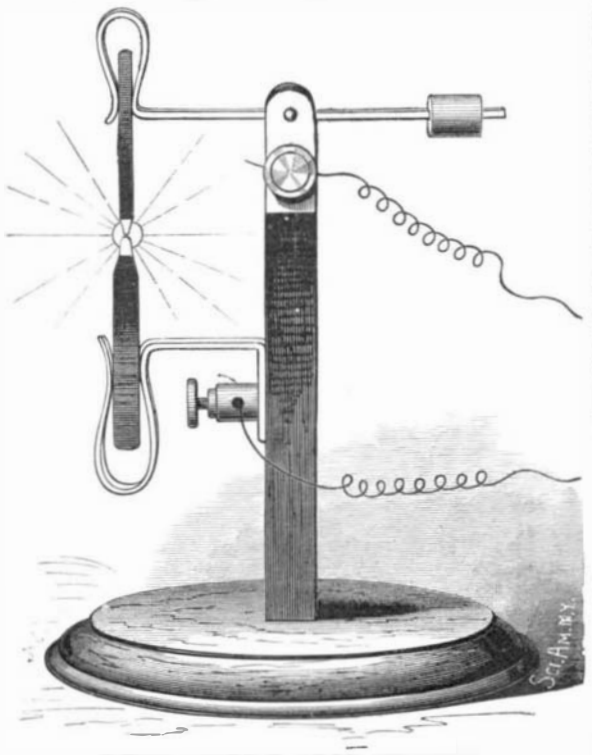
SIMPLE ELECTRIC LIGHT APPARATUS.

BY GEO. M. HOPKINS.

The engraving represents, full size, a very simple and easily constructed apparatus for producing an electric light on a small scale. To the center of the wooden base is attached a vulcanite standard, to one side of which a spring carbon holder is secured by the binding post, which screws into the standard Two brass ears, having apertures for receiving the pivots of the upper carbon holder, are secured to the upper end of the vulcanite standard.

By placing in the U-shaped loop at the end of each holder a small pencil of battery carbon, and adjusting the holders so that the points of the carbons touch, and connecting the instrument with a battery of 4 or 6 Bunsen cells, a small but very brilliant light will be produced.



SIMPLE ELECTRIC LIGHT APPARATUS.

As the points burn away the upper carbon moves downward of its own gravity. The contact of the points, which should be light, is regulated by a movable weight on the straight end of the pivoted holder.

Town Sewage Changed into Hydraulic Cement.

In May, 1872, General Scott read a paper before the Society descriptive of a method of dealing with sewage precipitates, and then described how, by means of fire, the sludge deposited, after precipitation by lime, could be converted into strong and salable cement. That purification by lime will produce a clear effluent, and one which, thrown into a river of sufficient volume, will insure a satisfactory result, is admitted by Royal Commissions and leading chemical authorities, but the great difficulty remaining has ever been how to deal with the vast accumulation of sludge that necessarily takes place. In some cases, as at Birmingham for instance, it costs the town £14 per acre to dig it into the land, which the corporation has secured in connection with its sewage works, while at Leeds and other places it has been a source of great trouble to get rid of at any price. General Scott, however, discovered that the sludge, when dried, contains in it sufficient combustible material to act as a fuel for burning it; and he thus, at a moderate expense, converts the sludge into a powerful and useful cement of the character of Portland or Roman, according to the constituents of the sewage from whence it was derived. Repeated experiments on a more or less extended scale showed the practicability of the process. A few days since a large party, consisting of the Mayors of Burnley and the neighboring towns, with the chairmen and members of sanitary authorities in Lancashire and Yorkshire, met together, by invitation of Scott's Sewage Company, to inspect the works lately erected by the Corporation of Burnley, Eng., for carrying out this process on an extended scale for dealing with the sewage of Burnley.

