

MAGNETOGRAPHS MADE BY RADIATIONS FROM THE POLES OF A MAGNET.

BY PROF. JOHN S. MCKAY.

If a paramagnetic substance be placed upon the sensitive film of an ordinary photographic plate and the poles of a magnet, either a permanent or an electromagnet, be brought near to the other side of the plate and left for a time, the plate, when developed, will show a clearly defined image of the object. Positives made from such plates will give in shadow the outlines of any object used as armature. Thus may be obtained clearly defined silhouettes of a key, a wire gage, a pair of pliers, or any iron or steel implement used as armature.

If the plate be placed with its sensitive side facing the poles of the magnet and a disk of iron nearly as large as the plate be placed on the opposite side in the position of armature, "shadowgraphs" of any non-magnetic or diamagnetic bodies placed on the other side, between the plate and the poles of the magnet, will be produced upon the plate. The shadow pictures produced by either of these methods are as clear and distinct as those produced by Roentgen rays. I have obtained dark shadows with a compound steel magnet weighing little more than a pound. If strong electromagnets are used, the poles may be separated several inches from the plate. With an electromagnet capable of lifting a hundred pounds or more, I have made a "magnetograph" through a block of wood two inches in diameter. The object whose image is to be impressed upon the plate must be in contact with the sensitive film; a thin sheet of mica or paper seems to prevent the action, or at least to decrease the effect more than the removing of the poles several inches. The best results seem to be secured by suspending the magnet in a vertical position, so that the plate and the keeper will be held up against the force of gravity, as shown in Fig. 1, but that arrangement is not essential to success. In experimenting with electromagnets the objects were placed on the plate, and the plate was wrapped in several folds of black paper in the dark room. The plate was thus very perfectly protected from light throughout the experiment.

The image shown in Fig. 2 was produced with the apparatus arranged as shown in Fig. 1.

In the case of an electromagnet, varying the current by means of a rheostat or frequently making and breaking the circuit seems to facilitate the formation of the images. The time of exposure does not seem to be a matter of great importance, although the plate is evidently darkened more and the contrast increased by a long exposure. I have, however, obtained as clear an image in five minutes as with the same magnet after an exposure of ten hours. It would seem that the action is largely due to the approach or removal of the armature or to the change of current strength. I judge this to be true for the reason that the slightest change in the position of the object immediately after being placed in the field produces a double shadow of nearly equal intensity. In one case a key was used as an armature. In suspending the magnet in the dark closet the plate and key fell from the poles. They were immediately replaced in what was supposed to be the original position. When the plate was developed ten hours later, it showed two images of the key of nearly the same intensity, overlapping, with ends reversed. The experiments with permanent magnets were all made in the dark room and the plates were not covered. I used the Cramer Crown plates and eikonogen developer.

The results of these experiments are given with the hope that they may prove interesting and perhaps helpful to those who are trying to solve the great Roentgen conundrum. They seem to indicate that the ether in the field of a magnet is in a state of permanent stress, perhaps due to ether vortices, and that any change in magnetic force caused by

motion of the armature or variation of current strength produces a change in the degree of stress, and thus originates ether waves capable of affecting the ordinary photographic plate. There does not seem to be any difference in the radiations from the two poles, since the plate is equally darkened on all sides except where protected by intervening objects. Conductors seem to be the most opaque to these magnetic radiations, possibly by converting the energy of the waves into eddy or Foucault currents. It is not clear why the

