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MOUND-MAKING ANTS OF THE ALLEGHENIES.

BY REV. HENRY C. M^CCOOK.

THE following notes are substantially extracts from an article printed in the Transactions of the American Entomological Society.¹ They relate to the familiar mound-making ants which inhabit the mountain regions of the Atlantic States, particularly Pennsylvania. These are insects in form as represented in the accompanying figures, the head and thorax being of a fallow or reddish color, the abdomen a glossy black. There are three forms of workers, the major, minor and dwarf, by whom the entire external economy of the formicary, and for the most part the internal also, is conducted. The females closely resemble the workers-major, but are larger, more robust, and in the virgin state are winged. The males are winged, are smaller than the females, from

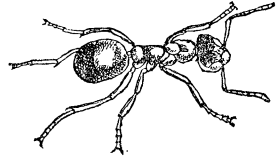


FIG. 1. Worker-Major. The lines beneath the latter figure show the natural length of the three worker forms.

whom they are further readily distinguished by the smaller head, an additional segment to the abdomen and the different form of the same. In the original paper these ants are referred to as *Formica rufa*, the name which they bear (identified by Fr derick Smith, of the British Museum) in the collection of the Entomological Society. They very closely resemble these ants, but on the authority of Dr. Auguste Forel, the author of the "Swiss Ants" (*Les Fourmis de la Suisse*), to whom specimens were sent, they are referred to in the following notes as *Formica exsectoides* Forel, a new American ally of *F. exsecta*. Their habits do not greatly differ from those of *F. rufa* of Europe, but are nearly if not quite identical with those of *F. exsecta*.

It is further premised that the observations given below were made while encamped in the midst of a colony, or "ant city," of more than 1600 nests, situated upon the eastern slope of Brush mountain, Pennsylvania. These nests are conical elevations of various sizes, the largest measured being fifty-eight feet around the base, twenty-four feet over the top, and forty-two

¹ Vol. VI, 1877, p. 253, sqq. The entire paper is published separately by John A. Black, 1334 Chestnut street, Phila.

inches in height. The mode of building the hills, which are honey-combed with regularly placed tubular galleries, is as follows. The mason work was greatly stimulated by a shower of

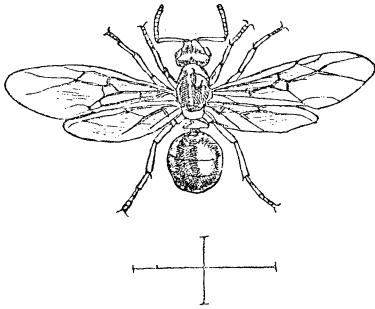


FIG. 2. Female.

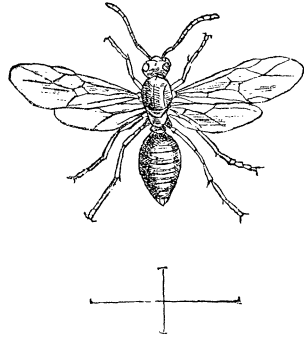


FIG. 3. Male.

rain, and was indeed scarcely observed (beyond excavations of the underground galleries) before the rain-fall.

Building Galleries.—1, Fig. 4 represents a covered way or gallery six inches long, which started on the foundation three or four inches below the surface of the field, and rose up toward the half-

