The Alligator Industry.

The business of killing and catching alligators gives occupation to many persons in the South. According to the St. Louis *Globe-Democrat* the hide of a large alligator is worth from one to two dollars. It is almost a day's task to skin a large one. Alligator oil has quite a reputation as a remedy for rheumatism. It has, however, a most unpleasant smell, unless properly treated. Many fishermen have been known to eat portions of the meat, that of the tail being said, when cooked, to have much the appearance of veal and to taste something like pork. Quite a lucrative business is that of capturing alligators alive to send away for exhibition. Colonel Williams, when Spanish Fort was made a summer resort, made a contract with a fisherman to fill the hole known as the alligator pond for him, and in the course of a couple of weeks he had it stocked with thirty or forty, ranging in length from 6 inches to 7 or 8 feet. The man who caught them showed no fear in handling the huge reptiles. With a companion he would capture and bring into camp an alligator 16 feet long.

The manner of accomplishing this feat was, as he explained, quite simple. The old are savage and will fight for their young, and this fact is taken advantage of. Some of the young are caught out of the spot in which the old one is lying, and a stout noosed rope is then placed where to emerge she must thrust her head through it. When all is ready the young are allowed to cry out, and the old one thrusts out her head to have her neck caught in the noose. She is dragged around in the water until pretty well choked, when another noose is secured to her tail, and she is firmly strapped, stomach downward, on a wide board, which she cannot break, as her powerful muscles in the tail act only in a lateral direction. Her head is then fastened to the boat, the noose about her neck is removed, and she is towed away after her young have been placed in the skiff.

Young ones are bought by dealers for from $2 to $4 a dozen, if not over a foot in length. When they sell them they get a much higher price, as they are hard to preserve alive. The large ones are sold differently, there being an increase in price of 50 cents to $1 for every additional foot over a certain length. Alligators 16 or 18 inches long are frequently found by the dozens in shallow water, and can be handled without trouble, providing the old one, who is generally near, does not take alarm. Most alligator fishers are usually turtle hunters also, and search along the shores of bayous and lagoons for the holes of the animals. When the hole is discovered it is explored with a long pole with a big hook set in the end, and if the unfortunate resident is at home he is promptly dragged out in spite of his struggles and quickly appears in market. The eye of a young alligator is a queer and pretty sight, having the fire and appearance of an opal of a similar size.

Embalming.

Experiments have been made at the New York morgue to test a process by which it is claimed dead bodies, though badly swollen and decomposed, can be restored to something like a natural appearance, and preserved so that it will be recognizable after months of burial. The subject operated upon was the corpse of an unknown woman who had died from erysipelas. It was soft, black and blue, and out of all human proportions. An incision was made in the right leg and an embalming fluid injected into the femoral artery. In less than half an hour the body assumed its natural size, became harder than in life, and as the degree of hardness increased the discoloration disappeared, leaving it of a marble whiteness. The body of a man, operated upon seven weeks before, had been kept unburied without decomposition. It retained a natural appearance, and was without odor.

A flywheel, said to be the largest in the United States, has been built by Watts & Campbell, of Newark, N. J., for Clark's Thread Works, of that city. It is twenty-five feet in diameter, with a face of seven feet six inches. It has three crowns for three belts, each twenty-four inches wide. It weighs 49 tons.

THE NATURAL REDDENING OF WATER.

In human societies the persons most in sight are rarely the most useful. The obscure workers, the humble and the ignorant, are in reality the ones who render the most service. It is the same in animate nature; among living beings it is the smallest, the least well known, that play the greatest role in the world. The formation of certain continents is the work of microscopic organisms which, for a long series of ages, have worked without relaxation at the bottom of the seas. In our brooks and our stagnant waters, in the air that we breathe, upon the earth that supports us, in the interior of our own bodies, and in that of the higher animals, magnifying apparatus reveal to us the presence of myriads of microbes which are accomplishing in silence gigantic operations. Invisible agents for reducing organic matter, they decompose the carcasses of animals, as well as dead plants, and cause their elements to serve for the elaboration of a new life. Like those ghosts that superstition has engendered, we are all born, in fact, as in a cemetery, partly formed from the *débris* of generations that have passed away. This circulation of matter, which renders us a portion of the past and connects us with the future, is effected through the innumerable legions of animalcules and microphytes that surround us. Of these, there are some, indeed, that enter our blood and our tissues, and bring about contagious and frightful diseases.

