SIMPLE EXPERIMENTS IN PHYSICS.

BY GEO. M. HOPKINS.

As a means of illustration, nothing can excel projection by means of a good optical lantern. Not only can pictures and diagrams be shown clearly to a large assemblage, but apparatus of various kinds may be projected on a mammoth scale, many chemical actions may be exhibited, the phenomena of light, heat, electricity, and magnetism may be shown in various ways. In fact, there is scarcely a branch of physics that may not be illustrated in this way. The lantern is becoming deservedly popular in colleges and schools and for private use. Besides being of great use for general instruction, it affords a means of rational amusement and entertainment.

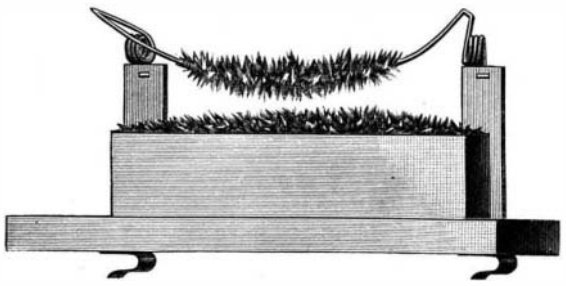


Fig. 1.—ARAGO EXPERIMENT.

A poor lantern, like any other inferior piece of apparatus, is undesirable. An instrument for scientific work should have a triple condenser, a rectilinear objective, a swinging front for the vertical attachment, a calcium or electric light, polariscopic and microscopic attachments, an erecting prism, and an alum or water tank. Such an instrument may now be purchased for a reasonable price, so that there is no economy in making one's own instrument. It will, however, be found advantageous to make the attachments.

A simple way of illustrating Arago's experiment showing the magnetizing effect of an electric current on soft iron, is represented in Fig. 1. The lantern to which this and other pieces of apparatus are adapted is provided with two rods projecting from the front of the instrument and connected with binding posts, which in turn are connected with a battery or dynamo. The base of this apparatus is furnished with spring clips for engaging the conducting rods of the lantern. To the upper ends of two posts rising from the base are attached the extremities of a copper wire, which is bent into spirals at its fixed ends. The wire is bent twice at right angles, and is curved downwardly between the arms extending from the spirals. The ends of this wire are connected with the clips. On the base below the curved part of the wire is placed a box well filled with iron filings. The box and the wire are projected on the screen, an erecting prism being used. The wire is pressed downward into the filings and withdrawn before the current passes, to show that the wire, uninfluenced by the current, is not able to lift the filings. The current is sent through the wire, when it is again dipped into the filings. This time it will take up a quantity of the filings, as shown in the engraving, each fragment of iron becoming a magnet, which tends to place itself at right angles to the current. When the current is interrupted, the filings fall.

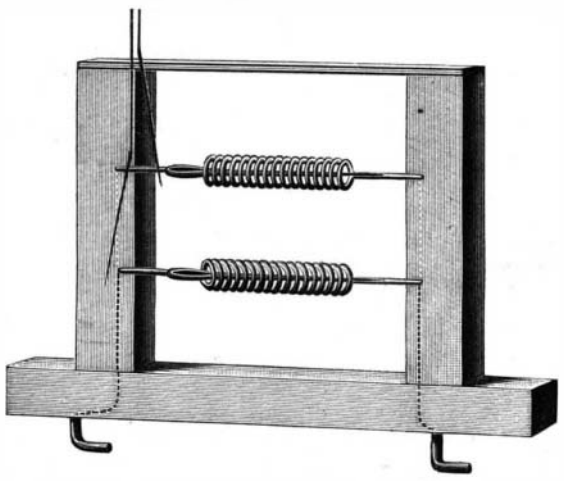


Fig. 2.—MAGNETIZATION BY MEANS OF SPIRALS.

In Fig. 2 is represented a device for showing the magnetizing effect of a helix, also the different results secured by helices wound in opposite directions. The frame is provided with metal clips for attachment to the rods of the lantern, and two helices, which are oppositely wound with respect to each other, are stretched across the frame.

The ends of the helices are connected with the clips, so that the current passes from one clip through both helices, as indicated by dotted lines, to the other clip. The helices are provided with a coating of insulating varnish. A darning needle is placed in each helix, and when no current is passing, a magnetized cambric needle, suspended by a fine thread, is held near the ends of the needles in alternation. It is drawn toward both alike.

