EXPERIMENTS IN MAGNETISM.

BY GEO. M. HOPKINS.

When a piece of soft iron is placed in direct contact with the poles of a permanent magnet, the magnetic force is nearly all concentrated upon the soft iron, so that there is very little free magnetism in the vicinity of the poles of the magnet. This may be readily shown

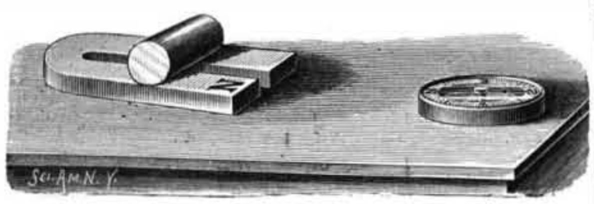

Fig. 1.—EFFECT OF THE ARMATURE.

by arranging a U-magnet parallel with the magnetic meridian, placing in front of and near the poles of the magnet a compass so adjusted with reference to the poles as to cause the needle to rest at right angles to the magnetic meridian, then applying to the poles of the magnet a massive armature. It will be found that the needle, under these conditions, immediately tends to assume its normal position, showing that the power of the magnet over the needle has been, to a great extent, neutralized. By rolling a cylindrical armature along the arms of the U-magnet, as shown in Fig. 1, it is found that as the armature recedes from the poles of the magnet the influence of the magnet upon the compass needle is increased, while the movement of the armature in the opposite direction diminishes the power of the magnet over the needle.

In Fig. 2 is illustrated an example of temporary magnetization by induction, and of the effect of a permanent magnet on the iron so magnetized, showing that the iron bar inductively magnetized acts like a permanently magnetized needle. The soft iron bar is freely suspended, and receives its magnetism from the fixed magnet. The end of the suspended bar adjacent to the

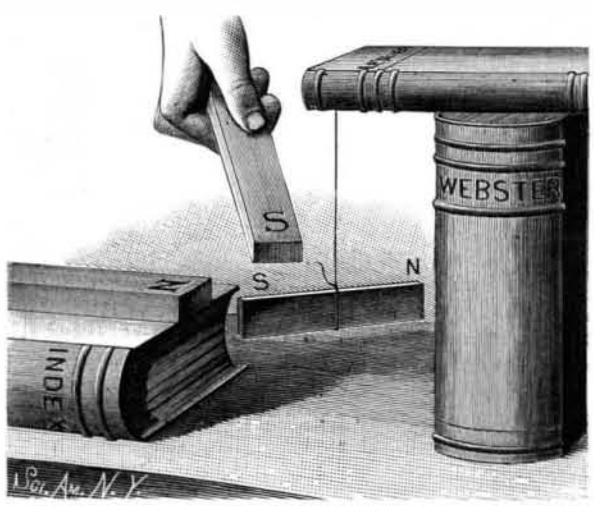

Fig. 2.—PERMANENT MAGNET AND BAR MAGNETIZED BY INDUCTION.

N pole of the magnet becomes S, as may be shown by presenting to it the S pole of another permanent magnet. The S end of the swinging bar will be immediately repelled. If the S end of the permanent magnet be presented to the opposite end of the suspended bar, the reverse of what has been described will take place, *i. e.*, that end of the bar will be attracted, showing that its polarity is N.

In Fig. 3 is illustrated an experiment showing the neutral effect produced by induction from two dissimilar magnetic poles. A bar of soft iron is arranged near, but not in contact with, the pole (say the N pole) of a magnet, so that it becomes magnetized by induction to such an extent as to support a nail. The N pole of the magnet produces S polarity in the end of the soft iron bar adjacent to it and N polarity in the opposite end. The S end of another permanent magnet presented to the same end of the iron bar will produce exactly the opposite effect in the bar, and will, therefore, neutralize the magnetism induced in the bar by the first magnet and cause the nail to drop.

A similar effect is produced when the iron bar is in actual contact with the N pole of a magnet and the S pole of another magnet is brought into contact with the opposite end of the bar, as shown in Fig. 4. The nail will adhere to the bar when either magnet alone is in contact with the bar; but when dissimilar poles are brought into contact with opposite ends of the bar, its middle portion becomes neutral, and is no longer able to support the nail.

When like magnetic poles are presented to the ends of the iron bar, as in Fig. 5, a strong consequent pole is

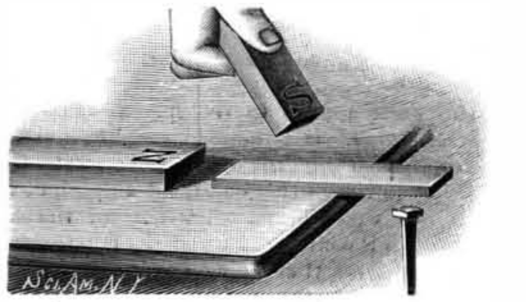

Fig. 3.—NEUTRALIZING EFFECT OF AN OPPOSING POLE.

developed in the center of the bar, which is of the same name as that of the ends of the magnets touching the bar.