However infinitesimal are these little beings with respect to ourselves, they are worthy, then, of fixing our attention. To him who studies them they offer every day a new surprise. We find them, in fact, indefatigable actors in the drama of life, in a large number of natural scenes whose splendor and novelty excite our admiration. Such is the magnificent spectacle of the phosphorescence of the sea. I have had the good fortune to witness several times during the last two years a phenomenon none the less curious, in the tanks that serve for watering the Jardin des Plantes, at Paris. This was the conversion of the water into—I was about to say wine, so similar to the latter in its beautiful red color was the water that I had observed a few days before perfectly clear. Nothing could have allowed the extraordinary change that occurred to be foreseen. Great was my surprise, then, when I found that the entire liquid, from the lower part of the tank up to the surface, was strongly tinged with red. Drawn up by means of a pipette from different depths, it everywhere exhibited the same appearance. When poured into a glass it exhibited by either reflected or transmitted light almost the same aspect as a solution of fuchsine. And yet, far from being cloudy, far from holding the least visible particle in suspension, it was absolutely limpid. The microscope caused the prodigy to vanish; for, on examining a drop of the bloody fluid under a magnification of 500 diameters, although I found it as hyaline as normal water, I discovered in it clouds of red organisms in motion, as numerous as the stars in the heavens. Nothing can give to one who has not seen it any idea of so immense an overflow of life in so small a space. The restlessness of these animalcules was extreme; pressed one against another, they swam with wonderful rapidity in all directions in the liquid, some turning over and others moving in a spiral or describing fantastic sinuosities and endless gyrations. The apparent coloring that the water exhibited to the naked eye was due, then, to the multitude of living beings that it contained. Fig. 1 shows these curious little animals as I observed them in the water. They are very different from the algæ (*Hematococcus nivalis*) which, according to Ehrenberg, sometimes color mountain snow red. They approach, rather, the nudoflagellate infusoria, and I refer them, in fact, to the group of monads, although the organism, *Monas okenii*, Ehrbg., with which I identify them, has not offered me all the characters now attributed to that group. I have been enabled to cultivate them, follow their movements, and then to reproduce artificially in the laboratory the phenomena that they give rise to in nature. My object in making them known is to incite others to researches of the same kind; for I feel only too well the imperfection of my own, and the great interest it would prove to science to have them completed by more extended observations. It has doubtless happened that many persons have been struck with the singular coloration that the water of ponds in the country takes on at certain seasons of the year. Were the liquid submitted to microscopic examination there would probably be observed in it an infinity of animalcules analogous to those whose evolution I have endeavored to determine.