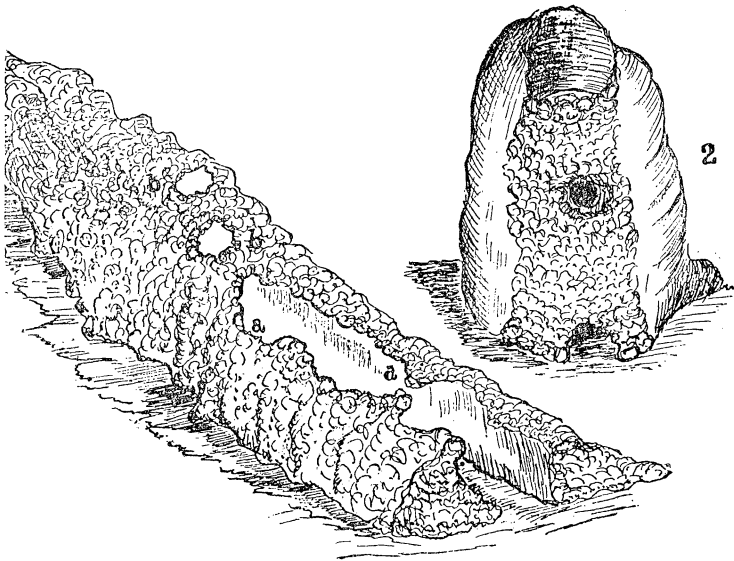


FIG. 4.—Covered Galleries.—1, horizontal gallery; 2, vertical gallery.

cone at an angle a little less than 45° . When first seen it was an open gallery or ditch, and was observed until it was entirely cov-

ered over except one door or round hole near the top. The work progressed by the continuous addition of earth pellets to the outer edge. The pellets were carried in the mandibles of the ants, and were usually pressed into position. The springing of the arch was plainly seen, the two sides slowly approaching each other in irregular lines as shown at *a a*. Gradually two points drew nearer and nearer, until they well-nigh touched. It was quite exciting to watch now the delicate manipulation of the architects. Here comes a worker with pellet of larger size; she climbs the arch, reaches over, holding the while by her hind feet, and drops the ball of soil into the breach. The bridge is made. And now with surprising rapidity it is widened until the roof of the arch assumes the appearance indicated at *b b*. Circular openings or doors are habitually left in the work, through which the ants are moving back and forth, apparently working upon the inside to strengthen the arch. As sections of the building are completed these doors are closed, so that they are plainly but temporary arrangements for the convenience of the masons.

On other parts of the foundation similar structures were going up. At 2, Fig. 4, was a section of a vertical column, one side of which had been cut away. It was two inches high, and one inch across. The ants were working upon this in the same manner as described above. They built not only from the bottom up, but from the sides across. The central opening in the figure was finally closed, leaving, when the work ended, the opening at the foot of the column. The circular gallery thus enclosed was one-half inch in diameter, which is about the usual dimensions. The work of construction was not confined to the space which, as in the above cases, was the original site of the cone. Having occasion to lift up a fragment half the size of one's head, which had been thrown to one side, I saw that the section had already been made the nucleus of a new mound. Columns, corridors and halls, corresponding closely with those outlined upon the under face of the fragment, had been erected, which were thus quite united to the fragment. In one of the halls was a small collection of dead ants. The greater portion of one day was spent in studying and recording the work upon this one hill. Other drawings were made from different positions, but the method and result were the same. As the activity occasioned by the shower

continued for the remainder of our stay, I had full opportunity by subsequent observations to verify my notes.

Fig. 5 is another example of architecture drawn from the same broken hill. The figure represents a double gallery which was built up against the perpendicular side H of a hole cut by the spade in removing the cone. The gallery *a a a* was carried along the base of the side three inches, and then upwards toward the surface. The gallery was widened at two points, *c c*, to one and a half inches, as though intended to serve as store-rooms for cocoons. Galleries opening downward communicated with these enlargements. At *e* ants were arranging pellets along a projection on the side, for what purpose was not apparent.

My attention was next directed to a large hill, which with its surrounding hill-cluster was on my regular "list." I took this plan of keeping several hills under regular, daily, and indeed for much of the time hourly observation, for the obvious reason that thus I could become "acquainted" with the workers, could trace the work done, and confirm or condemn previous conclusions as the case might be. In this hill a track had been made by one of a herd of cattle grazing in the field. The foot of the steer had left an irregular depression measuring nine inches each way, in depth eight to nine inches, the lower margin being six inches from the base of the hill.