Luminous Cascade for the Exposition.

At the Academy of Sciences M. Troost described an apparatus, newly imagined by M. Beckman, for illuminating large size jets of falling water. Colladon's method, hitherto employed, consists in the use of a hollow cylinder containing water under pressure. Several holes allow the water to flow down in the shape of parabolic jets, and little windows on the opposite side of the cylinder enable the operator to throw a pencil of electric light into the axis of each one of the jets. The effect, probably known to most readers, says the *Chemist and Druggist*, is exceedingly fine, as the light follows the course of the water, and each jet sparkles like liquid fire. Unfortunately the plan will not work with high pressures, when the jets are, for instance, thrown much farther than one meter from the cylinder. In the new system devised by M. Beckman the jets will be, owing to an ingenious form of faucets, hollow instead of solid, and the electric light will be projected into the central space. It has been found that streams of water may thus be illuminated throughout, even when thrown 4½ or 5 meters from the cylinder or fountain, and a brilliant night display is expected in the exposition gardens.

REMARKABLE LOCOMOTIVE EXPLOSION IN NORWAY.

We give an engraving of a remarkable explosion of a locomotive, which took place at Strommen, December 22, 1888. By the force of the explosion the locomotive was thrown upward and capsized, and came down bottom up, alighting upon an adjacent locomotive that was standing on the track. Our illustration was prepared from a photograph of the two locomotives as they appeared soon after the occurrence.

New Antidote for Morphine.

Professor Bokai, of Klausenberg, believes that the best antidote for morphine is picrotoxin. The two substances act in an opposite manner on the respiratory center, morphine paralyzing its action, while small doses of picrotoxin increase it. As in poisoning by

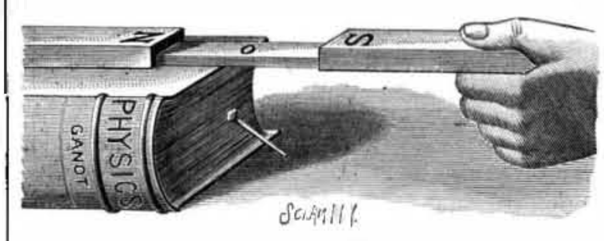

Fig. 4.—NEUTRAL POINT BETWEEN UNLIKE POLES.

morphine death occurs from paralysis of the respiratory center, and as picrotoxin hinders this paralysis, it follows that picrotoxin is likely to be of real use in morphine poisoning. In morphine poisoning, diminution of the blood pressure plays an important part, but picrotoxin enjoys the property of stimulating the vasoconstrictor center of the medulla and thus counteracts the effect of the morphine. Once again, the action of these two substances on the cerebral hemispheres is also of an opposite character. As atropine, the only known antidote of morphine, cannot be administered in large doses, it is certainly desirable that other means of combating morphine poisoning should be sought for. Professor Bokai thinks that picrotoxin may be useful as a substitute for preparations of nux vomica, and he also believes that it will be found of value in preventing chloroform asphyxia.—*Lancet.*

Dredging Sand and Silt.

In *Les Annales des Ponts et Chaussees*, M. Boulle describes a form of dredger in which the removal of sand or silt is effected by an injection of compressed air instead of by suction. The machine consists of a tube passing through the water to the bottom to be dredged, and a compressed air injector placed at the bottom and at right angles to another pipe. The injector surrounds the main tube, and is fitted with a number of small mouthpieces producing a flow of a mixture of

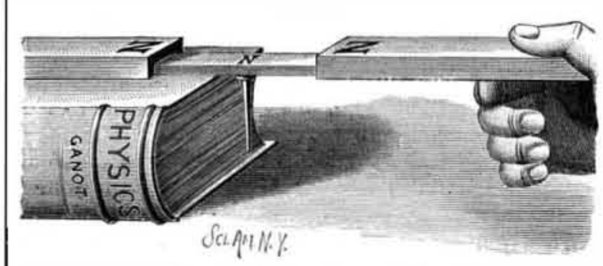

Fig. 5.—CONSEQUENT POLE.

water, silt, and air up the main tube. In a trial at Saumur, on the Loire, the main tube was 4 inches in diameter, and sand was dredged from a depth of 15 feet, lifted 5½ feet above the water level, and finally transported to a distance of 50 feet. The compressor was of 15 horse power, which drew in 3·53 cubic feet of air per second, and by it raised 130 cubic yards of sand-burdened water per hour, the sand constituting from three-tenths to four-tenths of the whole volume. At Havre a 9 inch tube was used, and the depth was from 26 feet to 30 feet. Using a compressor of the same power as at Saumur, 390 to 520 cubic yards of silt and water were lifted per hour, the silt forming one-quarter of the whole. The dredger is most efficient in soft silt, sand, or gravel, but stones weighing 22 pounds have been removed by it, using the 9 inch tubes.

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