NEW THERMO-ELECTRIC BATTERY.

BY M. A. NIAUDET.

This battery is frequently used and is much appreciated in Austria and Germany. It is made of different forms, of which the most recent, represented by Fig. 1, appears to us to be the best, since it requires only two Bunsen burners to set in action forty thermo-electric elements. There is another model of sixty elements, with three burners, which offers the same advantages as the one represented.

Each circular group of twenty elements should be separately considered. The following is the description of such a group:

The elements are arranged in a horizontal plane, and radially; the heated junctions being towards the center of the circle, and the cooled junctions at its circumference.

The two metals are: 1st. German silver (called *maillechort* in France and *neu Silber* in Germany), and, 2dly, an alloy of antimony and zinc, which fuses at a temperature slightly higher than the melting point of antimony.

These two metals are soldered (at least at the heated junction) without the intermediary of any other metal; the ends of the German silver wires pass into a little capsule of brass, which forms the bottom of the mould in which the other metal is cast. This capsule is shown at *c*, in Fig. 2, which represents two elements of the actual dimensions; it remains attached to the element and forms part of the apparatus.

Into the same capsule penetrates a small rod, *r*, of copper, the extremity of which is also enveloped by the cast metal; and by means of this rod the heat is conducted to the heated junction. The extremities of these copper rods are arranged in a small circle, and are held between two circular plates of mica, so that they all become heated by the same flame. In the apparatus shown, a Bunsen burner is adopted; but in some simpler apparatus the flame of a spirit (wood naphtha) lamp is used. The mica plate has the effect of concentrating and directing the heat of the flame on to the copper rods.

The object of using the copper rods at the heated junction will be seen from the following: The heated junction does not obtain its heat directly from the flame, but only through the intermediary of the copper rod; it is therefore protected against any accident through overheating, that is, against the fusion of the alloy, which would cause the immediate break down of the battery.

To avoid, at least partially, the loss of heat by radiation, these copper rods are inclosed, excepting at their extremities, within a small tube, shown at *t*, in Fig. 2. The cooled junction is altogether dissimilar; the fusible metal is here soldered to a plate of copper, to which is soldered the German silver wire of the next element. The plate of copper is of large surface, forming a cylinder through which the air circulates, with the production of a cooling effect.

These batteries have been subjected to careful experimental trial by M. Waltenhofen, of Prague; he has compared them with that of Marcus, and has found them to be much superior to it.

It was found in the previous experiments of M. Stefan, of Vienna, that the thermo-electric elements of Marcus may obtain an electromotive force of one-eighteenth volt, but this maximum is obtained only at a temperature close upon the fusing point of one of the alloys of which they are formed.

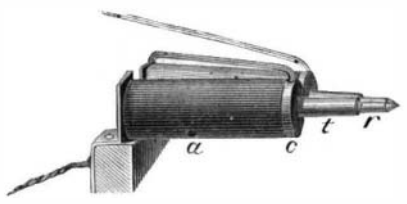
Under similar conditions, M. Waltenhofen found that the Noë elements possess an electromotive force between one ninth and one tenth volt.

In practice, these maxima, or anything near them, cannot be depended upon, and, when several elements are connected in series, they are never attained, because the elements are never equally heated. For ordinary experiments we may calculate upon one sixteenth volt per element. The resistance of each element is one fortieth Siemens' unit.

An improvement which is supplementary, but very useful in practice, consists of the addition of a regulator of the pressure of gas, by means of which any overheating, and the accidents which ensue from it, are avoided. It formerly sometimes happened that an unexpected increase in the gas pressure produced some fusion of the metal, and thus deteriorated the battery.

The safety apparatus here referred to, and which is shown in the front part of Fig. 1, consists of a glass bottle containing water, and closed by a cork. Two tubes enter this bottle through the cork; one, B B, is a branch from the gas supply, and passes to the bottom of the vessel; the other, H, does not reach the surface of the water. Its use is to lead away any gas passing into the bottle, and to conduct it to the small gas jet, I, which is kept constantly lighted. If the pressure of gas be low, the tube, B, is closed by the water; if it should become too great, the gas bubbles through the water and escapes at G, where it

FIG. 2.



inflames. The apparatus thus constitutes a safety valve, preventing the pressure from rising above a certain degree, which can be regulated at will. The gas which escapes, being at once consumed, cannot give rise to accident.