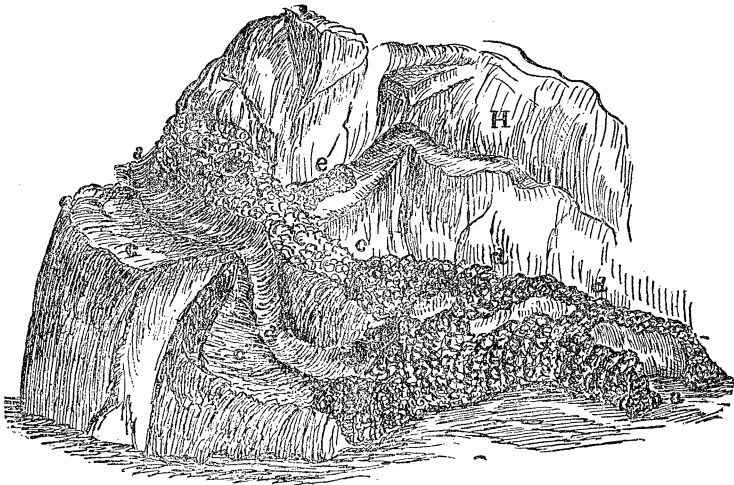


FIG. 5.—Covering a double gallery *a a a*, and chambers *c c c*.

Engineering.—The lower part of this track is shown at Fig. 6,

in order to exhibit what seems very much like a deliberate and well planned system of engineering, in filling up the hole. The drawing is one-half natural size. At *A, a*, the original hill is shown, marking the southern limit of the foot-print. The work of filling up against this had begun. From the lower point *A*, marking the outline of an arc, were the following works: *b*, a circular column one inch high, from the upper base of which, a broad bifurcated plateau was being extended; next to this was an oblong mound *c*, one-half inch high, and beyond that, marking the opposite limit of the track, a lunette *d*, one inch high. Beyond this, toward the base of the hill, and parallel with the arc *b, c, d*, was thrown an arc of like but smaller lunettes *i, i, i*. At *e* and *f*, were lunettes similar to *d*, and at *g*, a scolloped mound. These elevations, with that at *k, k*, surrounded the cavern *h*, which was the deepest part of the cattle-track. The plan of operations is very plain; from the little raised columns and mounds figured above, the work of covering in could proceed with the greatest advantage. The elevations *b, c, d*, were evidently gauged by the height of the edge of the hill at *A*, thus marking the depth of the track on that line. The diminishing depth was met by a corresponding lowering of the lunettes *i, i, i*, and at other points in the excavation the same facts held good.

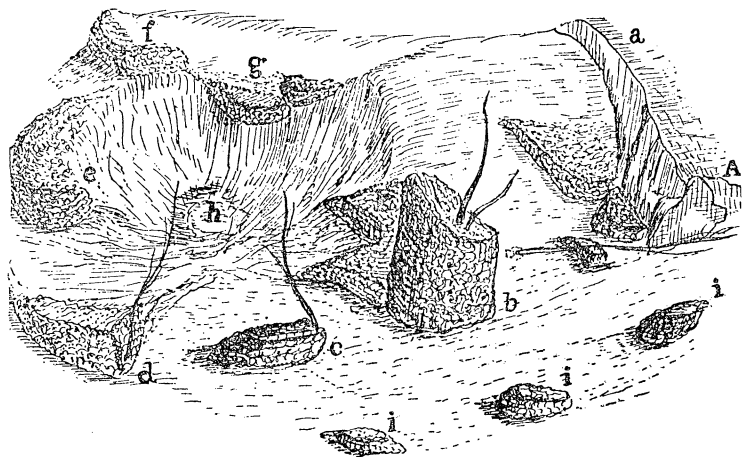


FIG. 6.—Engineering work; filling up a break.