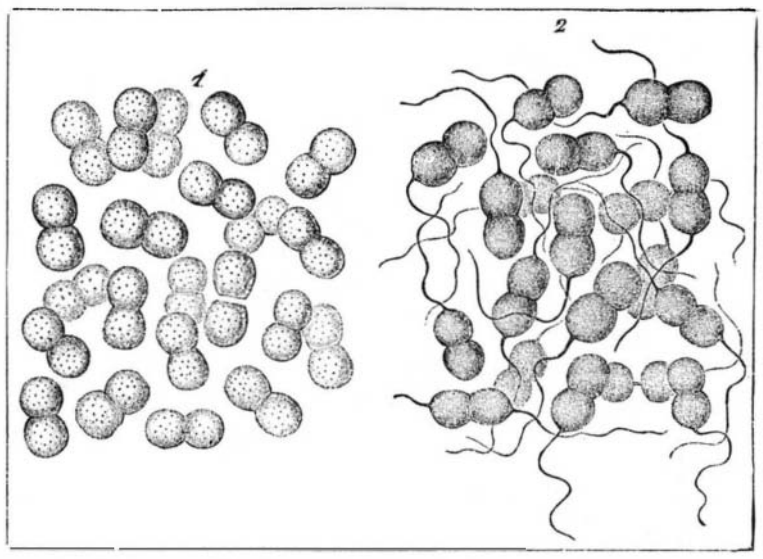

Fig. 1. *Monas Okenii* in the course of active division.—Fig. 2. The same colored by Paris violet. (Magnif. 530 diameters.)

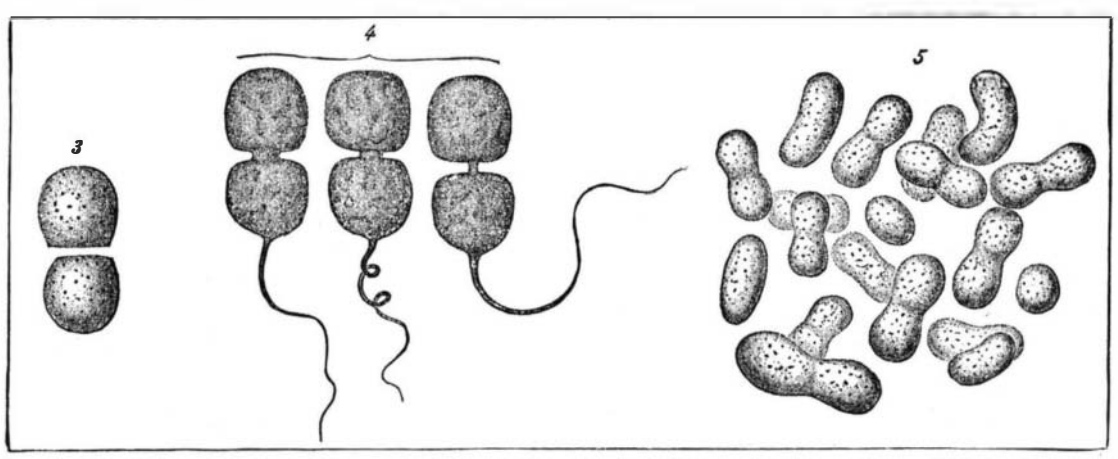

Fig. 3. *Monas Okenii*, not colored, and considerably magnified, so as to show the apparent interruption produced by transverse scission.—Fig. 4. The same colored by Paris violet, and considerably magnified to show transverse scission.—Fig. 5. *Monas Okenii* exhibiting a not very frequent division. Protoplasm colorless, containing extremely fine granulations. (Magnif. 530 diameters.)

It would prove very important for biology in general to gather precise facts as to the development, mode of nutrition, and reproduction of those beings that represent living matter naked, so to speak, and consequently life itself in its simplest state, in what it possesses of absolutely essential.

Unfortunately, when we wish to study these little organisms in all the phases of their existence, a great difficulty presents itself, for the liquid which contains them is soon invaded by a foreign population which disputes with them the empire of the water; infusoria, bacteria, micrococci, diatoms, and algæ of all kinds multiply therein, and, through their rapid and abundant development, exhaust the nutritive qualities of the medium. In this contest for existence the microscopic animalcules, whose modification it was proposed to detect, soon succumb, and it becomes impossible to continue the observation.

