MAGNETISING A POKER BY HAMMERING

PROBABLY the most interesting of all magnets is the Earth itself. It is certainly the most mysterious, for as yet no completely satisfactory explanation of its magnetism has been given, although this may have some connection with the immense mass of iron and nickel believed to constitute its centre. Whatever the cause of its magnetism, the Earth has two poles exactly like an ordinary magnet. One of these poles is in the far north of Canada and the other is in the Antarctic Continent, and the movements of the compass needle, or any other magnet suspended so that it is free to swing, are due to the attractions of the Earth's magnetic poles.

A compass needle, wherever it is taken, sets itself along the lines of force due to the Earth's magnetism, and the result of trials of this kind over every accessible part of the Earth's surface is a map of its magnetic field. Thus the compass needle plays on a large scale the part of the iron filings in the fascinating magnetic map experiments described in the Elektron Manual. Magnetic maps obtained with its aid are published for the guidance of mariners, for the magnetic north is not true north, and for navigation purposes it is important to know how these differ.

Compass needles are not the only things affected by the Earth's magnetic field, for every piece of iron or steel comes under its influence. As explained in the No. 1 Elektron Manual, it is believed that a magnet is composed of tiny molecular magnets that have their north poles pointing in the same direction, and thus act with each other. In an ordinary piece of iron or steel the small magnets are not arranged in regular order, but are turned in various directions, with the result that their poles neutralise each other. These tiny magnets are influenced by the Earth's magnetic field, which tends to pull them round so that their north poles all point northward, but the magnetic force exerted is too slight to overcome the resistance offered to their movement.

A proportion of the molecular magnets in a piece of iron or steel can be set free to turn round if the mass is jarred by striking it violently, and an experiment on these lines is very interesting. An iron or steel poker is held with its point towards the north magnetic pole, and the other end towards the south magnetic pole. This position is readily attained by simply holding the poker parallel to the line along which the Elektron Compass Needle sets itself. With the poker thus pointing in the direction of the Earth's lines of magnetic force, as revealed by the Compass, the handle is given two or three violent blows with a hammer. This jars the poker, giving the tiny magnets within it an opportunity to turn, and on testing it is then found to be feebly magnetic.

Fig. 1. A floating battery, the current from which flows through a coil of wire mounted above it.

It is interesting to note that pieces of iron and steel laid north and south and subject to vibration have been known to slowly acquire magnetic powers. For instance, railway tracks running parallel to the position taken up by a compass needle eventually become feebly magnetic, the blows they receive when the wheels strike their ends being equivalent to the hammer blows in the experiment with a poker.

The poker is converted into a more powerful magnet if the end pointing north is dipped at an angle of nearly 70 degrees, as shown in Fig. 2. The reason for this is that the Earth's poles are not on the surface, but below it, with the result that a compass needle swinging freely would not remain horizontal, but would dip down at one end. Often the tendency to dip in this manner can be detected with an ordinary compass needle; and a needle pivoted on a horizontal axis and placed along the magnetic north and south line shows it plainly, the north end of the magnet pointing downward if the experiment is tried in the northern hemisphere, the south end dipping if the trial is made in the southern hemisphere. The angle of dip is of course greatest above the Earth's magnetic poles, for there the needle will point vertically downward.

In order to magnetise our poker as strongly as possible by simply hammering it, it is first thrown violently on the ground in order to destroy any magnetism remaining from the previous experiment. The effectiveness of this rough treatment is tested by means of the Compass Needle, and when each pole of the Needle is attracted