The Corporation of Burnley was prohibited by injunction from allowing the effluent from their sewers to flow into and pollute the River Calder. The Corporation and Scott's Company entered into a contract whereby Scott's Company engaged to produce and have produced a clear effluent. The injunction has been got rid of, and the Corporation has recorded its satisfaction at the results which the company has attained. The works at Duckpits, a short distance from Burnley, have been erected by the Corporation, after the designs of Mr. W. B. Bryan, C.E., which exemplify the latest scientific views on the subject, in order to deal with all the sewage of the town and district except in time of floods. The Corporation deliver the sewage into the tanks, and then Scott's Company purifies it by lime precipitation, to be supplemented eventually by filtration, through coke if required. The clear effluent passes into the Pendle water which joins the River Calder. The stream into which Colne and Barrowford, Nelson and Brierfield pour their raw sewage is at present unpurified. The Calder below Duckpits also receives a considerable amount of sewage before it joins the Ribble. Duckpits thus placed, as it were, between two sources of impurity, presents a case of some difficulty. How it is met on the Pendle water is shown by the pure effluent discharged into it. The sludge, always an offensive difficulty, is entirely cleared away by its conversion into cement (Portland and other hydraulic and Roman cements). All that has hitherto been made has been sold or used in the works. The cement is sold with a guarantee as to the strength and quality. The company is open to make contracts with any other sanitary authority. The nature of the contract and the cost of working the process depend on local circumstances.

The sewage from the town passes into four settling tanks, after receiving the proper dose of lime cream previous to entering them. After settlement, the time for which varies from a few days to a fortnight, according to circumstances, the sludge is pumped into draining and drying "backs," from whence it is dug out and carried to a heated drying floor. When sufficiently dry it is packed into kilns and burnt, the only fuel used beyond that which it contains being a small amount of coal and shavings to set it alight. At the end of a few hours the kiln is drawn, and the "cement clinkers," as they are termed, are ground into a coarse powder, which forms the cement. The cement is readily salable as Portland or other hydraulic cement, according to the character and treatment of the sludge. It is understood that these are the first works on a commercial scale for carrying out the process. The Corporation are satisfied with the effluent, and the company feel assured that the results of working up to the present time are a money success.

Eau de Cologne as a Peace Maker.

The Rev. H. C. McCook has given to the Academy of Natural Sciences in Philadelphia an account of some experiments he has made to determine the mode of recognition among ants. The pavement ants (*Tetramorium cæspitum*), for example, are very quarrelsome, and fight like human savages whenever members of different colonies meet. They challenge all comers. If friends, they pass on; if foes, they interlock antennæ, and "have it out" on the spot. Mr. McCook thinks that they recognize friends and foes (as some savages do) by the sense of smell; and he has made the curious discovery that when fighting factions of these ants are enveloped in an atmosphere of eau de Cologne, they instantly become friendly; a truce is declared, and these natural enemies go on together for several days amicably feeding, burrowing, and building. We infer that the truce holds so long as the peace compelling atmosphere is maintained. Carpenter ants, on the contrary, are not amenable to this treatment, but go on snipping off each other's heads without regard to their fragrant surroundings.

Philanthropists may possibly find a pregnant hint in these observations. Who knows but it may be possible to discover eau de Cologne adapted to allay human passions; so deftly compounded that a bottle or two broken over the heads of rival factions (say on the 12th of July, or in a Bulgarian village) would insure instant amity?

INTERESTING EXPERIMENTS WITH LYCOPODIUM SEEDS.

The seeds of the *Lycopodium clavatum*, or club moss, are so fine that they appear as a yellow powder, and repel water so powerfully that a person may thrust his hand below the surface of water that has been well sprinkled with it without wetting his hand. This property renders it useful as a preventive of chafing in infants, and as a coating for pills to prevent their sticking to each other.

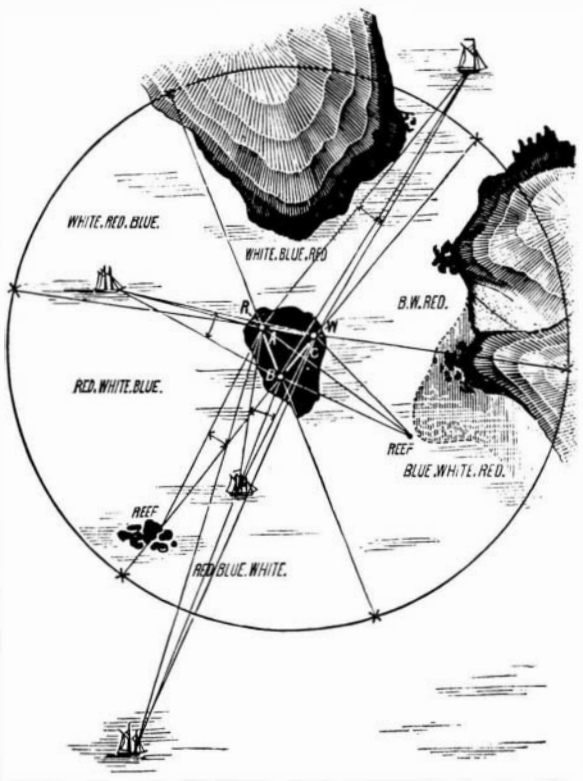
It has another curious property: if a teaspoonful of it be placed in a saucer, the flame of a common match will not light it; it appears to be as incombustible as table salt; but if a small quantity of it be placed in a short paper tube and blown over the flame of a candle in a cloud, as shown in the engraving, it will burn with a flash like gunpowder, affording a good illustration of the dangerous explosive that is formed when carbonaceous dust is mingled with a certain proportion of air; and shows the necessity of reliable means for the removal of such dust from flour mills, and other manufactories where it is liable to accumulate.