I have overcome such a drawback by doing the planting in liquids that have previously been deprived of germs by heat and afterward preserved from contact with the air in vessels inaccessible to atmospheric dust. Experience had taught me, in fact, that monads are great consumers of oxygen. It became necessary, then, to open the door to the outside air, and to close it against

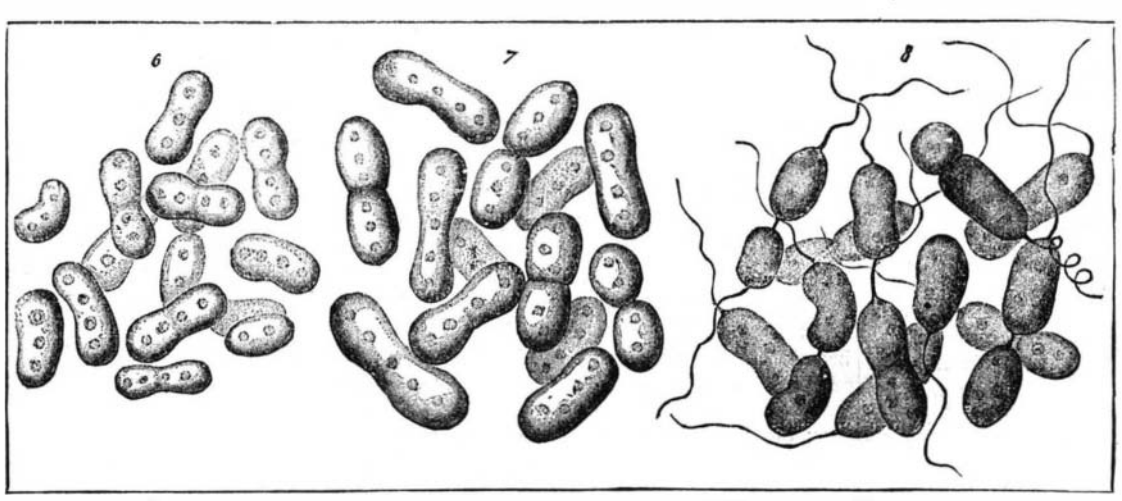

Fig. 6. *Monas Okenii*, showing a not very frequent mode of division. (Magnif. 530 diameters.)—Fig. 7. *Monas* dividing only after having acquired a large size.—Fig. 8. The same colored by Paris violet.

that heterogeneous army of spores that it always holds in suspension in houses, inhabited rooms, and especially in laboratories. The use of the Pasteur *matrass* has enabled me to attain such conditions for success.

This vessel (Fig. 9) consists of a small flat-bottomed glass flask, the neck of which is covered with an emery-ground cap that tapers above into a tube of small diameter filled with cotton. After introducing into twenty of these flasks the liquid found proper for the development of the monads, I close each one with its cap and put it into a stove provided with a regulator. In this I keep them for five hours at a temperature of 125° C. All the germs contained in the interior of each matrass, either against the sides of the vessel, in the liquid, or in the cotton wad, are thus destroyed.

The air which, during the cooling, enters the vessel through the tube of the cap filters through the cotton, and deposits the germs with which it is charged on the upper surface

Fig. 9. Fig. 10.

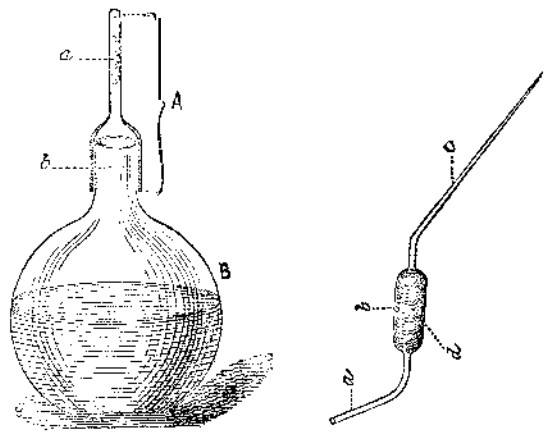

Fig. 9. *Pasteur Matrass.* A, the cap; *a*, wad of cotton; B, the flask; *b*, its neck.—Fig 10. *Pipette.* *a*, tube for sucking and blowing; *c*, tapering tube serving to introduce the objects into the liquid; *b*, inflated part filled with cotton, *d*.

thereof. The liquid remains, then, perfectly pure, and may be preserved indefinitely in that state. To do the planting it is only necessary to remove the glass cap for a few seconds, and to blow into the flask by means of a special pipette (Fig. 10), previously warmed, a drop of the liquid in which a microscopic examination has revealed the *exclusive* presence of the monads. This operation, when well executed, introduces impurities into only a small number of the flasks. We may say, then, that the results of it are excellent.

