

power cost £1 per light when the lamps were distant two hundred yards from the engine, it would cost £4 per light if they were distant four hundred yards; while there would be a constant loss in the conducting wires equal to about ten per cent. of the total power. Some members of the Corporation Committee, however, held that the makers of the "Otto" gas engines had now reached a point in their manufacture which did away with the risks and disadvantages urged against their use for this purpose. Those who visit the new library any evening now can see in the perfectly satisfactory nature of the lighting how well grounded this belief was. So perfect is the lighting, and so well have the "leads" been arranged, that the variation of power in the light from the top to the bottom of the building—from the starting place to the furthest point to which the power is carried—does not exceed two per cent. For the first few days of the lighting those who had predicted evil things of the gas motors found cause of complaint in a concussion produced by their working, arising from the explosion caused by the gas. This, however, was quickly remedied by the completion of the exhaust receiver—a brick enclosure filled with rubble, over-laid by a four-inch deposit of river sand; by which the noise of the explosion is rendered imperceptible. The engines are of 12 horse-power each, and are supplied from two 80-light meters.

THE ENTOMOLOGY OF A POND.—(Knowledge.)

BY E. A. BUTLER.

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The Middle Depths.

About a month after the hatching of the eggs, it is time for this aquatic life to close, and an existence less gross and far more ethereal now lies before the little creature, which has, however, by this time nearly completed the cycle of its moral life, and so has but scant opportunity left to enjoy the greater freedom and pleasures which the acquisition of superior powers will bring. Within that ugly, limbless pupa-case has been formed a delicate, long-legged, feathery-horned, two-winged, sylph-like being, which, like the Prince in the old story of "Beauty and the Beast," is but waiting the removal of its hideous disguise to appear in all its rightful elegance and grace. The moment of deliverance having at length arrived, the pupa tail is brought up level with the surface, a considerable part of the thorax being thereby caused to rise above the water. The skin then splits between the two horns, and the imprisoned fly begins to emerge at the opening. This is the most critical moment in its whole career, for with head and thorax released, but legs still encumbered by their encasement, the creature is perfectly helpless and, at the same time, rather top-heavy, so that a sudden gust of wind may in a moment capsize the tiny boat and disappoint the hopes of the half-liberated fly, which can then look forward to nothing but a miserable death by drowning. If, however, no such mishap occurs, the struggling insect gradually drags out first one pair of legs and then another, and then, leaning forward, rests them on the water and draws out the third pair; then making use of the empty pupa skin as a sort of canoe, it soon dries its wings and mounts aloft to join its companions, who everywhere around are at the same time putting on their adult costume. In their society we will leave it for the present, hoping to meet it again later on.

The larvæ of the midges are called bloodworms, and are probably familiar to everyone who has kept a rain-water butt, for such receptacles often swarm with the wriggling, blood-red, worm-like things. They are also abundant in ponds, and, indeed in any stagnant water. The remarks made above concerning the life-history of the gnat apply in great measure to the present insects also. These red, worm-like things, however, must not be confounded with a certain red worm that also inhabits fresh water, forming vertical burrows in the mud of rivers; they are gregarious, and crowd their tiny burrows close together, remaining with their bodies partly protruded, and thus forming large red patches upon the mud, and it is amusing to see the sudden disappearance of such a patch as they all sharply retreat into their holes on the approach of an intruder. These, however, are not insects at all, but true worms, or, as they are called in scientific language, annelids, and have reached, in this vermiform condition, the highest stage in their development. The fly, which is the parent of the red wrigglers of the water butt and stagnant pond, is called

Chironomus plumosus. The larva is rather more worm-like than that of the common gnat, and the pupa carries some elegant plumes of fine hairs on its ungainly thorax.

There is a beautiful little creature, clear and transparent as crystal, that is the larva of another member of this group, and is noteworthy for the variety of curious appendages it carries on the fore-part of its body. Imagine an animal with a pair of arm-like hodies consisting of a stem with long bristles at the end, and used to lash the water, then a stout bundle of hairs movable *en masse*, then a pair of little saws, then a kind of policeman's truncheon, with bunches of hairs at the end, also capable of swaying backwards and forwards, and then a pair of jaws and a set of bristles, and you will see at once that *Corethra plumicornis*, as it is called, must have enough to do to manage properly all these contrivances. Such is its transparency, that it may easily elude observation till its wriggling, jerky motions betray its presence. This same transparency, however, affords wonderful facilities to the microscopist for the study of its internal anatomy and physiology, for, by aid of the microscope, all that is going on in its interior is made plainly visible. It is, of course, a distinct advantage to be able to study the action of an animal's internal organisation without interfering with the free action of its parts, or placing it under abnormal conditions, as there is thus less chance of mistaking for essential peculiarities accidental ones, such as might be induced by the altered circumstances. It is not to be wondered at, therefore, that this creature has become classic by having been made the subject of elaborate investigation by more than one observer; and, indeed, there are few more entrancing occupations to those who have a desire to search out the secrets of nature than to watch, hour after hour, under a good microscope, the varied actions and vital processes of this and other minutiae of animal life. It must not be ignored, however, that the very transparency of parts tends also to introduce a certain element of difficulty into the investigation; for where several organs overlies one another it is not always easy to trace their relative position, and it becomes necessary to examine the object from different points of view before such a matter can be settled.

Through the transparent skin of *Corethra* can be seen, first the whole of the digestive apparatus, forming a long tube of varying diameter, stretching almost from one end of the body to the other; then, on one side of this (the mouth side) can be traced the greater part of the nerve system, looking like a long string, with knots tied in it at tolerably regular intervals. Where it approaches the mouth, however, the string divides, and sending one branch on each side of the throat tube, terminates on the opposite side of the digestive tract in a double mass of nervous matter, which is all the representative of brain the poor creature possesses. Then all down the back (to be traced with a little more difficulty, on account of its extreme transparency) is the "dorsal vessel," as it is called, which is an insect's equivalent of a heart. Those who have kept silkworms or other pale, smooth-skinned caterpillars, will probably have noticed this apparatus as a dark line running along the back just underneath the skin, and alternately contracting and expanding from behind forwards at the rate of from forty to fifty pulsations per minute; in the present insect the pulsations are not so rapid, being only about twelve per minute. Then there can be seen the numerous oblique bands of muscles by which it is enabled to effect its wriggling movements, as well as those strips by which the motions of its various appendages are controlled. Again, at each of two places, one near the head, the other much farther down, will be noticed a pair of black bags, which are air-receptacles connected with the system of breathing-tubes distributed over the body; the tracing of these latter, however, is, on account of their extreme minuteness, a matter of much more difficulty. At the tail there are two tufts of feathery hairs, one at the end, the other at the side; small though they are, the hairs are hollow, and connected at their base with the tracheal system, and, whatever other function they discharge, they evidently take part in that of respiration. All these aquatic fly larvæ are more or less transparent, but we have chosen the present for more detailed reference, because its superior transparency renders it best adapted for microscopical investigation. Like the rest of its brethren, it is carnivorous, and its favourite dish seems to be the quaint little creatures called, from their spasmodic, jerky movements, water fleas, though they are not fleas at all, nor, indeed, even insects, but belong to the group of animals of which crabs, lobsters, and shrimps are the most familiar representatives. These specks of creation, which are