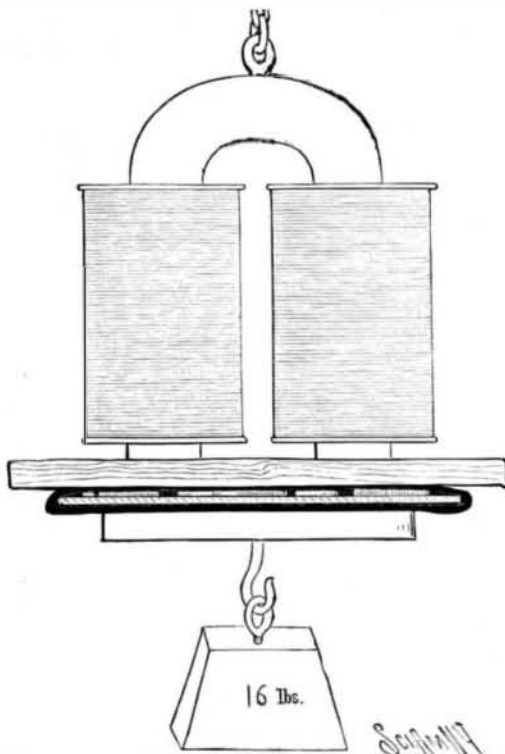


Fig. 1.—ARRANGEMENT OF MAGNET AND PLATE FOR THE MAGNETOGRAPH.

armature should protect the plate beneath it. One would naturally expect that there it would be affected the most.

Perhaps the shadow pictures produced by long exposure to sunlight, and which some think to be a Roentgen effect, may be caused by magnetic waves from the sun. And may not the Roentgen rays themselves be something analogous to these magnetic rays? May not the Roentgen effects be due to the magnetic component of a Hertz wave?

A Few Kinks in Brazing.

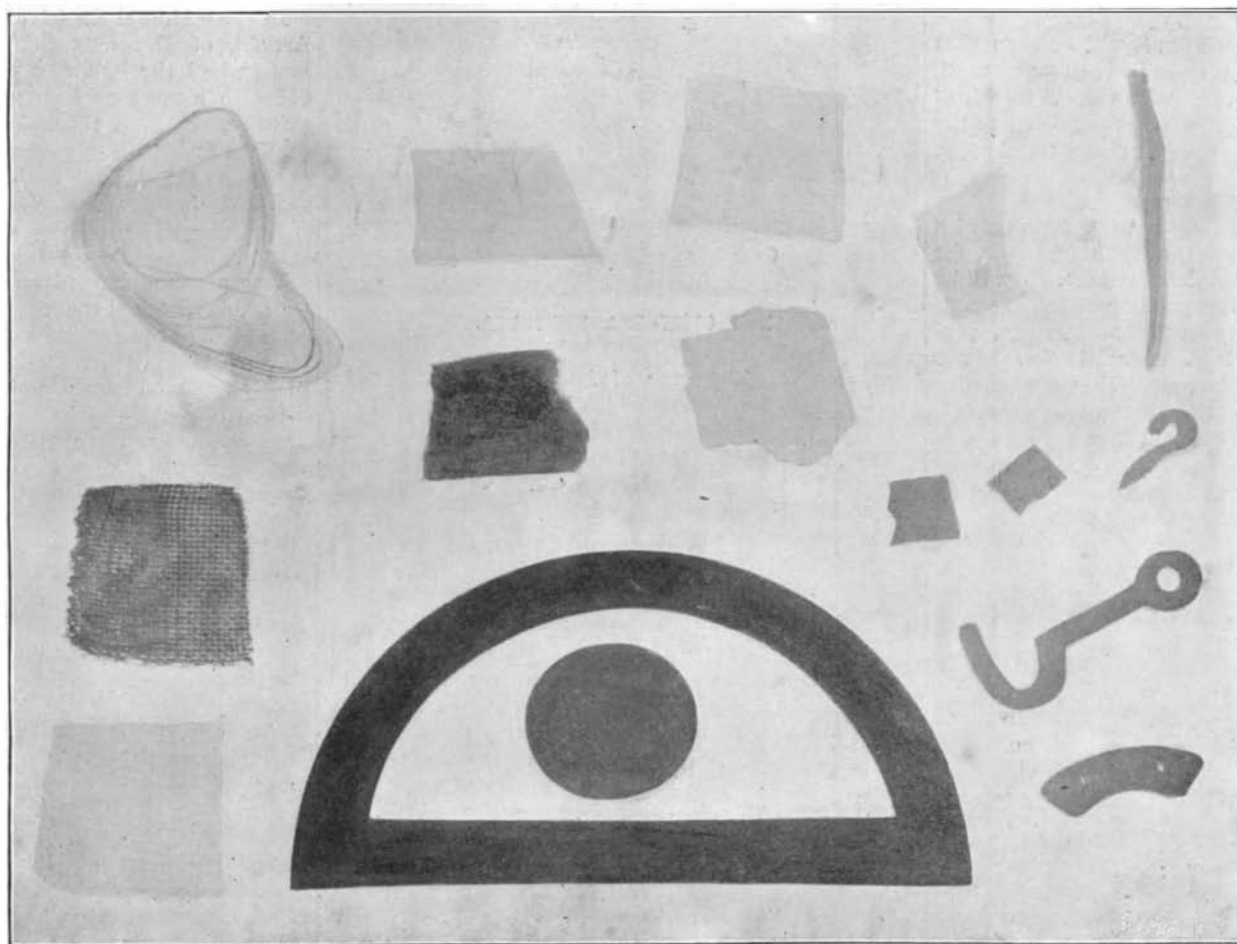
Brazing, says the Boston Journal of Commerce, is getting to be quite an art now that bicycle mending is coming in from all directions, and the way some of these thin steel tubes for the framework are handled down by the furnace door of an establishment is enough to make one think that soft coal and water