As for the liquid with which the matrass is to be half filled for cultivating the monads, it is necessary to select it carefully. Thus, the very water that these animalcules colored red was found improper for such use; the tank that held it contained a large quantity of plants of all sorts that constituted a constantly renewed food for the microscopic organisms, but deprived of such vegetable matter it ceased to be nutritive. The thought then occurred to me to boil the water with the plants and organic detritus of the tank, then to filter it, sterilize it by heat, and to aerate it. This process succeeded very well. I also had recourse to veal bouillon and to Liebig bouillon, diluted with water, adding to it a few drops of a weak solution of potassa to bring the bouillon, of itself acid, to a neutral or slightly alkaline state.

In both cases the monads developed so quickly in the interior of several matrasses that they formed, a few days after being planted therein, a red cloud suspended in the liquid. Thanks to this process, and to cultures tried with less success, it is true, in vessels from whence vital concurrence was not banished, I have been enabled to determine the structure of the monads, and, in these minute agents that redden water, a whole series of interesting transformations whose succession it was of importance to ascertain accurately.

When these microbes are sown in a properly prepared liquid they develop therein in abundance. In the majority of cases they fall to the bottom of the vessel, but sometimes they swim either at the upper part or in the middle of the liquid and form there a very remarkable red zone. Under each of these circumstances they exhibit a peculiar phenomenon. When they form a floating cloud they are always in the course of active division (Fig. 1), their joints are short, their motions are very lively, and in the interior of their body, which is hyaline, are seen numerous red granules. Then they deposit themselves on the bottom of the vessels and cease to divide so actively; but they increase more (Fig. 5), their motions become slower, and their granulations less numerous and especially much finer.

They are found also in the water of ponds and laboratory aquaria in a very agile state around aquatic plants. Growing then enormously, without segmenting, they are much elongated (Figs. 6 and 7), and exhibit very large dark-red granulations, perfectly spherical, in the interior of their bodies, whose mass is then of a pale rose color.

All these transitions from one state to another can be studied by cultures in flasks. We may, even, by possessing one, reproduce the others at will. Thus it is that the elongated form shown in Fig. 7, when sown in a medium rich in nutritive matters, segments very rapidly and gives in a short time the organism shown in Fig. 1, with all its characters.

Microchemical reactions seem to assign to the red globule the role of a reserve material for the organism. They have also permitted me to establish the anatomical characters of the monads, several types of which were studied a few years ago by Prof. Ray Lankester and confounded by that scientist with the bacteria. I have, in fact, been able to convince myself of the absence of a cellulose, ternary, vegetable envelope at the periphery of the body. All reagents that color protoplasm color the external part, and *vice versa.* In alcohol, glycerine, and dilute acetic acid the contraction is general. It is the same during desiccation. The use of Paris violet led me, besides, to discover the existence in monads of organs very different from those figured for bacteria. A very concentrated solution of this reagent brought to light at one of the extremities of the body (rarely at each of them) a filament about twice longer than the rest of the organism (Figs. 2 and 8). It is very delicate throughout its whole extent, exhibits the same refraction as water, and, for this reason, is invisible without the aid of an artificial coloring.

