SIMPLE EXPERIMENTS IN PHYSICS.

BY GEO. M. HOPKINS.

A simple and efficient rotator, in which the means of communicating rotary motion does not appear on the screen, is shown in Figs. 1 and 2. In this apparatus a glass wheel, provided with a brass rim, is furnished with a shaft, which turns in a hole bored in the center of a thick glass supporting disk. The brass rim of the wheel is provided with a series of radial vanes, also with three clamping screws bearing on springs in the interior of the rim for clamping the objects to be rotated. A nozzle attached to the back piece is arranged to direct a jet of air upon the vanes, and thus cause the glass wheel to revolve. A Fletcher blow-pipe bellows furnishes a suitable blast for this purpose.

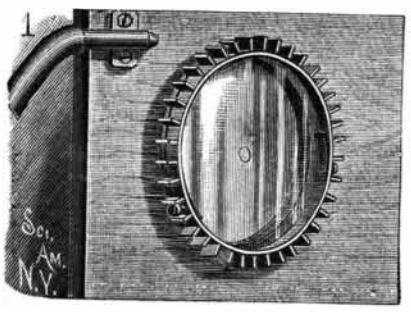

Fig. 1.—ROTATOR FOR THE LANTERN.

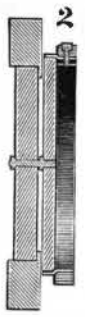

Fig. 2.—SECTION OF ROTATOR.

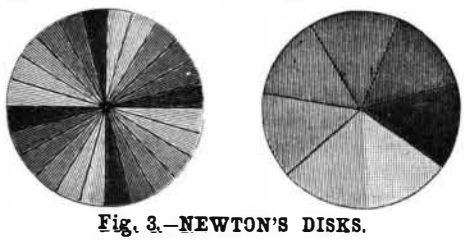

Fig. 3.—NEWTON'S DISKS.

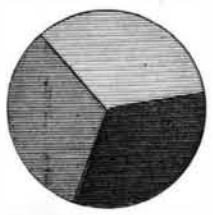

Fig. 4.—BREWSTER'S DISK.

To the rim of the glass wheel are fitted disks for blending colors. Among these are Newton's disks, Fig. 3, in one of which the colors of the spectrum are four times repeated, also a Brewster's disk. These disks are made by attaching colored films of gelatine to glass, or by tinting the glass by means of colored lacquer. The rotator is also provided with a circular cell filled with the liquids of different densities, to which allusion has been made in a previous article. This cell, when at rest, appears as in Fig. 5, and when in motion as in Fig. 6, the different liquids being compelled to assume certain relations with each other by centrifugal force, the heavier liquid, *a*, taking the position as far from the center of rotation as possible, the liquids, *b c d*, arranging themselves in the order of their densities.

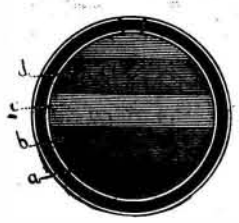

Fig. 5.

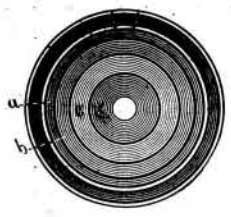

Fig. 6.

ACTION OF CENTRIFUGAL FORCE ON LIQUIDS.

The effect of a helix on particles of magnetic material suspended in a liquid is shown in the experiment illustrated by Fig. 7, which is arranged for projection or for individual observation. A short section of glass tubing, 2¼ inches in diameter and ¾ inch long, is ground true and smooth at its ends and clamped between two plates of glass with intervening rings of elastic rubber. Before clamping the parts together, one end of the glass tube is cemented to the packing ring, which in turn is cemented to the glass, and a small quantity of fine iron filings is placed in the cell, the cell is filled with a fifty per cent solution of glycerine and alcohol, and a helix formed of five or six layers of No. 16 magnet wire is placed upon the glass tube. The remaining packing ring is placed on the end of the glass tube, the second glass plate is put in position, the clamps are applied, and the apparatus is ready for use. This method of making the cell leaves an air bubble, which is needed to allow the liquid to expand freely.

By thoroughly agitating the liquid, the iron filings will be evenly distributed throughout the cell, and they will be prevented from falling immediately by the viscid nature of the solution.

When four or five battery cells are connected with the helix, the iron particles arrange themselves radially or at right angles to the wire surrounding the cell.

The effect produced in the magnetic field by the presence of an armature is shown by the lantern experiments illustrated in Figs. 8 and 9.

