-quarters to an inch and more.

An abortive bud is generally at the basis of the gall. A spongy mass fills the inside. In a kernel in the centre I found the pupa of a large gall-fly apparently allied to *Cynips confluens* Harris. Several other, smaller hollows which I found nearer to the shell were evidently those of parasites.

I obtained some of the latter, but never succeeded in bringing the gall-fly to perfection, although I noticed the gall several times, always on the spanish oak.

21. QUERCUS ALBA. *White oak. Round mass, resembling wool on oak twigs, internally with numerous, seed-like grains.* CYNIPS SEMINATOR Harris.

This gall and the insect have been sufficiently described by Dr. Harris and Dr. Fitch (Reports, Vol. II, No. 315). I will only notice the differences, between my observations and those of Dr. Fitch. The thorax of my female specimens was black, the head alone being reddish-brown, whereas Dr. Fitch obtained numerous females with head and thorax cinnamon-red. Again, this author states that the females are much more numerous than the males, as he had obtained from a single gall 40 ♀ and one male.

My observation gave a different result, as I obtained from one gall 44 ♀ and 29 ♂ specimens and it is possible that many more had escaped before, as the flies began to come out immediately after I got possession of the gall. The antennæ of my ♂ specimens are yellow at their base, but decidedly brownish on their latter half. Finally the four galls of this kind, which I found in the environs of Washington have many angular projections which render their surface uneven and not so smooth and rounded as figured by Dr. Fitch. Notwithstanding all these differences, I hardly doubt that my specimens are identical with *Cynips seminator* Harris.

22. QUERCUS ALBA. *White Oak. "Dense clusters of hollow, bladder-like galls, pale dull yellow, resembling in shape preserved figs, packed in boxes."* (Dr. Fitch, Reports, Vol. II, No. 314.) CYNIPS QUERCUS FICUS Fitch.

I have found a similar gall near Washington, but it is much smaller, the whole cluster being about three-quarters of an inch long and about a quarter of an inch broad. As this gall was on the same twig with one of the galls of *Q. quercus tuber*, I am not sure from which of them the flies I obtained came, the more so, as, according to Dr. Fitch's statement both

flies are very similar. The ♂ thus obtained had 15-jointed antennæ, which agrees with *C. quercus ficus* Fitch; but the males of the flies which I reared from the oak tumor had the same number of joints. By all means, the insects which I reared from both galls are no true *Cynipidæ*, the second segment of the abdomen being shorter than the third and must be referred to the *Figitidæ*. (See No. 27, *C. quercus tuber*.)

23. QUERCUS PHELLOS. *Willow Oak. Rounded, woody swelling at the tip of the limbs.* CYNIPS QUERCUS PHELLOS n. sp.

Found copiously on the Virginia side of the Potomac, near Washington in June. At this time they were greenish and from 0.3 to 0.35 in diameter; numerous green leaves were attached to them. The flies escaped on the 29th of June.

Cynips quercus phellos n. sp.—Reddish-brown, abdomen shining, tarsi somewhat paler, their tips infuscated; antennæ 13-jointed; wings hyaline, very transparent, the thick veins almost colorless, hardly yellowish, *areolet none*, radial and cubital veins almost obsolete; the branch of the subcostal running towards the margin is abbreviated, rudimentary. Four ♀. Length 0.1.

The color of this species is like that of the head and thorax of *C. quercus nigra* and the wings have the same transparency. The only thick and distinct veins of the wing are the basal vein and the subcostal vein, except its branch, running towards the margin, and the cross vein, running from the angle of the subcostal towards the place of the areolet. All the other veins, and consequently the area which they form, are almost obsolete.

24. QUERCUS ALBA. *White Oak. "Swellings similar to those of Cynips quercus tuber, growing on the tips of the limbs of aged and large white oak trees."* (Dr. Fitch, Reports, Vol. II, No. 310.) CYNIPS QUERCUS ARBOS Fitch.

The fly is "small, black, having all its legs and antennæ of a bright pale yellow color, and one more joint in the latter organs than in the preceding species (*C. quercus tuber*) in the males, which sex is 0.06 in length and to the tip of its wings 0.1." (Fitch, l. c.)

Is it identical with the following gall? But according to Dr. Fitch, this gall differs from that of *C. quercus tuber* by occurring on old and large trees only, whereas my gall No. 25 is found on trees of different age and size.