The above operations began on Saturday morning; on Monday morning the cavity was two thirds filled. Very strangely the work did not connect with the face of the break towards the sum-

mit of the hill, but a deep trench or gallery had been preserved all the way across, the wall being maintained intact. Nor was there any appearance here of the formation of the galleries above described; it was dead filling in. In one of the little hollows the shells of cocoons, out of which antlings had just been delivered, were piled up, apparently to assist in the filling. I had before observed these being carried from this hill and deposited on the stones outside. A number of straws were worked into the columns, evidently as braces. A few feet from this large mound was a small hill, one of its off shoots, which even before the rain had shown much activity in construction, for the surface was covered with fresh pellets. The shower had inspired the inmates of this young community with amazing zeal.

Underground Galleries.—Thus far we have been dealing with that part of the formicary which is above ground and is apparently the most considerable. There is, however, a hidden portion which is immense in extent, and must have vast importance in the economy of the community. Every hill furnishes a fair measure of the extent of the underground system of galleries connected therewith; for it is reasonably certain that the entire bulk of soil in each mound has been excavated and brought up from the galleries beneath the surface. The average width of the upper galleries is about three-eighths of an inch; the maximum width not exceeding one-half inch. The underground galleries are probably of the same size. A glance at these mounds, therefore, at once gives indication that an extraordinary system of subterraneous galleries must be connected with each formicary, though I made no satisfactory examination into the arrangement of this system; this might have been done, perhaps, by sinking a deep trench close to a mound and extending it for some distance. But the soil is so very full of stones that even thus the results might not be satisfactory. No doubt the ants descend to considerable depths, utilizing the stones in various ways, for example for roofs and walls, as they do upon the surface. It would hardly seem possible to preserve any great regularity in the course of these underground ways which must constantly be diverted by the stones. But they undoubtedly can be held to a general course, and are carried with great directness from point to point, when it is desired to communicate with the trees and feeding places. I was able in one case to trace the extent of the galleries near the surface in the follow-

ing way. Tapping upon a hill whose inmates were in a particularly "nervous" condition, the ants issued in excited hordes not only from the doors of the mound, but from various points on the surrounding surface. Taking a principal centre of excitement, four or five feet distant, a stone underneath which was an entrance to the galleries, I again agitated the ground. The ants as before issued from the surrounding surface, chiefly upon a line running eastward, up the slope. At the limit of excitement, which was something less than before, I once more agitated the stones and earth with like results. Thus I traced this surface gallery eastward about 60 ft., where the excitement under the above treatment ceased at an oak tree. I am satisfied that as a rule the central formicary or hill communicates with the trees which serve for feeding grounds, by galleries as long as or much longer than this.

Adding Stories.—On the east and west sides of the hill, several inches from the top, deep fissures had been cut, looking like sun cracks, the lower edges of which were being built up, and the upper bent over. An additional story was thus being added to the cone. Here grass-straws were strewn over the summit, and others which I threw upon the hill were dragged into place and utilized with skill. This story was well nigh completed by Monday morning. The building was carried forward (and such was the case on the large hill and on others observed), by erecting warts or small cones upon the surface and around the openings or doors of the galleries, and filling between them. I could trace the evident outlines of galleries laid out.

Entrances or Doors.—The principal entrances to the formicary are at the foot of the hill. They are commonly placed around the entire circumference of the mound, and are arranged in two, three, or more circular rows, one above another. At certain points where, apparently, there is need of an especial vomitory, the gates are much multiplied. Besides these, there are openings at irregular intervals upon the entire surface of the cone. These are not numerous, but sufficiently so to allow easy approach to and exit from the more elevated portions of the mound. The main dependence appears to be upon the lower gateways. It would seem, at first thought, that there could be no real necessity for so many doors; but one who has witnessed the rapidity with which the myriads of workers swarm upon the surface when their nest is attacked will at once perceive the economy of these numerous

gates. The doors are simply the surface openings of the galleries with which they correspond in size.

