

ility of the thread of liquid inside the wider capillary tube. The length of this thread remains constant after the lapse of about five minutes.

"In wiping the instrument (after its removal from the bath) care should be taken not to touch point, *a*, as capillarity might extract some of the liquid; otherwise the handling of the instrument requires no especial precaution.

"The nicety attainable by this method is very satisfactory."

[From the Fourth Annual Report of Charles V. Riley, State Entomologist of Missouri.]

THE GREAT LEOPARD MOTH.

There is a large family of moths, known as Arctians or tiger moths, which is rendered conspicuous by the beauty of design and boldness of contrast in color which its members generally present. There are two whose caterpillars are often seen, either rolled up cozily under some plant or crawling rapidly across a path, but which are not by any means generally known in their more beautiful and perfect states. They were both more than usually common the past year, and both have very similar habits. They neither of them can be considered injurious; but a brief account of their transformations, in this department of my report, will doubtless please and gratify many an inquisitive reader, who has wondered what the "hedge hog" caterpillars produce.

The species above named is the largest, and perhaps the most beautiful, of the family in North America.

Its larva (Fig 1) may be called the large black bear, as the hairy worms of our different Arctians are popularly called bears, and the family name was derived from the Greek word for "bear." It is often observed in the fall of the year, though few persons have ever seen the moth which it produces.

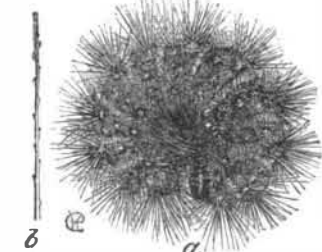


Fig. 1.—The Leopard Moth Larva.

This larva is black, and so thickly covered with jet black spines as almost to hide a series of roughened warts, on each joint, from which the spines spring. When disturbed, it curls itself up, and then the sutures of the joints are seen to be reddish brown, in strong contrast with the black of the rest of the body. If carefully observed, the spines will be seen to be barbed, as represented at *b*.

This worm feeds, mostly during the night, upon the wild sunflower (*Helianthus decapetalus*), the different species of plantain (*Plantago*), and upon willows. J. A. Lintner, of Albany, N. Y., thinks it likewise feeds on black locust, as he has often found it beneath that tree and has fed it on the leaves. It comes to its growth in the fall, and curls up and passes the winter in any shelter that it can find, being especially fond of getting under the bark of old trees. In the spring, it feeds for a few days on almost any green thing that presents itself, and then forms a loose cocoon, casts its prickly skin, and becomes a chrysalis. The chrysalis is black, and covered with a beautiful pruinescence, which rubs off almost as that covering a Duane's early plum. It has a flattened blunt projection at the extremity, armed with a few barbs and bristles.

In a few exceptional instances I have known both this and the following species to go through all the transformations and produce the moth in the fall. The chrysalis state lasts but about a fortnight, when the moth escapes.



Fig. 2.—The Great Leopard Moth. *Epaethia scribonia*, Stoll. (Lepidoptera, Arctiada.)

Fig. 2 represents the female moth at *a*, and the male at *b*. The upper portion of the abdomen is steel blue, or blue black, marked longitudinally along the middle and sides with yellow or orange. With this exception, the whole insect is white marked and patterned with dark brown, as in the figures. The male differs from the female principally in his smaller size and more acuminate wings, and by the narrower abdomen, which is also generally duller in color, with the pale markings less distinct. The markings on the wings vary in a striking manner in different individuals, the oval or elliptical rings sometimes filling up, especially in the male, so as to look like black blotches. This insect is considered rare in New England, but is much more common in the Mississippi valley. It occurs still more abundantly in the

Southern swamps, where the larva is dubbed "fever worm" by the negroes, under the absurd impression that it is the cause of fever and ague.

As an illustration of the wonderful power of resisting extreme cold, which this caterpillar possesses, I will quote the following experience communicated to me by Mr. Lintner. He says: "I had placed one for hibernation in a small keg among leaves, which I inserted in the ground. During my absence from home, either the thawing of the snow or the wind had overturned the keg and driven away the leaves. On my return I found the larva remaining, but stiffly frozen, with its head encased in ice and fastened to the ground. As an experiment I detached a piece of the ground with the larva, and placed it in a warm room. On the thawing of the larva and the release of its head, it was restored to activity."

