

[For the Scientific American.]

THE SPIDER.

[By Edward C.H. Day, of the School of Mines, Columbia College.]

The spider is a proscribed individual among the refinements of our human civilization; its webs are a perpetual eyesore to the housekeeper—its habits are quoted as the very ideal of cruelty—its appearance, according with its habits, often grotesque in color, and always ghoulish in form, is the signal for screams and flights in the fearful, and for determined efforts at its destruction in the more bold part of the household. And yet we think that all this antipathy to the spider is hardly fair; we have much to thank him for; we reap the benefit of his capture of the tormenting fly; and, let us face the truth, is not our sentimentalism about his so-called cruelty altogether out of character. With the scenes recently enacted in a corner of France before our eyes—thousands of our fellow-beings hurried out of existence—thousands maimed for the rest of their lives—thousands of families rendered fatherless and homeless—whole nations for future generations ground down by oppressive taxes, making harder the hard fate of the poor, and driving millions into the abject miseries of crime; is it for us—justifying war, applauding the victor, and sympathizing with the desperate brute valor of the vanquished—to speak of the cruelties of the spider or the tiger? With human diplomacy and its effects before our eyes shall we hypocritically bewail the deceptions of a spider's web?

It may seem out of place for us to intrude such thoughts here, but we trust that in the future, science may render war impossible—not by inventing destructive engines, but by carrying out her glorious mission of peace by raising the intelligence of man above his brutish passions—and by educating him to a recognition of the beauty of that nature of which he forms a part, and which he alone mars by the intelligent and wanton destruction of life.

But the spiders deserve well of us for the amusement and instruction they afford us by their habits and instincts. The spider's thread of silk is a wonderful product in itself, spun as it is from such a multitude of infinitely fine streams of the gummy secretion of which it is composed; but the variety of ways in which this silk is applied to diverse purposes is still more admirable. The strength of these silken threads is remarkable. Madame Merian described spiders existing in South America which captured small birds in their snares. This was disbelieved, as a gross exaggeration, but recent observers have established the truth of the statement, and we ourselves see no reason to doubt it on other evidence. The Mygale of which this fact is stated is a perfect giant among spiders, many times larger than our largest native species, yet we have more than once, in pushing through the woods, had our straw hat fairly taken off by a spider's thread which remained unbroken, and frequently we have seen Cicadas (the common locust) captured in the webs of spiders of by no means extraordinary dimensions.

The habits of spiders and their natural characters are so closely associated that systematic classifications of the group have been based upon the habits of species and the kind of webs they spin, or the use they make of their silk, and the variety of their instincts is well shown in such an arrangement.

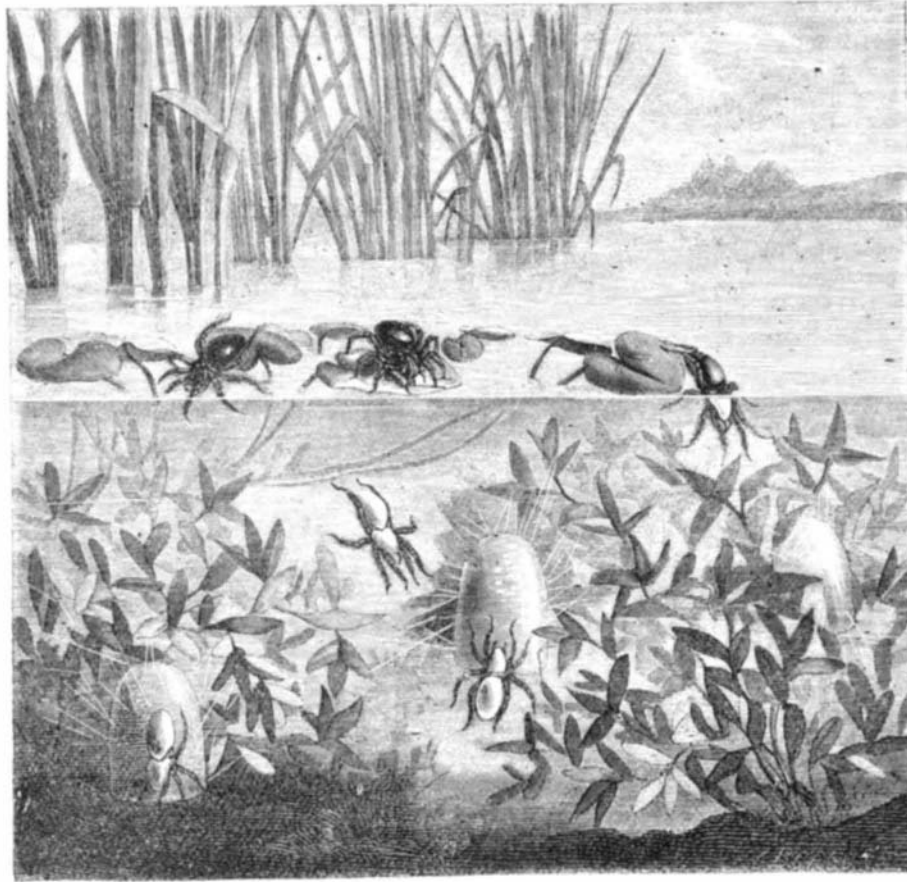
Almost all spiders are terrestrial in their habits (the Crustacea perhaps taking their place in the water), all have the power of spinning silk, and all are carnivorous. Many of the best known species are of sedentary habits; some spin nets of various forms, and lie in wait until their prey touches or becomes ensnared in the sticky meshes. Some of these nets have the greatest accuracy of outline, others consist of threads cropping irregularly in various directions, while others again are thick snares, tapering away into a tube in which the hunter lies hid, reminding us of the decoy structure used for wild fowl. Numberless species of spiders are wanderers prowling about in search of prey, throwing out glutinous threads to entangle it, and often lining their habitations in sheltered spots with their silk. Some chase their prey with great speed, others lie in wait for it and leap upon it in a cat-like manner, while others hide themselves in natural recesses or make hiding places for themselves. There are species of mygale that form tubes in the earth, line the tube with their silk, and close it with a trap-door formed upon a basis of silk, and this trap-door, when closed, they hold with such force that admission can only be obtained by stratagem; there are others that follow their prey over the surface of the water; while Kirby and Spence mention one species that actually makes rafts and floats off upon them in search of drowning insects—"not as you may conceive, for the sake of applying to them the process of the Humane Society, but of hastening their exit by a more speedy engine of destruction. The booty thus seized is devoured at leisure upon its raft under which it retires when alarmed by any danger."