Huber declares it to be one of the fixed habits of the fallow ant (*F. rufa*), of Switzerland, to close the gallery-doors at night and re-open them in the morning. The most careful attention could discover no such behavior among the ants at Camp Riddle. At no time during the whole week was there observed any sign of attempt to close up the galleries. Even during the heavy storm of rain referred to, the doors which were closely examined at various hours of the night, remained open. It would have been more satisfactory could an observation have been made during a fall of rain in the day time, but I have little doubt on this point, and none at all on the ordinary night-condition of the doors. This is certainly a remarkable variation in habit. It may possibly be accounted for by the presence in Switzerland of some nocturnal enemy, from which the American congeners are free.

Before taking up in detail the life habits of our mound builders, a comparison and contrast may be allowed which may give a popular illustration of the immense labors of the fallow ant. I have calculated the cubic contents of one of the largest hills to be, in round numbers, two millions of cubic inches. Let us estimate the bulk of an ant equal to that of a cylinder three-eighths of an inch high and one-sixteenth of an inch in diameter at the base. We have thirty-five one hundred thousandths of a cubic inch as the bulk of a single ant, or two thousand eight hundred and sixty insects to the solid inch. The size of the builder is therefore to the size of the edifice as *one to fifty-eight thousand millions*. Let us compare this with a corresponding estimate of the work of man (taking his bulk at four cubic feet), as wrought upon the great pyramid, reckoned to contain two hundred and seventy-six millions of cubic feet.

Man's bulk to his building is as 1 : 69 millions.

The Ant's " her " " 1 : 5800 "

The figures are given roundly, without strict verification ; they show vastly in favor of the mechanical energy and industry of the insect, if such comparisons may be allowed to show any thing, which is perhaps doubtful. They may serve however to impress some minds more vividly than other methods, with the immense activity which marks the wonderful realm of insect life. The advantage is yet more striking when the period of time consumed

in erecting an adult hill, from 3 to 7 years, is compared with the thirty years which one hundred thousand men spent in building the pyramid. Moreover, as will also appear, the superstructure or hill, is by no means the whole of the formicary. A vast system of subterraneous galleries penetrates the earth to unknown depths and distances, requiring labors which in magnitude may well be compared with those which excavated the catacombs of Rome.

Sentinels.—I observed on the tree-paths a movement that had the appearance of some policy of police. Workers, with the normal round black abdomen, were scattered at intervals along the trunk. They did not seem to belong to the line of ascending foragers, but rather to be stationary, as though they were sentinels or policemen. They were active in challenging with their antennæ the repletes who were on the return, and were quick to resent any interference made by intruding a finger or straw upon the path. This statement is made with reservation, as I was not able fully to satisfy myself that the facts revealed a fixed habit. The point, however, is well worthy of future investigation. There is at least a probability, from analogous habits of the ant, that the individuals referred to above were indeed sentinels as their behaviour indicated. It is a well established fact, in the economy of ant hills, that sentinels are posted at or near entrances, and common avenues of approach. I satisfied myself of this by very many observations and experiments, which it is not necessary to relate in detail. It will suffice to say that on every occasion of approach of any object to a hill or entrance, workers instantly sprang upon the surface. These sentries were constantly seen lurking just inside the gallery doors, whence they issued with every mark of intense vigilance and excitement the moment a finger was intruded or the smallest object dropped near them. Frequently they patrolled the vicinity of the gates. They attacked every intruder with the utmost promptness and intrepidity. It gave subject for great wonder to note the rapidity with which an alarm was communicated throughout a large hill. Two hills in particular, whose inhabitants were for several days in a condition of high nervous excitement, attracted attention. Standing a yard or more from the base, I would agitate with my foot a stone which evidently had communication with the interior of the mound. There was scarcely an appreciable interval of time ere the whole surface of the cone

was covered with insects. The black and red masses whirled in indistinguishable mazes, producing a very perceptible buzzing sound by their rapid movements. Even for several feet beyond the hill, on the opposite side, the excitement extended, and was manifest with almost equal rapidity.