EN ROUTE TO THE GREAT EXPOSITION.—LETTER FROM UNITED STATES COMMISSIONER PROFESSOR R. H. THURSTON.

NUMBER 2.

LONDON, JUNE 10, 1873.

The previous letter was written while on the Atlantic, with more than one half of our voyage accomplished. The remainder of the distance was made under very similar circumstances of wind and sea. Light wind and sea, invariably ahead, or on the bow, while admirably adapted to meet the wishes of those of the passengers who were at all inclined to suffer from sea sickness, prevented our making a quick passage, and we only made the land, at the north of Ireland, after a thirteen days run from New York.

In that high latitude, the sun, at this season, does not set until late in the evening, and it rises correspondingly early in the morning; while the twilight, on a clear night, is sufficiently bright at midnight to enable us to read a newspaper without very greatly fatiguing the eyes.

It was broad daylight, therefore, when, the next morning, at about three o'clock, an unusual bustle on deck announced that they were preparing to set some of our passengers ashore at Moville, a little village in Lough Foyle, a few miles below Londonderry. A chilling breeze met us, as we stepped on deck, and would have at once sent us below again had the scenery been less beautiful.

THE NORTH COAST OF IRELAND.

The green and fertile fields, lying on the slope which extends from the shore of the lough back to the summits of the surrounding hills, half concealed by the haze of early morning, the little hamlet of Moville close by, the larger dwellings seen at long intervals in the more picturesque spots, and an old ivy-covered, ruined castle, which we had just passed, formed, altogether, a picture beautiful intrinsically, and one which, to eyes which had been, for nearly two weeks, only able to contemplate an unvaried expanse of rolling waves, appeared a second Eden.

The steerage passengers were nearly all landed here, and the ship was soon headed seaward again. As the northern coast of Ireland was rounded, we had an opportunity to see that singular basaltic formation,

THE GIANT'S CAUSEWAY,

where 40,000 columns are packed closely together, forming the precipitous boundary of the Irish coast of Antrim. Isolated columns stood here and there, like colossal sentinels. At one point, a vast mass stood by itself at some distance from the face of the Causeway, with which it was connected by a bridge of ropes—a rude suspension bridge which has been thrown across the fearful looking gulf by some bold and skillful fisherman. It is a most interesting specimen of early engineering, for, like the rope bridges seen in South America and in China, this construction antedates considerably the days of Roebing.

THE CLYDE.

From this point all the way around the coast, across the North Channel, and up the Firth and the river Clyde, our eyes were feasting upon ever changing but always beautiful scenes. The lofty headlands of the Mull of Cantire, the hills of Arran and of Holy Island, the romantic bays and the narrow mouthed lochs of the Scotch coast, afford uninterrupted enjoyment to the lover of the beautiful in nature. At one point, we obtained a fine view of the summit of Ben Lomond, enveloped in a soft purple haze, yet brought out into relief by a background of clouds illuminated by the bright golden rays of the setting sun. We took a pilot at Greenock, and, as we steamed slowly by the wharves of that old town—the birth place of James Watt—we counted nearly twenty large iron steamers, completed or in process of construction.

Just below, we had passed a great steamer, the City of Chester, next to the Great Eastern the largest in the world; and, not far above, we saw the monument erected to Henry Bell, who sixty years ago built, here on the Clyde, the first successful steam vessel which ever ran in British waters. She was a little craft of about 60 tons burden; the City of Chester probably has a displacement of seven or eight thousand tons. The latter is nearly 600 feet long.

Nothing could be more appropriate than that the scene of the birth and of the first great work of James Watt, and that of the earliest triumphs of Bell, should be known, to-day, as the spot where the greatest masterpieces of human constructive talent are wrought.

Just above Greenock is the famous castle of Dumbarton, where Wallace was for a time imprisoned. This, then impregnable, stronghold is built upon an enormous, steep sided, rock, which stands 500 feet high, all by itself upon the shore, and, projecting out into the tide, is a most strikingly pictur-

esque object. Behind it is the village of Dumbarton, where the Messrs. Denny are building some fine iron ships.

The scenery becomes less striking as we go up the river; and the beautiful envired fishing villages, and the pleasant watering places, seen so frequently on the shores of the Firth, give place to isolated farm houses or elegant country seats, with smooth lawns and grounds elegantly laid out, as we progress towards Glasgow.