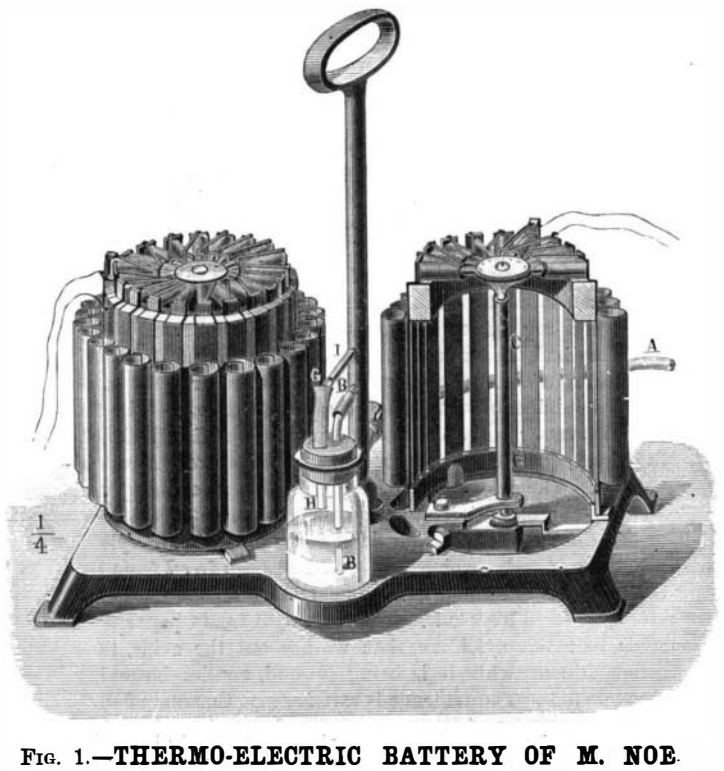


FIG. 1.—THERMO-ELECTRIC BATTERY OF M. NOE.

With a battery of twelve elements, it is possible to work an electric bell; with twenty elements, water may be decomposed in the voltameter; with forty elements, a secondary battery of Planté may be charged, or an induction coil worked. In a word, these batteries allow of most of the experiments in physics, and small industrial operations, gilding, plating, nickeling, etc., being carried into effect.

One great advantage of this kind of electro-motor is that it is set in full action in one or two minutes, and all expenditure ceases the moment the current is no longer required. Lastly, and this is the most important point, the battery undergoes no alteration by use, as in the case of those which have preceded it, and which in a short time show a considerable internal resistance, and a corresponding diminution of effect.—*La Nature.*

THE CARP AND ITS CULTURE.

In the accompanying engraving we reproduce a careful drawing of the mirror carp (*Cyprinus carpio specularis*), so called on account of the large scales which run along the sides of the body. This is one of the three races of carp recently introduced into this country, the other two being the scale carp and the leather carp, the one entirely covered with scales, the other having few or none.

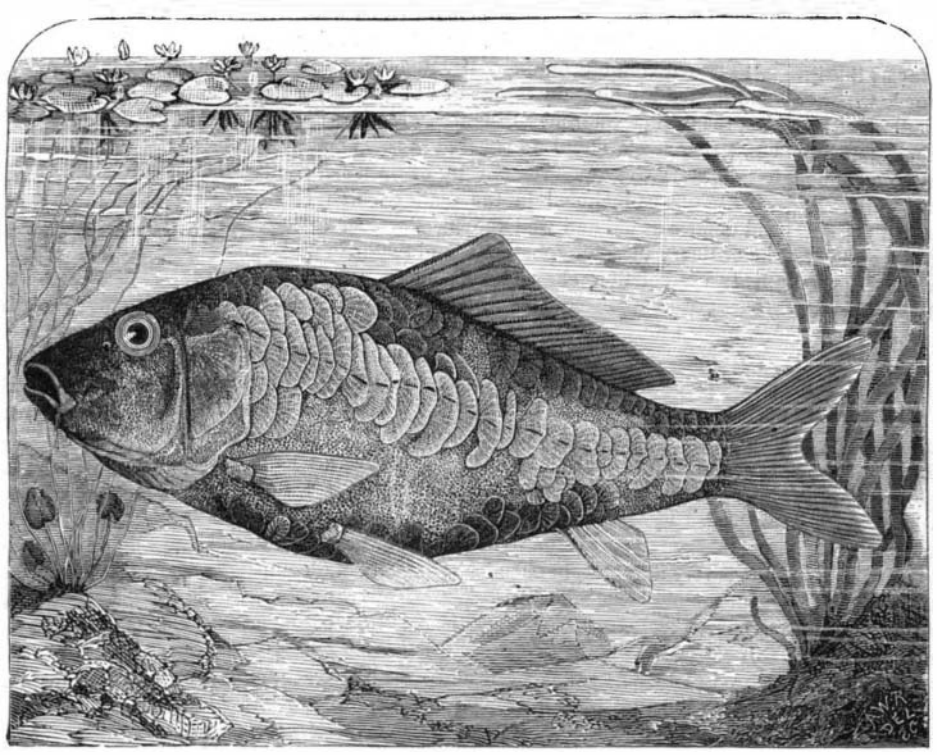
Three years ago the national carp pondswere established at Washington, in the old swamp and canal near the monument, and many thousand young fish have since been distributed for stocking suitable waters in Kansas, Nebraska, Missouri, Ohio, Indiana, Illinois, Pennsylvania, Maryland, Virginia, North Carolina, South Carolina, Georgia, Alabama, Louisiana, Texas, Tennessee, Kentucky, and New York. Persons desiring them for such purpose can be supplied on application to Prof. S. F. Baird, U. S. Fish Commissioner, Washington, D. C.