Tree-paths.—The word tree-path, as used above, perhaps needs a brief explanation. It was observed that the ants ascending and descending the trees invariably kept to a beaten track, two or more inches in width. In many cases this track or tree-path was stained, the entire length of the trunk, a brownish-yellow color, caused doubtless by the formic acid which the ants secrete. The position of these tree-paths is determined by the situation of the hill to whose domain the tree belongs, for each community has its own special feeding grounds upon which intrusion is rarely if ever made. The tree-path is located habitually upon that part of the trunk which directly faces the hill. This was verified by observations upon a very great number of trees.

Winter Habits.—There are several inferences, more or less conclusive, concerning the winter economy of the fallow ant which we may draw from the facts. First, the ants dwell within their formicaries during winter, and make no attempt to modify the surface surroundings. Second, the vast majority of the community, together with the fertile queens, larvæ and cocoons occupy the underground galleries. This appears from the fact that but one young queen and comparatively few workers of the various classes were found in the hill galleries. Third, the composition of the mounds is such as to ensure, in the central parts, a good degree of protection against ordinarily severe winters for the few ants that occupy them. Fourth, the vitality of the ants is sufficient to keep them active within the hills during all ordinary seasons. Fifth, it is yet more evident that the occupants of the underground galleries are not torpid during ordinary winters, if ever, but exist in a state of considerable activity. Finally, it would appear that the ants are able to spend the winter in the active state without regular and ordinary supplies of food.

I do not advance this last opinion with any great degree of confidence. The mysteries of the underground galleries still veil the facts that would solve the question completely. But all the known facts point to the above inference. I had thought that the tufts of grass which grow upon many hills, and which evi-

dently grow at the ants' consent, might be preserved, not only to strengthen the architecture, but to furnish at their roots sustenance for aphides. Accordingly, at a visit made October 26, 1876, a cold, snowy day, I carefully searched for aphides upon the roots of the grass, but found none. Mr. Kay's search was equally fruitless. The roaches found in such numbers by Mr. Kay, and also by myself, are doubtless simply squatters upon the emmet territory. However, it must be considered as still unsettled whether our mountain mound-builders feed during winter, and if so, what are the sources of their food supply.

Beetles.—The possibility that the beetles, certain species of which are well known to frequent the nests of ants, might be in some way concerned in this interesting query, did not escape my attention. But I was never so fortunate as to take any beetles in the hills either during the summer or fall visit. This was doubtless chiefly owing to my ignorance at that time of the size and appearance of the insects, and the best mode of capturing them. I hope at another visit to remedy this deficiency. Dr. Horn informs me that the spring is the best season to search for these domesticated beetles. Among the ants collected in mid-winter by Mr. Kay, and sent to me as specimens, I found one beetle. It is a small insect, about one-tenth of an inch in length, of a dark claret-brown color, quite closely resembling in this respect the ants among whom it dwells. It is determined by Dr. Horn as *Tmesiphorus costalis* LeConte, and belongs to the Clavigeridæ. The discovery of this beetle in midwinter, together with the fact that the beetles are found in abundance with the ants in early spring, show these insects to be closely connected with the winter life of the ants, if not with their winter food supply.

Dr. John L. LeConte, so widely distinguished for his thorough knowledge of the Coleoptera, has shown me the following species collected by himself from ants' nests. Two of these, taken from formicaries of our Allegheny Mountain mound-builders, I have been permitted to figure. They are drawn in order simply to give a general idea of their appearance, and not for systematic description. The most interesting of these is perhaps Fig. 7, 1, *Atemeles cava* LeConte, which, like the Clavigeridæ, is furnished with tufts of hollow, hair-like tubes, on the sides of the abdomen. From these tufts a sweet secretion exudes, upon which the ants feed, as upon the honey-dew of the aphides.

A. cava is a brown-colored insect, about one-fifth of an inch in length. Specimens were found with fallow ants in Columbia

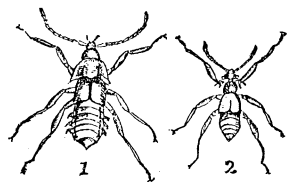


FIG. 7.—Beetles found in nests of *F. Exsectoides*. No. 1, *Atemeles cava* LeConte. No. 2, *Cedius Ziegleri* LeConte.