25. QUERCUS ALBA. *White Oak. Club-shaped, woody swelling at the tip of the limbs.*

In June these swellings are yet green; later in the season, they become brown, hard and woody; in autumn, the leaves emerging from their tip, break off and the swellings at the tip of the limbs are easily noticed.

They can be recognized immediately by their club-shaped form, the vestiges of the leaves (usually three), broken off from their tip and the flattened, uneven surface between these vestiges, with the round hole, through which the insect escaped, generally in the centre. If cut lengthways in two, an elongated cavity is found just below this hole, and under this, a second, smaller, more rounded cavity. The latter contains the larva.

Sometimes there are two cavities of the latter kind and consequently two larvæ occur in the same gall. On the 4th of July I found a pupa in an advanced state of ripeness in one of these galls; in the adjoining cell however was still a larva. I did not succeed in obtaining the gall-fly; instead of it, one of the specimens gave me *Hydrocera verticilis* Say, a coleopteron, living, as it seems, parasitically on oak-galls, as I obtained it also from the oak-bullet gall (*C. quercus tuber*) of Dr. Fitch.

This gall is very common around Washington. Is it the gall of *Cynips quercus arbos* Fitch (Reports, Vol. II, No. 310)? From the gall of *C. quercus tuber* Fitch it is easily distinguished by its more constant form, its more uniformly woody consistency and the absence of the seed-like shells, containing the larva.

I have found similar swellings on other kinds of oaks also.

26. QUERCUS ALBA. *White Oak.* "Large, hard, uneven swelling, three-quarters of an inch thick and twice or thrice as long, resembling a potato in its shape, growing on white oak twigs, more distant from their ends than the oak tumor." (Dr. Fitch, Reports, No. II, No. 311.) CYNIPS QUERCUS BATATUS Fitch.

"Its surface is coated with a glaucous, pale blue bloom, internally it is of a dense, corky texture in which are hard, woody spots." (ibid.)

"The fly has the basal joints of the antennæ and its legs dull pale yellow, its thighs and hind shanks black and its middle shanks often dusky, the antennæ of the female with thirteen joints and the length of this sex 0.09." (ibid.)

I have found near Washington a single gall answering this description, but did not succeed in obtaining the insect.

27. QUERCUS ALBA. *White Oak.* Swelling of the small limbs or twigs. (Dr. Fitch, Reports, Vol. II, No. 309.) CYNIPS QUERCUS TUBER Fitch.

These galls are easily distinguished from the club-shaped galls by their inside. "On cutting into these galls, says Dr. Fitch, the small limb on which they grow is found to have its wood thickened or swollen, and over it, forming the chief bulk of the tumor, is a corky substance of a yellowish-brown or snuff color, between which and the wood are several small

hard grains, resembling seeds, each having a cavity in its centre," etc.

The flies which I obtained from these galls agree with Dr. Fitch's description, except that the neuration of their wings shows that they do not belong to the true gall-flies (*Psenides*) of Hartig. The second segment of the abdomen is shorter than the third, the radial area is closed by the prolongation of the subcostal vein along the anterior margin and the areolet corresponds more to the middle than to the base of the radial area, all characters distinguishing them from the true gall-flies. Still, I am at a loss to say to what genus they belong. I thought for some time that they agreed with *Amblynotus* Hartig, as defined in Reinhardt's recent Monograph of the *Figitilæ* (Berl. Entom. Zeitschr. 1869), but the antennæ of the male, which I examined repeatedly on the living and the dead insect, appeared to me 15- and not 14-jointed. The ♂ of Dr. Fitch's *C. quercus tuber* has 14-jointed antennæ. My ♀, like Dr. Fitch's, have 12-jointed antennæ, if the last, very elongated joint, is counted for one. The ♀ of *Amblynotus*, according to Reinhardt, has 13 joints.

My specimens (several ♂ and one ♀) are black, with yellowish mandibles and a spot of the same color between them and the antennæ; the latter brownish-yellow, more dusky towards their tip in the ♂; feet yellowish, last pair, except at the knees and tarsi, more brownish; intermediate pair also slightly infuscated on the femora; wings hyaline, thick veins pale yellowish-brown; ♂ 0.05, ♀ 0.09 long.

