

August 1894, near the Bernina Hospice in Switzerland, I came across several plants of *myosotis* growing by a pool. In some cases the flowers were a bright blue, but in others they were distinctly pink, several being entirely pink, and others showing pink blotches and lines. The plants were in a hollow, and on the day of my visit there was an extremely cold wind blowing.
London, December 2. HECTOR COLWELL.

Fire-fly Light.

REFERRING to my reply to Prof. S. P. Thompson (NATURE, July 29), concerning fire-fly light, I can confirm what then I wrote. Mr. H. Muraoka has sent to me from Kioto in Japan a letter from which I derive the following particulars. (1) In the neighbourhood of Kioto there are about nine kinds of *Luciola*, which Mr. H. Muraoka continues improperly to call, in German, *Johanniskäfern*. (2) The insects used by him were probably *Luciola villicollis* and *Luciola picticollis* (Kiesenn).
Florence, December 1. CARLO DEL LUNGO.

AN ENGLISH BEAVER PARK.

SINCE the Marquis of Bute established a colony of beavers on his estate near Rothesay in 1874, no such interesting experiment has been made in acclimatising these animals as that which Sir Edmund Loder has carried out in Sussex. The beavers have now been inhabitants of his park at Leonardslee, near Horsham, for eight years, or rather they occupy an enclosure inside the park. There they have been placed on the banks of a small stream, with a rather rapid fall, a situation which exactly suits them. It is sheltered, for the valley is deep and wooded, and there was an ample supply of timber, large and small, in the enclosure when the industrious beavers, reversing the story of "Settlers in Canada," were brought from Canada and settled in Sussex. In the course of their eight years' sojourn they have ensured their comfort by constructing in great perfection, and in the most durable form, the engineering works for which beavers are so justly famed, and which gave rise to the Indian legend that the Creator, after separating land from water, employed gigantic beavers to "smooth" the earth into shape. Meantime the colony increases in number, so that some of the produce have been sold to go elsewhere. Nevertheless the beavers' industry is such that the size of their works, and consequently the area of the pool which they have formed, constantly increases.

The space in which they were originally enclosed was less than an acre. This was only one-third of the size of the Marquis of Bute's "beaver park"; but it gave quite sufficient scope for the beginnings of the colony. It was surrounded with a corrugated iron fence, which the beavers could not gnaw down, while at the same time they could not see through it, and so felt more secure and "private" in their park. Beaver engineering is directed entirely to one end. This is to form a pool deep enough and wide enough for them to be able to swim beneath the water to the entrance of their burrow, and to keep this entrance submerged in dry weather, when the streams run low, and covered with such a depth of water that even in the longest frosts, when the ice in Northern Canada is two feet thick, there shall still be water-space below it.

In the water the beaver knows it is safe; and, though it also stores branches for food below water, fastening them down with stones and mud, it is to serve as a place of refuge rather than as a storehouse, as a combined moat and temporary hiding-place, that the beaver forms his pool. All his clever engineering, his wood-cutting, building, canal-making and construction of "rolling ways," are subordinate to this end. The two last works, the beaver canal and the beaver road—the one for floating, and the other for rolling logs to the pool—are only

brought into play when the supply of timber near at hand is exhausted. But they are part and parcel of beaver devices, and, though only recently brought to notice, are not less creditable than their other feats.

In the present paper we shall not use the technical phrases of hydraulic engineering, but term the reservoir made the "pool," and the containing barrier the "dam." In Canada, when the beavers were numerous, these dams were noticed to be so nicely adjusted in form to the material with which they were made, and to the force of the stream which they barred, that they could be classified in relation to these circumstances. Dams built mainly of mud and stones had a different section from dams built of sand and wood; and some made across rapid streams were curved, to resist the extra strain. But the greater number were made of battens of wood about three feet long, with the crevices stuffed with mud, stones, and the twigs and small branches; and in every case the first engineering principle necessary in the construction of a dam is observed. This is that the top shall be exactly level, so that the water of the pool, which must overflow, because the stream enters it from the top end, shall flow evenly over the whole length of the dam. As every one conversant with that most difficult form of the profession—river engineering—knows, any small gap or inequality soon ruins a dam. The water pours through these by preference, and at once cuts a gap. The beavers know this, too, and at Leonardslee, no less than in Canada, constantly examine the top of the dam, and mend the smallest gap along the line. The Leonardslee dam is of the ordinary kind, not curved but straight, and built of battens of wood, made of the boughs from trees cut down inside their enclosure, or from those which were given them as food. In all cases they ate most of the bark; then they cut the sticks into lengths of about three feet, and worked them into the structure. Plenty of mud was pushed into the crevices on the upper side, and all the small twigs and sticks were pushed in to make the whole dam tight. With great judgment they spared a small oak growing just below the dam. This now acts as a support to the structure; all the other trees in the enclosure, except those protected by metal guards, and one very large fir, were either felled, or attempted to be felled. It seems obvious that they kept this tree purposely as a buttress; for the dam is made higher and, therefore, wider each year, as the pool above increases; the tree is now almost in the centre, and its roots are already worked into the dam foundations. Even the baby beavers at Leonardslee, no bigger than rabbits, are put to "light jobs" in mending the dam, and the elders are most industrious. Each winter brings down a quantity of mud, which would make the pool shallower. But the beavers raise the dam so rapidly that the pool gains in depth, and spreads for a long distance up stream and laterally. The dam is at least five and a half feet high, and the depth of water above it five feet, yet it is so well made that, though the human-built dams of several artificial pools higher up the stream were carried away in a winter flood, the beaver-dam was undamaged. Near the point at which the stream enters the enclosure three large trees, formerly on the bank, are now submerged in three feet of water, owing to the fresh height added to the barrier below. The beavers had begun to cut these trees down—a very hard task, but one in which they would have succeeded had not the water risen so fast that they were floated off their legs when trying to go on cutting. One large beech tree, standing on a raised bank washed by the ever-increasing pool, was an object of envy to the beavers. They concluded that the quickest plan was not to cut it down, as it was very large and the wood hard, but to dig it up. So, with the aid of the increasing waters, they undermined the tree, which fell across their pool. This gave them occupation for some