Co., Pa.; in Michigan, Maryland and Illinois. Those from Illinois were found in nests of *F. rufa* (?) in large numbers. One of the ants taken with the beetle still holds in its mandibles, firmly clasped even in death, one of these household treasures. The other specimens figured are destitute of the hair-like tufts, and probably serve simply as scavengers, or are permitted to remain as “squatters” in the formicary, for some purpose, the economy of which is unknown. *Cedius ziegleri* LeConte, Fig. 10, 2, was taken in a hill of *F. exsectoides* at Bedford, Pa. It has short elytra, the color is brown, the length is one-tenth of an inch. On each of the first pair of legs are two spines, one situated (apparently) at the base of the femur, the other on the trochanter. The remaining specimens were also taken at Bedford, Pa., and are an undescribed species of Homalota, and an unnamed species of Oxyopoda. They are small brownish insects, with a slight pubescence.

Lepidopterous larvæ with Ants.—I introduce here as bearing upon the general matter of ant-food, and the relation of ants to myrmecophilous insects, the following observation. During the early summer of 1877, I had frequent opportunity to note the habits of a large colony of black, shining ants, *Formica fusca*, whose formicary is established at the edge of a grove on the farm of Mr. George B. Lownes, Delaware Co., Pa., nine miles from Philadelphia. The ants were found scattered through the woods, within a circuit of many rods from the nest. June 18th, I observed a column of these ants ascending a young wild-cherry tree, near which grew several tall stalks of the black snake-root or bug-bane, *Cimicifuga racemosa*. While watching the ascending column I noticed an ant moving upon the round blossoms of this plant. Attracted by some peculiarity in its movements I fixed my attention upon it, and saw it to be in attendance upon a small green grub about one-half inch long, which proved to be the larva of a butterfly, probably some species of *Lycænida*. The lower segments of the abdomen were continually gently stroked

by the antennæ, in the familiar manner of ants when soliciting honey-dew from aphides. This novel behavior was of such interest that I placed the ant under close continuous observation for more than two hours. During this time the strokes were repeatedly interrupted by short excursions up or down the plant, the ant always returning and renewing the solicitation. The ant always occupied a position below the grub, and directed her strokes toward the head, which, however, generally fell upon the lower part of the body. The larva did not remain stationary, but several times moved its position, slowly creeping around the stem. I ceased observation at noon, and returned to the grove at 4 P. M. The grub was in about the same position, and was attended by the same (or another) ant which was accompanied by a companion. The same behavior observed in the morning was continued until 5 P. M., when I captured ants and grub and took them home. A number of the same larvæ in different stages of growth were found on the same plant in various parts of the grove. I was only able to observe that the ant continued to attend the grub under confinement just as in the woods. But preparations for a journey to Texas, compelled me to suspend observations. Although satisfied that the object of the ants was to secure some kind of refreshment from the larvæ, I was not able to note any secretion on the grub, or anything like the actual taking of food by the ant, although the mouth organs were applied to the last segments.

A casual mention of my discovery was the means of opening communication with W. H. Edwards, well known for his valuable works upon the Lepidoptera, who later in the summer (as I infer), had observed the same fact. In comparing notes it was found that the larva observed by him in West Virginia, was also of the Lycænidae (*Lycæna pseudargiolus*), and that it was domiciled upon the same plant (*Cimicifuga racemosa*). Two species of ants were seen attending the larvæ, one of which was sent to me and proves to be identical with the European *Prenolepis nitens* Mayr. Mr. Edwards kindly communicated to me the details of his own observations, which he has since given to the public in the Canadian *Entomologist*. As examined by me under the microscope, the larvæ prove to be possessed of organs upon the upper part of the last segments, apparently designed or fitted for the exudation of some fluid. Mr. Edwards also directed my attention to a paper