There seems to be good ground for supposing the recent terrible explosion and burning of the flour mills at Minneapolis, Minn., were due to the presence of mill dust.

METHOD OF DETERMINING THE POSITION OF VESSELS.

Mr. P. A. de la Nux, of Haulei Kauai, Sandwich Islands, sends us the following very ingenious method of determining the position and distance of vessels as they approach the coast.

The lighthouses can at present only be used for the position of vessels by an inspection of the compass, while the distance is obtained by the height above the horizon. Frequently, however, the compass is not reliable, and especially near the coast, and also at night the horizon is distinguished only with difficulty. It cannot be observed at all if an island or other piece of land is between it and the vessel. The lighthouses lose, therefore, in utility the nearer a vessel approaches the land.



METHOD OF DETERMINING THE POSITION OF VESSELS.

The following method may be employed to fix positively the position and distance of a vessel:

A B C are three lights of different colors, which are preferably double lights, so as not to be confounded with stars. They are placed on the angles of a triangle at the entrance of a harbor or passage. in such a manner that their rays extend over as large a circular space as possible.

It is evident, by reference to the illustration, that no two positions of a vessel can give the same angles. The position of the vessel is then readily determined by the order in which the colors of the light are seen, as thereby the sector is given in which the vessel is situated. The distance of the light indicates in what part of this sector the vessel is, while finally the size of the angles formed by lines drawn to the lights furnishes the exact distance of the vessel therefrom. The shape and size of the triangle can, of course, be changed and adapted to the nature of the locality. Three lights are sufficient, but more, arranged in quadrangle, etc., may be used.

Tables can be calculated for each place, according to the size, shape, and position of the lights, by which, on taking the angle of the vessel to the lights, its position and distance may be instantly determined.

The Preservation of the Teeth.

Dr. J. W. Clowes, of this city, is one of our oldest and most esteemed practitioners of dentistry. He is accustomed, on dismissing a patient, after putting the teeth in good order, to present him with a copy of a neatly printed little tract, full of excellent hints, as follows:

DIRECTORY, EXPLANATORY, AND VALEDICTORY.—When the teeth of a patient have been under professional treatment, to the extent of a thorough overhauling or placing in order, he is advised as follows, for his personal observance and benefit.

Saving a set of teeth is one of the most positive and undoubted processes in the world, providing the dentist does his work well and the patient does likewise. This statement is made in all candor, that the patient may comprehend his position; for, if he would retain his teeth, he must "make an effort"—he must, indeed, be a co-worker. When both the dentist and patient are faithful, there can be no result but success. Therefore, O reader! peruse, ponder, and practice these

DIRECTIONS.

In the morning, before breakfast, always brush your teeth—first with water only, then with powder. Powder should be used at least once a day. Without powder teeth cannot be kept clean. Using a brush with tooth soap, just before retiring at night, is a commendable practice. To brush effectually, place the upper and lower rows of teeth parallel to each other, the points of the fronts touching; then use your brush up and down the teeth between the gums, being not unmindful nor fearful to brush as well the gums as the teeth—thereby toughening the one and cleansing the other. Your back teeth need more brushing than your front ones. Wisdom in this respect will be displayed,

should you show a partial care for the back and outsides of the rearmost teeth, above and below. After each and every meal use a quill toothpick, waxed silk floss, and rinse the mouth with moderately cold water. The intention of these is simply to remove food from among the teeth. Decomposed acidified food, animal or vegetable, is the worst enemy your teeth have now to encounter. The enemy, the combat, and the prize are before you! Will you win or lose?