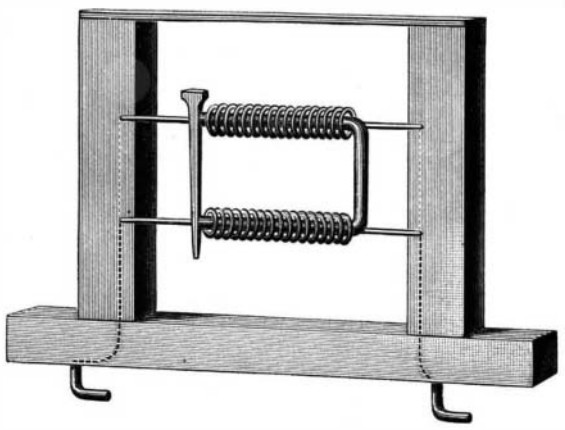


Fig. 3.—STURGEON'S MAGNET.

After a current has been sent through the helices it will be found that the darning needles are magnetic, but, owing to the opposite winding of the helices, corresponding ends will have opposite polarity, as will be shown by again presenting the suspended cambric needle to the ends of the darning needles. It will be attracted by one and repelled by the other. By placing a U-shaped piece of soft iron wire in the helices, as shown in Fig. 3, the construction of the first electromagnet (Sturgeon's) is clearly illustrated. In Fig. 4 is shown a device for projecting the incandescent lamp. It is suspended from two conductors, and its image is thrown upon the screen with a dull light which is just sufficient to clearly show the outline of the lamp and the black carbon filament. A current is then sent through the lamp, when the filament becomes incandescent and shows as a brilliant arch on the screen, while all of the parts of the lamp are distinctly visible.

In Fig. 5 is shown a method of projecting the electric arc which has the advantage of showing the carbons before the arc is formed, and also of rendering them visible during the experiment. The lamp consists of two wire carbon holders attached to a wooden standard and connected with the rods of the lantern, as in the cases before described. The carbons are projected with a dim light, showing the crater of the positive carbon and the point of the negative carbon. Then the current is turned on, the carbons are brought into contact and separated, forming the arc, the points soon become incandescent, and the arc light, in full operation, is seen on a large scale on the screen.

These experiments are very striking when seen upon a large screen, the projection of the arc and incandescent lights being particularly interesting.

Our First Imported Locomotive.

In our sketch, in September last, of the venerable octogenarian, Eli Cooper, engineer on the first railway train from Boston to Lowell, it was inadvertently stated that the locomotive, the Stephenson, brought from England in 1834, was the first locomotive imported. The Stourbridge Lion, which is reported as having made but one trip, had, however, the precedence of the Stephenson by some five years. It was built at Stourbridge, England, and imported by the Delaware & Hudson Canal Company. Horatio Allen, of Orange, N. J., then chief engineer of that company, thus speaks of the trial trip, in a note under date of January 18 last, addressed to Mr. J. E. Watkins, Curator of the National Museum, Smithsonian Institution:

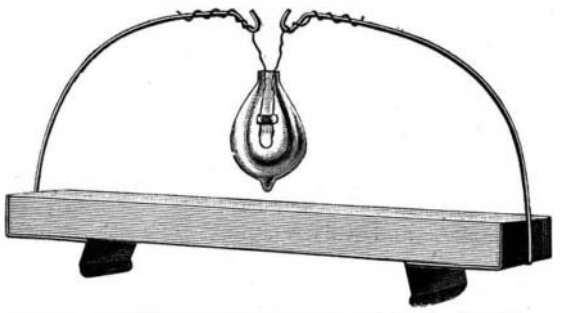


Fig. 4.—INCANDESCENT LAMP ARRANGED FOR PROJECTION.

"The locomotive known as the Stourbridge Lion was the first locomotive run on this continent. The occurrence took place at Honesdale, Pa., August 9, 1829, on the mine railroad of the Delaware & Hudson Canal Company. The locomotive was one of three built for that company in England, in 1828, under my direction as to plans, which were received in the city of New York early in the year 1829. Through circumstances not necessary to state, I ran the locomotive myself—a responsibility I had never undertaken before and have never repeated since. Thus on this first movement by steam on railroads on this continent I was engineer, fireman, brakeman, conductor, and passenger."