How do these long filaments form? What is their function? I thought I should be able to decide it by coloring them after killing them at different stages of division by osmic acid, which fixes the majority of the infusoria in their forms. I ascertained thus that the two segments of the body which separate from each other, and, although mutually interdependent in their motions, seem to be disconnected (Fig. 3), are in reality connected to one another by an isthmus of the same nature as the caudal filament. It is wholly comparable with the latter, it shrinks in size as it elongates, and it ends by detaching itself from one of the two segments, or by breaking in the middle.

There is no doubt that the caudal filament plays an active role in locomotion. The following is an experiment which well shows how contractile it is: I put a large number of monads into two vessels, each containing distilled water. To one I added a drop of osmic acid (of 1 per cent). Four days afterward I collected the monads and colored them with Paris violet. This reagent brought clearly to light the filaments of the monads, whose forms were fixed by the osmic acid. It did not permit me to see the filaments that the monads that died in the distilled water were enabled to retract freely.

It is not without interest to reflect on what this little mass of albuminoid matter that forms the monad and its flagellum represents with respect to the higher organisms. It corresponds entirely to the protoplasm which constitutes exclusively the living and generating part of each of those innumerable cells of which the body of a man, of a horse, or of an oak consists. All the functions of which this body is the seat are accomplished also in the monad. Only, in the horse for example, the organs are differentiated by the predominance in some of physiological qualities that are weaker in others.

In the *Monas okenii*, on the contrary, the same work is executed by one unicellular and nearly homogeneous body. Although the existence of a locomotive flagellum gives proof of the tendency of the different parts of protoplasm to become specialized, such parts are nevertheless similar enough to act in the same manner. It is due to this simplicity of organization that the microbes can be cultivated in mineral liquids of known composition and serve to determine the physiological mechanism of nutrition.

It would be impossible to dwell too long on the excellence of this method. It is, up to the present time, the only one which allows us to ascertain with accuracy the influence of physical surroundings upon living matter, and the general reactions that it exhibits. It must not be believed, in fact, that the higher animals are alone endowed with contractility and sensitiveness, for these properties belong also to plants, and are common to all living beings. The monads that produce a reddening of water offer a surprising example of this, for they direct themselves toward the light. On observing them in laboratory aquaria I have remarked that they developed themselves preferably against the sides exposed to the light. On this subject I made the following experiment: I poured water rich in monads into glass crystallizers, the whole inner surface of which I had covered with mineral pitch, except one point designed to allow the passage of the light. The vessels were covered with disks of black cardboard. At the expiration of ten minutes a microscopical examination of the water showed me that all the monads had left the dark parts of the crystallizers and concentrated themselves against the little window that gave access to the luminous rays.

Such a phototactism recalls that of chlorophyl bodies. Is it in the monads connected with the existence of the red matter with which their globules, and sometimes their protoplasm itself, is colored? It has been impossible for me to decide. I have not succeeded, either, in obtaining the coloring matter in sufficient quantity to study its chemical constitution and its absorbing power. As it is very soluble in alcohol, it will be easy, the first time water is seen to redden, to obtain it by filtering the water and taking up the residue in alcohol. Such an occasion of continuing, under fitting conditions, the researches that I have begun into the monads will often present itself to naturalists who live in the country. I call the attention of those to it who think, with Fredol, that there is nothing so small to the sight which does not become great by reflection.—*Louis Olivier, in La Nature.*

A City of Water Jugs.

The various roads leading from the country to this city present a curious spectacle in the early morning, the ways being encumbered with numerous vehicles heavily laden with casks and jugs of different sizes, filled with fresh water from the numerous springs in adjoining towns. These jugs are distributed to stores, counting-rooms, and houses in all parts of the city, and the water is used for drinking and culinary purposes in place of the Cochituate water, which is supplied to almost every inhabitant. The empty jugs are picked up by the enterprising water carriers, and returned again filled with the sweet water of the country springs.

The cost of this supply of water is large to individuals, and very large in the aggregate, and the luxury can be indulged in only by those of ample or fair means.