As Glasgow is approached, the whole work done by the "Clyde Trust" in deepening the river, reclaiming the formerly overflowed meadows which border it, and in building substantial embankments, is observed by every one.

GLASGOW.

The prosperity of a city is seldom dependent upon local natural advantages alone; and the proximity of the iron and coal producing districts of Scotland, her experience in manufacturing, and the advantages arising from the fact that Glasgow is the birthplace of British marine engineering, could hardly have given that city her present position as the second in population (and the first in the realm in several branches of manufactures) had not her people, long ago, had sufficient foresight and energy to expend enormous sums in the improvement of the water approaches to the city.

Two hundred years ago the port of Glasgow was on the Ayrshire coast. To-day ships drawing twenty-three feet of water have reached the city wharves.

The work of maintaining and improving the ship channel below Glasgow is, by act of Parliament, placed in the hands of the Clyde Trust Company, which is controlled by Glasgow capital. This company have expended, in this work, about twenty-eight millions of dollars, and are still at work on their great scheme. They are permitted to levy a moderate tonnage tax, and the value of their labors, to the city, may be inferred from the increase of their income from this source. They received, in 1840, \$286,487; in 1860, \$443,938; and, in 1870, \$493,346.

They are employing a number of immense dredging machines, and are removing about one million of tons from the channel, annually. The registered tonnage of vessels arriving and departing annually has now exceeded the enormous amount of 5,000,000 tons.

The wharf at which we landed was reached, after passing the great shipyards from which a large portion of all the iron vessels in the world are sent out, and after slowly threading the narrow channel left between the long lines of steamers and sailing vessels which were closely packed on each side, sometimes three or four abreast. We ran the gauntlet of custom officials and were glad to find ourselves comfortably settled in our hotel, in the small hours "ayont the twal."

We had hoped to be able to make a leisurely tour *Weltausstellung*-ward, visiting some important manufacturing establishments in Great Britain and France, and some well known technical schools *en route*, but, among the letters awaiting us, at the office of our consul, was an urgent request to appear at headquarters in Vienna during the following week. Much can be done in even the limited time allowed, if it is well employed, and our programme includes a day in Glasgow, a day in London, one in Paris and one in Munich, and at least three nights on the rail. R. H. T.

Cultivation of Lobsters.

An interesting account of some recent experiments in the breeding of lobsters is presented by a correspondent of the Boston *Journal of Commerce*, the locality of the trial being on the New England sea coast, which is celebrated for lobster fruitfulness, even if its shores are sandy. It appears that the lobster conservatory consists of an inlet from the sea which has been enclosed by an embankment. The space enclosed contains thirty acres, and gates are provided to permit the tidal movement of the water.

"Last summer some 40,000 lobsters, of every age and condition, were let loose in the pond. Many of them were in the soft shell state, and many were unsaleable on account of a lost claw, or other mutilation. Food, in the shape of refuse from the fish market, was freely supplied to them; and a gate was put up at the entrance to prevent their escape into the sea.

When the ice had covered the pond, holes were cut and lobster traps were put down. Good, sizeable hard shell lobsters were at once caught, and two things were proved: First, the water was deep and pure enough to keep the fish alive, and secondly, the fish were healthy, for they had taken their hardened shells, in the usual manner, and new claws had grown in the place of those lost. In the spring, eels, perch and a great many other kinds of fish were taken from the pond in liberal quantities; and now that the spawning season is well advanced, the farm has reached its final and most critical stage. Some 15,000 good, marketable lobsters have been taken out and sold. Everything is favorable so far.

The experiment is a very important one. If it succeeds it will introduce an entirely new system of lobster fishing, and do much to prevent the destruction of the natural supply. Nor is this all: for the same pond can be made to yield perch, flounders, eels, smelts, and other fish in great quantities, at no additional expense.

Mr. J. H. Johnston, of the Great Western Gun Works, 179 Smithfield street, Pittsburgh, Pa., whose advertisement has been published in this paper for some time past, requests us to state that the minimum price of his double barrel shot guns should have been published at \$8 instead of \$3. We take this method of calling attention to the mistake, and would direct attention to his advertisement on another page.