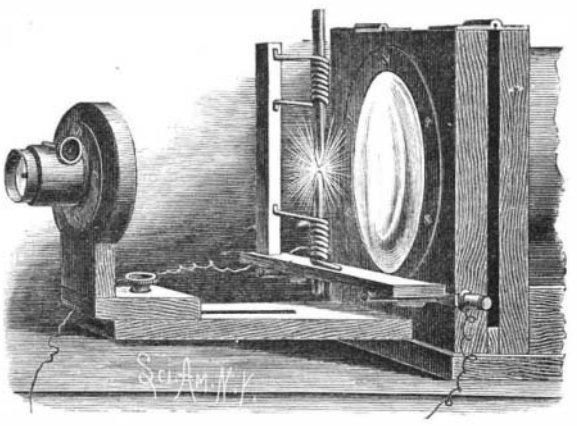
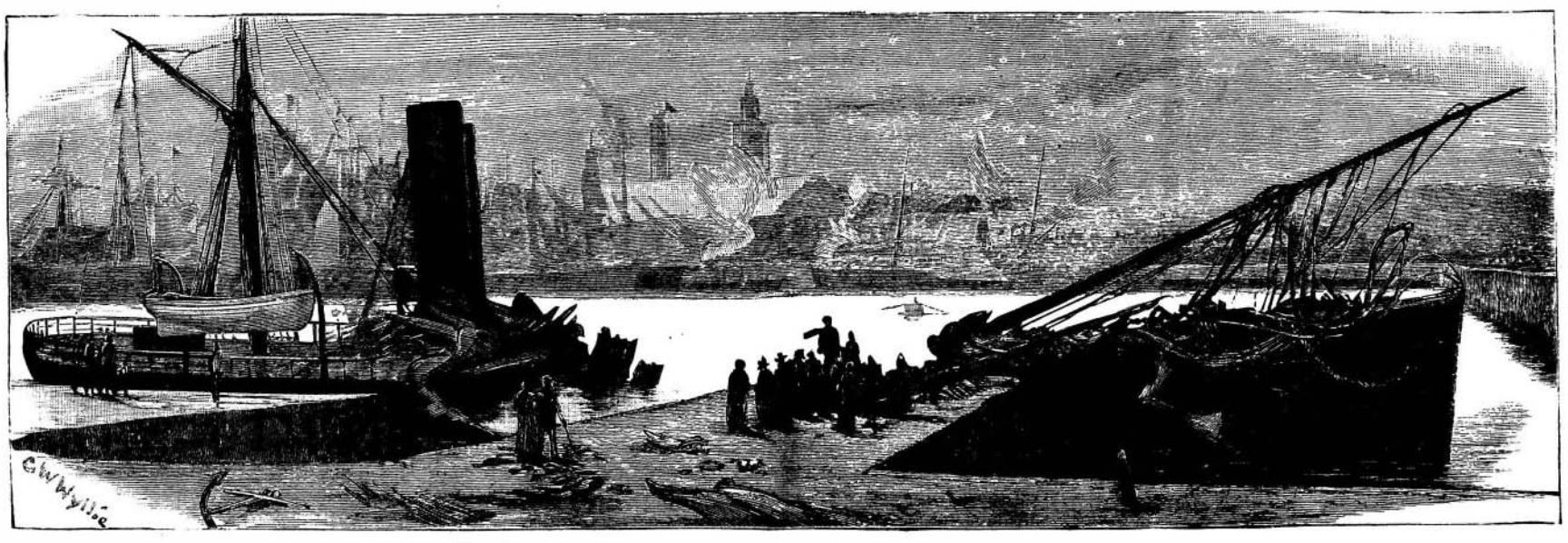


Fig. 5.—PROJECTION OF THE ARC.

EXPLOSION OF A PETROLEUM STEAMER AT CALAIS, FRANCE.

On October 16, a few minutes after nine o'clock in the evening, the usually quiet seaport of Calais was startled by a tremendous explosion. The inhabitants were terribly startled, the shock to the houses being terrific, and many people took to the streets, believing that an earthquake had occurred, windows being broken in all directions, and the gas being suddenly extinguished. It was soon ascertained that the explosion had taken place on board the Ville de Calais, a new vessel of some thousand tons register, which had been built for carrying petroleum between Calais



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