The cause of this amusing display of water jugs in the streets, counting-rooms, banks, restaurants, dwellings, etc., is that an impression prevails that the water supply of the city is not suited to domestic uses by reason of impurities. There has been noticed for many months a disagreeable odor and taste in the water, and protracted discussion has occurred as to the cause of this offensiveness. The resources of science have been exhausted in efforts to discover the cause, but without any satisfactory results. Professor Remsen had the good luck to hit upon a plausible theory, which attributes the difficulty to the growth and decay of fresh water sponges in the ponds or supply basins; but as these sponges exist in considerable quantities in numerous ponds in New England where the water is perfectly tasteless and unobjectionable, the theory has no good grounds to rest upon.

The sponges are found in six or eight ponds in Essex County, where the conditions are precisely similar to those of the Framingham pond, and no unpleasant results to the water are observable. If the Remsen theory were satisfactory to the water takers, and would have the effect to quiet apprehensions, the labor would not have been lost; but such is not the case.

In one view the condition of the city water supply is greatly exaggerated, and that relates to its possible unhealthfulness. We do not conclude, from the results of many years' observation upon the sanitary influence of New England pond waters, that there is anything contained in Boston water at present which is positively deleterious to health. These country water basins are to a large extent similar in their surroundings, and they swarm with the lower forms of animal life, and large quantities of fish of various kinds are present; but they have no positive anti-sanitary influence. They may confer disagreeable physical qualities, but not chemical.

Boston water contains no impurities which may not be removed easily and readily by mechanical means. The inflowing of water jugs may meet the ends of a conceit, and so far as it is confined to wealthy citizens the conceit is apparently harmless; but poor people cannot afford to purchase water in jugs, and they are excited to alarm by the acts of those who can afford it. The jugs create uneasiness and apprehensions on the part of the mass of the people of the city, without doubt.

By filtration, even by the most simple means, Boston water becomes pure and inodorous, and as good for domestic uses as any brought from springs. The use of ordinary flannel, of several layers, securely attached to a water faucet in the form of a small bag, gives to the inflowing water a colorless appearance, and removes nearly all offending matters. It is better, however, to use a filter of more efficient nature, and this can be of home construction and cheaply made. A cylinder of tin, three inches in diameter and six or eight inches long, filled with alternate layers of clean beach sand and pounded charcoal, answers an admirable purpose. It may be attached to the faucet by a screw obtained from the plumbers, and there should be a delivery tube at the bottom. It is best to have two delivery faucets, one for filtered water, for strictly culinary and drinking uses; and another for supplies for sink purposes and for washing. A filter used only for water for culinary purposes will serve its end in most families for several months, and when it fails of satisfactory service it may be removed, the contents changed, and again put in its place. If some plumber in the city would construct cheap and convenient filters, costing no more than a couple of dollars, on the plan suggested, he would confer a great service upon the poor people of the city and reap a rich pecuniary reward.—*Boston Journal of Chemistry.*

The Parasol Ant.

A correspondent from the London *Field*, writing from the island of Trinidad, W. I., says:

"We were about returning to the boat when one of Mr. B.'s sons, who had been some little distance away from us sauntering about in the bush, called to me to come back, and, on going to where he was, he pointed to what seemed a broad band of moving leaves right across the path, and, on looking more closely, I saw we had met with one of those enormous swarms of the "parasol ants," which are so destructive to plantations in the tropics.

"They were crossing from one side of the wood to the other, and were traveling in a column of more than a foot and a half in width; and as each insect carried in its mouth a piece of leaf, which entirely covered the body, they presented a singular appearance, like a Lilliputian grove in motion; and, although we watched them for some time, still they came, their numbers seeming to be inexhaustible.

"Nothing can turn them from their course; and although they be destroyed by the thousands, enough will swarm upon the intruder to make him repent interfering with them. On the mainland of South America I have known a fruit tree stripped in a single night by a swarm of these ants."