If I have learned how to place your teeth in their present condition of health, I have learned, also, how you may keep them so—as I, in my operations, have employed appropriate implements, so must you in yours.

These implements are always on hand for those who want them. I do not obtrude them upon any one: I merely state the fact that they are attainable. Employ other means—trust to other implements if you will—but in that case absolve me from all responsibility.

We are about to part. Come and see me at least once a year for inspection. This is important. Should you then exhibit evidences of having performed your part of the saving process, a mutual gladness will be ours—that we have not labored and suffered in vain.

Finally—be earnest. If I have been faithful, skillful, efficient, it is because I have been earnest. Earnest thought—earnest will—earnest action—never fail! They are the synonyms of success.

THE NEOMORPHA.

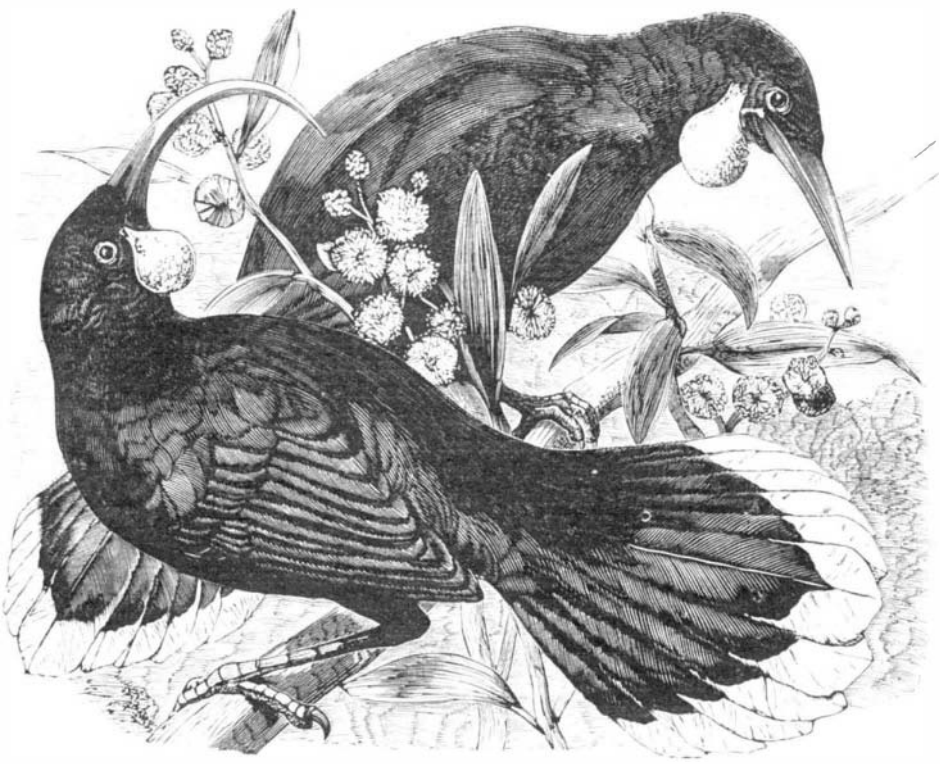
The very remarkable bird which is depicted in the accompanying engraving has been very appropriately named neomorpha, or new-form, as it exhibits a peculiarity of formation which, so far as at present known, is wholly unique.

The locality and habits of the neomorpha are briefly but graphically described by Mr. Gould in the following passage, which is taken from his "Birds of Australia:" "These birds, which the natives call *E Elia*, are confined to the hills in the neighborhood of Port Nicholson, whence the feathers of the tail, which are in great request among the natives, are sent to all parts of the island. The natives regard the bird with the straight and stout beak as the male, and the other as the female. In three specimens which I shot this was the case, and both birds are always together.

"These birds can only be obtained by the help of a native, who calls them with a shrill and long-continued whistle, resembling the sound of the native name of the species. After an extensive journey in search of them, I had the pleasure of seeing four of them alight on the lower branches of the tree near which the native accompanying me stood. Anxious to obtain them, I fired; but they generally come so near that the natives kill them with sticks."

In the coloring of its plumage it is, although rather dark, a really handsome bird when inspected in a good light. The general hue of the feathers is a very dark green, having a bright glossy surface. Upon each side of the neck is a fleshy protuberance or "wattle," analogous to the wattle of the common turkey, and of a rich orange color during life. The tail is of the same deep black-green as the rest of the body, but the uniform monotony of the tint is pleasingly interrupted by a broad band of pure white which is drawn around its edges. The bill is of a rather dark brown color, and is lighter toward the extremity than at the base.