gas must be selling cheap. Spelter is used that will melt a trifle below the fusing point of common brass, and, if it is not already granulated, it must be worked into fine powder with a file. A supply of borax is the next thing to look out for. Then if there is a gas jet handy an artificial blast can be sent through a burner of the Bunsen type and quite a heat is directed on a bed of charcoal, where the delicate work is supposed to be buried waiting for the brazing. The joint to be brazed is to be made as firm as possible by having a close fit well pressed together, so much so that it will stand the sharpest raps of the poker, for when the brazing materials first melt and are well absorbed in the joint it is a relief to realize what a rap will do toward working the solder through the joint and knocking off the waste material. The borax is first spread over the joint as the work is approaching a low red heat, and it soon swells up and turns into a snow-like froth, on account of the water of crystallization boiling out of it, settles down and flows over the joint like glass, ready to clean off the surface and prepare the way for the soft brass that is about ready to melt under this temperature. Then comes the green blaze that is always a sure index that the work of sweating the joint with brass is being performed. The zinc, to which is due the green blaze, when the brass flashes, is employed in the brazing material to reduce the melting point of brass, and, when it volatilizes and gives off the fumes that produce the colored blazes it leaves the brass behind in a less fusible state. It stands the brazer in hand, then, to prepare all the work with the brass in position and to heat it so carefully that none of it will melt till the joint is well heated all alike and every portion settles down at the same moment. Borax is a substance that is supposed to dissolve all the rust and every kind of earthy substances and make a clean surface, no matter how the work is brought together, but the surfaces that are found on both the inside and outside of steel pipes, as well as drop forgings, will need to be cleaned off by some other treatment, in which a file or scraper will be found useful. With sheet iron a joint can be brazed by using filings from soft cast iron in the same way as if it were brass, and a joint produced that will pass for welding. In all kinds of brazing the substance used for this purpose is inclined to etch the edges of the work and mar the surfaces wherever they have been exposed to the fused material, with the exception of silver. When used for a solder silver has such a liking for iron and steel that it will take hold without any of that biting action whatever, and when we come to see how economically it can be used for these purposes, it would seem to be the cheapest material in the end.

A Simple Seismoscope.

A simple instrument for recording the time of occurrence of an earthquake is described by Prof. C. F. Marvin in the United States Monthly Weather Review. A heavy lead weight is suspended on a short steel link, to which it is pivoted by means of a sharp pointed

screw, the point being just above the center of gravity of the weight. A similar pointed support is provided for the top of the link, which hangs from a small projection in the frame of the instrument. The link is prolonged upward as a needle about six inches long, the top of which passes through a small hole in a plate connected with the frame. The plate is electrically insulated from the rest of the instrument. A movement of the ground is magnified by the end of the needle, and the contact of the sides of the hole in the plate can, by connection with suitable electrical apparatus, produce an automatic record on a sheet of paper. The recording apparatus used with it is the so-called "weekly anemometer register," and the time of a disturbance can be read to less than half a minute.



Platinum wire.
Copper gauze.
Iron gauze.

Tin foil.
Gold foil.

Brass protractor.
Silver coin.

Platinum foil.
Brass.

Lead foil.
Aluminum.

Magnesium
ribbon.
Copper objects.

RADIOGRAPHS PRODUCED BY A MAGNET.