To such inventions are these creatures driven in the great struggle for existence! But perhaps the most extraordinary adaptation of the silk of the spider is that represented in the accompanying cut from Blanchard. Long before we had ever dreamt of a diving-bell these spiders had them in use,

not coarse, heavy, human-like inventions, but such as man might well copy from, and thus improve upon his own cumbersome machinery.

The *Argyroneta aquatica* is a plain, dark-brown spider, densely hairy. It dives from a leaf on the surface, and, as it plunges in, a bubble of air surrounds it attached to its hairy body. Arrived at a desirable location in the midst of a matted mass of water plants it sets the bubble free by means of its feet in such manner that it shall lodge amidst the vegetation. It repeats the journey, until finally the bubble thus produced is large enough; it then spins around its upper part a net to retain it, and anchors this net to the neighboring water plants. If this thimble-shaped diving-bell does not contain enough air, more is now brought down, until finally the satisfied creature establishes itself within its aquatic domicile to look out for passing prey.

Such is the summary of Prof. Blanchard's description, derived from his own observation. The silvery garb of the spiders as they descend, and the beauty of their delicate abode, must be seen to be realized, and they consequently form most delightful additions to the society of a fresh-water aquarium.



THE WATER SPIDER.

Prof. Blanchard adds that the Abbe de Lignac "saw the male construct its bell close to that of the female and make a gallery to communicate with the latter after having made an opening in the wall."

Such a proximity must be dangerous if the female of the water spider is as treacherous as most of her sex among the Arachnids. The female among spiders generally being the larger and the more powerful, invites a husband to her embraces, or following his natural instincts, he seeks them. She accepts him—the nuptials are consummated—but unless his movements are very agile, she finishes the ceremony by killing and eating him. This may be done out of excess of affection, a literal rendering of the theory that man and wife should be one flesh; or it may be an expeditious, effective, and certainly an economical way of procuring a divorce. Who knows? If the latter, we are anxious to learn does the lady marry again? because if not—this must be accepted as some mitigation of such an illegal procedure. It has one point of fairness, however, that some human divorcees that we have heard of, have not—the husband knows all about it.

Paris Defended without Gunpowder.

A novelty in the way of engines of destruction is that suggested by M. Delaurier, at the meeting of the Paris Academy of Sciences. It is really nothing more than the Lenoir gas engine, adapted to the discharge of projectiles. A mixture of gas and air is exploded in a sort of cannon and away goes the ball—to what distance and with what velocity is at present rather a matter of guess than calculation or experiment. Seven volumes of gas to 100 of air ought, we are told, to produce the greatest effect; but the machine to use the mixture is not yet in existence.