We take our illustration from Wood's "Natural History."



GOULD'S NEOMORPHA.

Natural History Notes.

The Reproduction of Eels.—It has always been a mystery how and where eels are developed, and many fanciful and singular statements have been made regarding the method of reproduction of this very common fish. For instance, not long since we saw it stated that Seth Green believes eels to be merely hybrids between other species of fish, and consequently incapable of reproduction. Doubt on this subject, however, has finally been set at rest by the discovery of eels with eggs—a discovery due to Mr. V W. Edwards, of Wood's Hole. According to the proceedings of the Boston Society of Natural History, recently issued, Mr. F. W. Putnam, at a meeting of the society in January, exhibited one of the eight specimens procured from the market at New Bedford by Mr. Edwards, and by him sent to Professor Alexander Agassiz. The specimens were all of one species, the common fresh and salt water eel (*Anguilla bostoniensis*). In allusion to this subject, Mr. Putnam remarked that all that is known at present is that "this year, for a month past, the eels brought into New Bedford are with eggs in various stages of development. Where they spawn is as yet unknown." The eight specimens examined by Mr. Putnam had ovaries in various stages of development. In two the ovaries were very small, and the eggs exceedingly minute. From these the series showed a gradual increase in the size of the ovaries and the contained eggs. In the specimen exhibited, the eggs were still so small as only to be seen by a lens of considerable power, and not yet ready to be excluded, though the ovaries were large and full. These circumstances seem to point to the fact that, contrary to the usual slow development of eggs in fishes generally, eels rapidly attain their seasonal development; the ovaries, immediately after the eggs are laid, being reduced to a minute size. In the specimen exhibited the ovaries were white, slightly plicated, and of great length, extending from the base of the liver along each side of the intestines to and beyond the anal opening; the left ovary passing for some distance into a cavity of the muscles on the side of the anal fin, while the right ovary does not extend quite so far. When the eggs reach maturity they are dropped into the abdominal cavity, from which they must pass by two very small peritoneal outlets on each side the anal opening and just back of it. These female eels were all silvery on the under side, being the variety known as "silver bellies." It would be interesting to know whether the "golden bellies" variety are the males of the fish.

Habits and Intelligence of the Yellow Hornet.—Mr. Thomas Meehan exhibited, before the Philadelphia Academy of Natural Sciences, young branches of the European ash (*Fraxinus excelsior*), and of the common lilac, which had been stripped of their bark during the summer by the large yellow hornet (*Vespa maculata*). The insects had been carefully watched at the work. They visited these trees in large numbers, and carried the strips of bark away in their mouths. For what purpose they used the bark could not well be ascertained. It is usually supposed that they collect the matter from which their huge nests of paper-like material are made from fences and other dead woody matter. Mr. Meehan thought it remarkable that the insect should collect from plants of the same natural order only, as careful examination of other plants in the vicinity could decide. This hornet, he remarked, was gifted with great intelligence. On one occasion he had observed one with a summer locust, several times its own size, endeavoring to rise with it from the ground and fly away, but failed from the great weight of the locust. It then walked with its prey about thirty feet to a tall maple, which it ascended to the top, and then flew off with its burden in a horizontal direction. There was more than instinct in this act; there was reasoning on certain facts, and judgment accordingly, and the insect's judgment proved correct.