In a recent communication Professor Baird expresses great faith in the future of this new fish. He is quite well satisfied that within ten years it will constitute a very prominent portion of the animal food of the country. Although scarcely known in the United States, and but little more, as an article of extended application, in England and France, the carp is in Germany and Austria cultivated to the highest degree, so as to constitute a notable article of the market supply.

The fish itself is probably of Asiatic origin, and has been domesticated in China for thousands of years. It has, however, been so extensively distributed in Europe as to have become, in a measure, a native fish, occurring in public waters as well as in private enclosures. It is, Prof. Baird remarks, emphatically a farmer's fish; and may safely be claimed to be, among fishes, what chickens are among birds, and pigs and ruminants among mammals. Its special merits lie in its sluggishness and the ease with which it is kept in very limited enclosures, it being a vegetable feeder, and its general inoffensiveness. Trout and black bass require abundant water and a supply of animal food for their sustenance and growth; the carp thrive in shallow ponds, and while not disdaining flies, worms, larvæ, etc., live on the succulent roots and leaves of aquatic plants, seeds as they fall into the water, and other similar substances, and may be fed very readily upon corn, grain, bread, root crops, raw or boiled, and, indeed, any vegetable refuse.

Their rate of growth, too, is something marvelous, and as observed so far in the specimens introduced into the United States, is even more remarkable here than in Europe. Among the original fish imported by the Fish Commission from Europe, and which are now only about three and a half years old, are some from twenty-five to thirty inches in length, weighing from four to eight or nine pounds.

The carp thrives best in artificial or natural ponds with muddy bottoms, and such as abound in vegetation. In large ponds it may not be necessary to furnish any special food, but in restricted enclosures, as, for instance, those of a fraction of an acre, they may be fed with the refuse of the kitchen garden, leaves of cabbage, lettuce, leeks, etc., hominy, or other substances. Grain of any kind is generally boiled before being fed to the fishes, but this is probably not absolutely necessary. The refuse of malt from breweries makes excellent food for them.



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The Washington ponds are arranged so that they can be drawn off at will, leaving all the fish collected in a small basin near the outlet. This is for convenience in assorting the fish, and for selecting such as are needed for other purposes.

It is a prime necessity that there be no predaceous fish in the same pond with carp. Of course, the larger fish will be measurably secure against the attacks of carnivorous species of about the same size, but the eggs and young will become a prey to the rapacity of such associates. As a general rule the fish will thrive best when they are the sole occupants of particular waters, although the association of suckers and chubs would be less objectionable than that of sunfish, perch, or black bass.

The carp spawn in the spring, in May and June, and indeed, under some circumstances, throughout the entire summer. The Fish Commission have young fish that spawned from May to September. They are very prolific, yielding from 400,000 to 500,000 eggs, according to size. The eggs adhere tenaciously to whatever they touch, and for that reason it is very important that a new pond should be provided with floating weeds for such attachment. The eggs hatch out in a few days, and the young grow very rapidly. They feed voraciously upon the so called frog spittle, the green alga scum so common in