It ought, says M. Delaurier, to be of iron, and to be shaped like a retort (the ordinary glass retort), the belly of which is to hold the mixed gas and air, and the tube, which must be long, is to form the barrel. As the ball must hermetically seal the barrel, it should, we are told, have a wadding of lead.

As the new engine will not foul, and will give no smoke, it may be used continuously, and there will be no difficulty in pointing it. How far it might, if it existed, be useful in the defense of Paris, is made clear by the following statement: Paris consumes 400,000 cubic meters of gas per day. This quantity of gas may be made to throw more than a million of 60-lb. shot—how far is not stated; nor is it said how Paris is to be lighted during the time. Another suggestion by M. Delaurier is to store a mixture of gas and air in cellars, and

in houses carefully sealed, to be exploded at the proper time (which everybody can guess) with terrible effect. Thus the defense of Paris may, it is thought, be conducted without the use of gunpowder.

Another French patent is for entirely removing the smell from turpentine, and so forming a superior kind of camphene, has been recently obtained. It is effected by rectifying turpentine over tannin, which is said, with how much truth we do not know, to remove all the resinous materials which give an offensive odor. So rectified, the turpentine can replace, it is claimed, the best benzole used for cleansing, and gives a much better result.

How to Skeletonize Leaves.

We find in an English exchange the following explicit directions for skeletonizing leaves, which will answer some queries we have received in regard to this subject:

Skeleton leaves are among the most beautiful objects in nature, and as they can be arranged either in groups under glass shades, made into pictures, as it were, and hung against the wall, or placed in either blank books or albums, they come within the means of all, and can be used to decorate the palace or the cottage. The most suitable leaves for the purpose are those from what botanists call *exogenous* plants, and may be known by the veins of the leaf branching from a central vein or midrib; those from *endogenous* plants rising from the base and curving towards the apex of the leaf. The object in view is to destroy what may be called the fleshy part of the leaf, as well as the skin, leaving only the ribs or veins.

The most successful, and probably the simplest, way to do this is to macerate the leaves in rain-water till they are decomposed. For this purpose, when the leaves are collected they should be placed in an earthenware pan or a wooden tub, kept covered with rain-water, and allowed to stand in the sun. In about a fortnight's time they should be examined, and if found pulpy and decaying, will be ready for skeletonizing, for which process some cards, a camel's-hair brush, as well as one rather stiff (a tooth-brush for instance) will be required. When all is prepared, gently float a leaf on to a card, and with the soft brush carefully remove the skin. Have ready a basin of clean water, and when the skin of one side is completely removed, reverse the card in the water, and slip it under the leaf, so that the other side is uppermost. Brush this to remove the skin, when the fleshy part will most likely come with it; but if not, it will readily wash out in the basin of water.

If particles of the green-colored matter still adhere to the skeleton, endeavor to remove them with the soft brush; but if will be necessary to avoid breaking the skeleton, and the hard brush should only be used in a perpendicular direction (a sort of gentle tapping), as any horizontal motion or "brushing" action will infallibly break the skeleton. Never attempt to touch the leaves or the skeleton in this state with the fingers, as when they are soft their own weight will often break them.

A very good way of bleaching the skeletons is to prepare a solution of chloride of lime, which must be allowed to settle, and the clear liquid poured into a basin in which the skeleton may be put by floating them off the card. It is as well to have half-a-dozen ready to bleach at once, as they require watching, and if allowed to remain in too long will fall to pieces. From two to four hours will generally suffice to bleach the skeleton of all ordinary leaves, after which they should be washed in several changes of water, and finally left in clean water for half an hour.

After the leaf has been sufficiently washed it should be floated on to a card and dried as quickly as possible, care being taken to arrange the skeleton perfectly flat, and as near as possible to the natural shape. This can be done with the assistance of the soft brush. When dry the skeleton should be perfectly white, and should be mounted on dark backgrounds, as black velvet or paper.

Well-grown leaves should always be chosen, and be thoroughly examined for flaws before maceration. Leaves containing much tannin cannot be skeletonized by this process but are generally placed in a box with a number of caddis worms, which eat away the fleshy parts, when the skeletons can be bleached in the usual way. Holly-leaves must be placed in a separate vessel on account of their spines, which would be apt to damage other leaves; they make beautiful skeletons, and are sufficiently strong to be moved with the fingers.

It is not necessary to give a list of leaves suitable; but the leaf of the poplar, the apple, the pear, and the ivy may be mentioned as easy ones to commence with. Various seed-vessels may be treated in a similar manner, and by precisely similar means, and thus greater variety given to the groups. Wishing our readers success in their experiments, we would remind them that what is worth doing at all is worth doing well, and that "a thing of beauty is a joy forever."

A rich silver mine has been discovered near Huamantanga in Peru, and measures are taken for working it.