by M. Guenée, in the "Annales de la Société Entomologique de France," Ser. iv, tome 7, 1867, pp. 665—668, which I have consulted. The paper is brief but exceedingly interesting, and gives a full description, illustrated by figures, of organs found upon the eleventh segment of the larva of the butterfly (*Lycæna bœtica*), whose protrusion from two openings near the ninth and last pair of stigmata, was observed, and the action and organ figured and described. At the summit of the tenth segment the author found another single opening, placed transversely, and surrounded by a projecting border around which the granulations which cover the whole body of the larva are especially massed. Out of this sort of button-hole, and at the middle, rises, at the will of the grub, a species of hemispherical, transparent vesicle, which gives passage to a serous liquid sufficiently abundant to form a large drop, which is reproduced whenever it is removed. The larva does not secrete this liquid except when disturbed, imitating in this respect the *Cucullia* and many other larvæ which disgorge at the mouth a colored liquid, with the intention, doubtless, of repelling those who molest them. M. Guenée ventures no opinion as to the economy of this exceptional structure. But, his description throws great light upon the behavior of the ants as recorded above. There can be little doubt that the gathering of a serous liquid, like that observed by M. Guenée, upon *Lycæna bœtica*, was the object of the attendance of the ants of *Formica fusca* upon the Lycænid larva as observed by myself. This larva (in alcohol) was placed in Dr. Leidy's hands for examination, under the microscope. He found on



FIG. 8. Glands upon terminal segments of Lycaenid larva, attended by *Formica fusca*.

each side of the two (or three) last segments, on the dorsal surface, a prominent, circular, brown-colored glandular looking body, with a central depression. These glands were quite distinct from the spiracles, which are not represented in the accompanying cut. Fig. 8 shows the appearance of these glands as situated upon one side of the terminal segments.

It is possible that the last three segments are here represented, the last (twelfth) being contracted. Dr. Leidy found no opening at the summit of the tenth or other segment, corresponding with the button-hole-like secretory gland described by M. Guenée. The above facts are all of very great interest, and may

prove to be another important factor in solving questions concerning the food supply of ants under both ordinary and extraordinary circumstances. Mr. Edwards is now pushing his observations upon the Spring larvæ of this butterfly, assisted by the microscopic skill of Prof. J. Gibbons Hunt, M. D., of Philadelphia.

—:o:—

THE SMALLEST INSECT KNOWN (PTERATOMUS
PUTNAMII).

BY HON. J. D. COX.

THE minute size of this species, which is said to be the smallest insect known, is probably the reason why it has been so little observed, and will justify a somewhat detailed description of a specimen which was caught and mounted in balsam last July.

I was examining the scissor-like mandibles of a leaf-cutter bee (*Megachile centuncularis*), when I noticed upon the surface of the water in which the larger insect was dissected, a mere mite which seemed to have life. Upon transferring it to a smaller cell of water and putting it under the microscope, it proved to be one of the most beautiful little creatures of the insect world, and a rarity which made it no ordinary prize.

Whilst it was not difficult to identify it as the *Pteratomus Putnamii* from Prof. Packard's description in the "Guide to the Study of Insects," it was also evident that the specimen which the Professor had before him in making his drawing and description, had been injured, and shorn of some of its parts, and that something might be added to our knowledge by putting the "winged atom" in shape for permanent preservation.

The first suggestion as to method was acted upon at a venture, and it turned out a rather lucky hit. A clean slide and cover, and the soft balsam were at hand. Her littleness was taken carefully on the point of a needle, dried against a bit of blotting paper, immersed in a drop of balsam and the cover put on, leaving the arrangement and display of the parts almost wholly to the effects of capillary attraction.

The cut is from an accurate tracing by means of the camera, and except as to the position of the wings, will give at once a correct idea of the little creature. The wings were forced somewhat out of place in the mounting, but with the aid of the binoc-