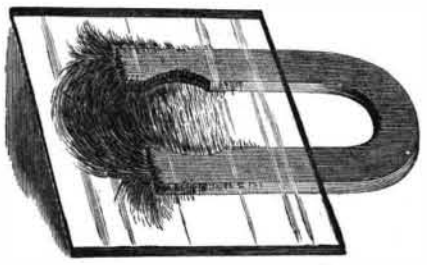

Fig. 8.—THE MAGNETIC FIELD.

In Fig. 8 is shown a permanent magnet having the form of a field magnet of a dynamo. This magnet is cemented to a plate of glass. When the magnet thus arranged is placed in a vertical lantern, with the glass uppermost, and a few fine iron filings are sprinkled on the glass, the usual magnetic curves are formed. The lines will extend straight across from one polar extremity of the magnet to the other, and at the ends will be formed symmetrical, approximately semicircular curves. When a cylindrical piece of iron, representing the armature core of a dynamo, is inserted between the poles of the magnet in the place usually occupied by the armature, the lines are deflected inward, becoming perpendicular to the periphery of the armature. The iron representing the armature is cemented to a second plate of glass. The iron particles arrange themselves in a more pronounced figure if the glass plate upon which they are sprinkled be jarred slightly.

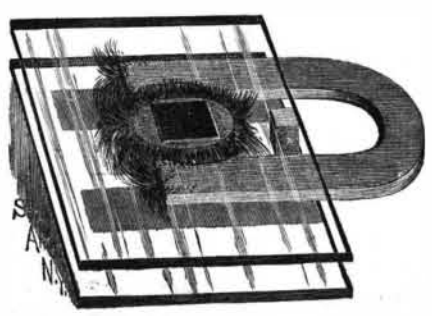

Fig. 9.—EFFECT OF AN ARMATURE ON THE MAGNETIC FIELD.

A very simple, pleasing, and at the same time instructive lantern experiment is illustrated in Fig. 10. A loadstone supported by a brass wire from the baseboard is arranged to project into the field of the lantern without showing the wire. Under the loadstone is placed a small cup filled with fine iron filings, and also in the field of the lantern. An unmagnetized needle is dipped in the filings and removed, showing that it has no power to lift the filings; then while it is still in the field of the lantern, the needle is rubbed across the end of the loadstone and dipped the second time into the filings. This time the needle takes up a quantity of the filings, showing that the loadstone has imparted magnetic properties to the needle.

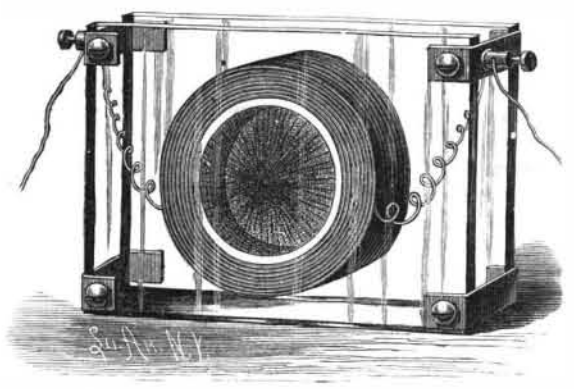

Fig. 7.—EFFECT OF A HELIX ON SUSPENDED PARTICLES OF IRON.

To render this experiment complete, an erecting prism must be used to cause the image to appear right side up on the screen.

THE LOWTH TELEPHONE.

This is a new and in some respects remarkable instrument, by which speech is transmitted, without making use of sound waves as in the Bell and other forms of electrical telephones.

In the Lowth telephone the transmission is effected by means of an electrical plug which is placed against the neck of the operator, near the vocal organs. The vibrations of the neck produced by the act of speaking shake or move the plug, thereby giving rise to corresponding electrical undulations, which pass over the wire to a receiver at the opposite end of the wire, and are there heard by the listener. A receiver and plug are both combined in one instrument, as shown in our engraving, which is from a photograph, and the telephone is used in the manner there represented. The instrument is held to the ear with the plug resting against the throat, as shown. The operator then speaks, and the voice is heard at the other end of the line, with the utmost clearness.

Fig. 10.—MAGNETIZATION BY LOADSTONE.

It is claimed that this new telephone is entirely distinct from what is usually called the Bell system, as the instrument employs no diaphragm, and is not operated by atmospheric or sound waves, but by the muscular vibrations that precede and also accompany the utterance of words and other sounds. These vibrations are imparted to the button which is held against the exterior surface of the throat, and conducted by proper mechanism connected therewith to the electrodes or current-controlling elements, thereby causing the distant receiver to reproduce the words or other sounds.

THE LOWTH TELEPHONE.