A Living Fish Line.—In the ocean, down among the sea weed stems and pointed rocks, we perceive a long, black, tangled string, like a giant's leather boot lace set to soak. Let us trace it in its various folds and twists, and disentangle some of it; we shall then have in hand a tough, slippery India-rubber-like substance, which might well be pronounced a sea string, and classed with the long trailing weeds among which we have found it. It is a sea string, but not a weed; in fact, a living lasso, capable of consuming the prey it incloses within its treacherous folds. From twenty to thirty feet is no uncommon length for this artful animated fishing line to reach, but its diameter rarely exceeds an eighth of an inch. It has a mouth, however, capable of considerable distention and holding power. Nothing can appear more innocent than this delicate-looking creeper, trailing here and there, as the water wells and flows with the incoming tide. Let an unwary tube dweller, lulled into a false security, stretch forth its tentacles to meet the welcome waves, and a pointed head is adroitly insinuated; the mouth effects a tenacious grasp on the yielding tissues, and the tenant of the tube becomes food for the "long sea worm" (*Nemertes borlassii*), for such is the name of the cord-like freebooter. This strange animal belongs to a group of worms closely allied to the entozoa (parasitic worms), having flat, soft, and often very contractile bodies, but their chief distinguishing characteristic being that they are entirely covered with cilia, by the movements of which they glide over any smooth surface. The length of this extraordinary production of nature is positively prodigious, and its whole history has more the appearance of fable than of sober truth. Charles Kingsley took more than ordinary interest in this creature. He inquires, "Is it alive? It hangs helpless and motionless, a mere velvet string, across the hand. Ask the neighboring annelids, and the fry of the rock fishes; or put it in a vase at home and see. It lies motionless, trailing itself among the gravel. You cannot tell where it begins or ends. It may be a strip of dead sea weed, or even a tarred string. So thinks the little fish, who plays over it and over it, till he touches at last what is too surely a head. In an instant a bell-shaped sucker mouth has fastened to its side; in another instant, from one lip, a concave double proboscis, just like a tapir's, has clasped him like a finger. And now begins the struggle, but in vain. He is being 'played' with such a fishing-rod as the skill of a Wilson or a Stoddart never could invent; a living line, with elasticity beyond that of the most delicate fly-rod, which follows every lunge, shortening and lengthening, slipping and twisting round every piece of gravel and stem of sea weed with a tiring drag, such as no Highland wrist or step could ever bring to bear on salmon or trout. The victim is tired now, and slowly yet dexterously his blind assailant is feeling and shifting along his side till he reaches one end of him; and then the black lips expand, and slowly and surely the curved finger begins packing him end foremost down into the gullet, where he sinks inch by inch, till the swelling which marks his place is lost among the coils, and he is probably macerated into a pulp long before he has reached the opposite extremity. Once safe down, the black murderer contracts again into a knotted heap, and lies like a boa with a stag inside him, motionless and blest."

The Toilet Habits of Ants.—The Rev. H. C. McCook, whose valuable observations on the habits of ants we have before had occasion to record, states that the agricultural ant (*Myrmica*)—and the remark applies to all other ants of which he has knowledge—is one of the neatest of creatures in her personal habits. He has never seen one of his imprisoned harvesters (either *M. barbatus* or *M. crudelis*) in an untidy condition. They issue from their burrows, after the most active digging, even when the earth is damp, without being perceptibly soiled. Such minute particles of dirt as cling to the body are carefully removed. Indeed, the whole body is frequently and thoroughly cleansed, a duty which is almost invariably attended to after eating and after sleep. In this process the ants assist one another; and it is an exceedingly interesting sight which is presented to the observer when this general "washing up" is in progress. They gather in groups upon the earth, cleanse themselves and each other, and sleep. The first operation was observed to be as follows: The ant to whom the friendly office is being administered is leaning over upon one side, as we begin the observation. The cleanser is in the act of lifting the foreleg, which is licked, the mouth passing steadily from the tarsus up to the body; next the neck is licked, then the prothorax, then the head. The attitude of the cleansed all this while is one of intense satisfaction, quite resembling that of a family dog when one is scratching the back of his neck. The insect stretches out her limbs, and, as her friend takes them successively into hand, yields them limp and supple to her manipulation. She rolls gently over upon her side, even quite over upon her back, and, with all her limbs relaxed, presents a perfect picture of muscular surrender and ease. If analogies in nature were not so apt to be misleading, we might venture to suggest that our insect friends are thus in possession of a modified sort of emmetonian Turkish bath. The ants engaged in cleansing their own bodies have various modes of operating. The forelegs are drawn between the mandibles, also through and along the lips, and then passed alternately back of the head, over and down the forehead and face, by a motion which closely resembles that of a cat when cleansing with her paw the corresponding part of the head. The hairs upon the tibia and tarsus seem to serve the purpose of a brush and comb, and Mr. McCook thinks that the object in drawing the leg between the mandibles or through the teeth is to straighten up the hairs, and thus increase their efficiency for service. Moisture from the mouth is evidently used for washing. He has seen one ant kneel before another, thrust forward the head under the face of the other, and lie motionless, expressing quite plainly the desire to be cleansed. The other ant understood this, and went to work. The amount of time devoted to these toilet duties is very great with im-