

**METALLO CHROMES.**

BY GEO. M. HOPKINS.

The production of Nobili's rings is a very simple and pleasing electro-chemical experiment which may be readily tried by any one having one or two batteries, or a small dynamo or magneto-electric machine, and figures of various kinds may be produced by the same process in brilliant colors.

To produce the rings, all that is required is a Bunsen or Grenet battery in good order, a strong solution of acetate of lead (sugar of lead) and a steel or nickel

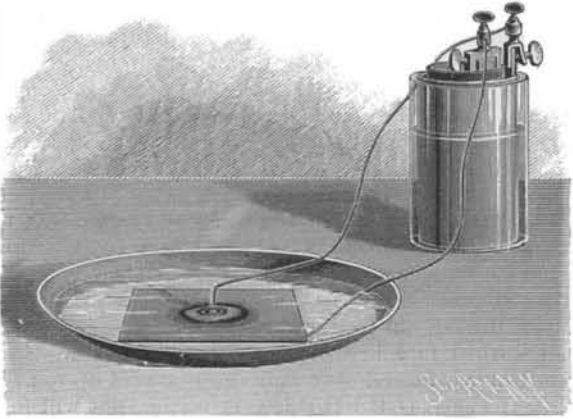


Fig. 1.—PRODUCTION OF NOBILI'S RINGS.

plated brass plate. The lead solution is placed in a common saucer, the steel or nickeled plate is placed in the bottom of the saucer and connected by a wire with the zinc pole of the battery, and the end of the wire, which is connected with the carbon pole of the battery, is held near the steel plate without touching it, as shown in Fig. 1. In a very short time a spot of color will appear on the plate, and in a minute or so the spot will spread rapidly and form concentric rings of prismatic colors, as shown in Fig. 2. A few trials will enable the operator to determine the time required for the production of the best effects. When the operation has proceeded far enough, the plate is removed from the solution, washed in clean water and dried. The beautiful color effect is due to the decomposition of the light by the exceedingly thin film of peroxide of lead deposited on the surface of the plate. It is quite

permanent, and serves to protect the surface of the plate from oxidation.

To secure the best results, the plate should be highly polished and the lead solution should be filtered.

By providing anodes of different forms, various ornamental figures may be produced on the surface of the plate. For example, a wire bent into the form of a letter or figure of any form may be used as an anode for producing a figure of the same general form on the plate. As it is sometimes difficult to hold the anode in the proper position, ordinary insulated wire (magnet wire) may be used. This permits of placing the anode down upon the plate, the insulation serving to prevent direct electrical contact.

Very beautiful effects may be secured by cutting an anode of the desired shape from sheet copper and bending parts so as to vary their distance from the plate as in the case of the cross, Fig. 2. The result is that the film is deposited in beautifully graduated colors at the extremities of the figure, the arrangement of colors bearing some resemblance to those of a peacock feather.

The arrangement of the colors in these films is that of the solar spectrum. Nobili's rings resemble Newton's. The colors are fully as intense and more readily seen.

Nobili discovered this phenomenon in 1826. Since that time many modifications of the process have been devised, and some commercial applications have been made. It has been used to some extent in the ornamentation of small objects, such as buttons, articles of jewelry, etc., imparting to them an iridescence which cannot be imitated by any artificial coloring.

Becquerel suggested a solution for this purpose, the formula of which is as follows: "Dissolve 200 grammes of caustic potash in 2 quarts of distilled water, add 150 grammes of litharge, boil the mixture for a half hour, and allow it to settle. Then pour off the clear liquor and dilute with its own bulk of water."

This solution is adapted to other metals than those above mentioned, but the acetate of lead solution yields very satisfactory results and is sufficient for experimental demonstration. In conducting these experiments the poisonous nature of the solutions should be borne in mind.

**HORIZONTAL TRIPLE EXPANSION ENGINE.**

We illustrate a triple compound horizontal engine constructed by Messrs. Tangyes, limited, Cornwall

Works, Birmingham. *Engineering*, to which we are indebted for our engraving, says: The cylinders are respectively 8 inches, 11½ inches, 16½ inches in diameter by 18 inches stroke, and drive cranks set at angles of 120 degrees. The cut-off to the high pressure cylinder is controlled automatically by the Tange-Johnson expansion gear direct from the governor; the cut-off to the intermediate and low pressure cylinders is not variable, ordinary Trick-ported valves being used.

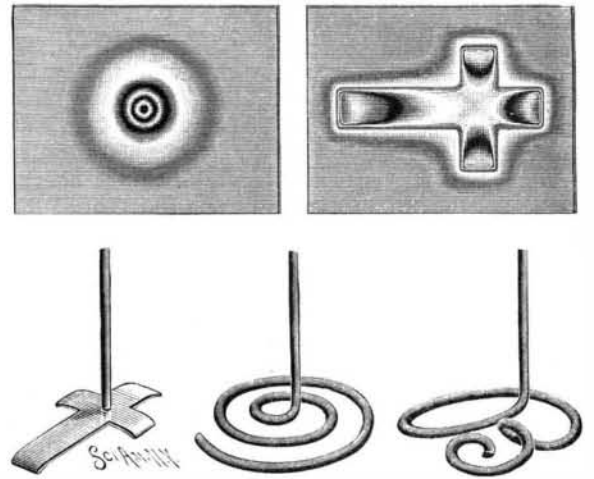
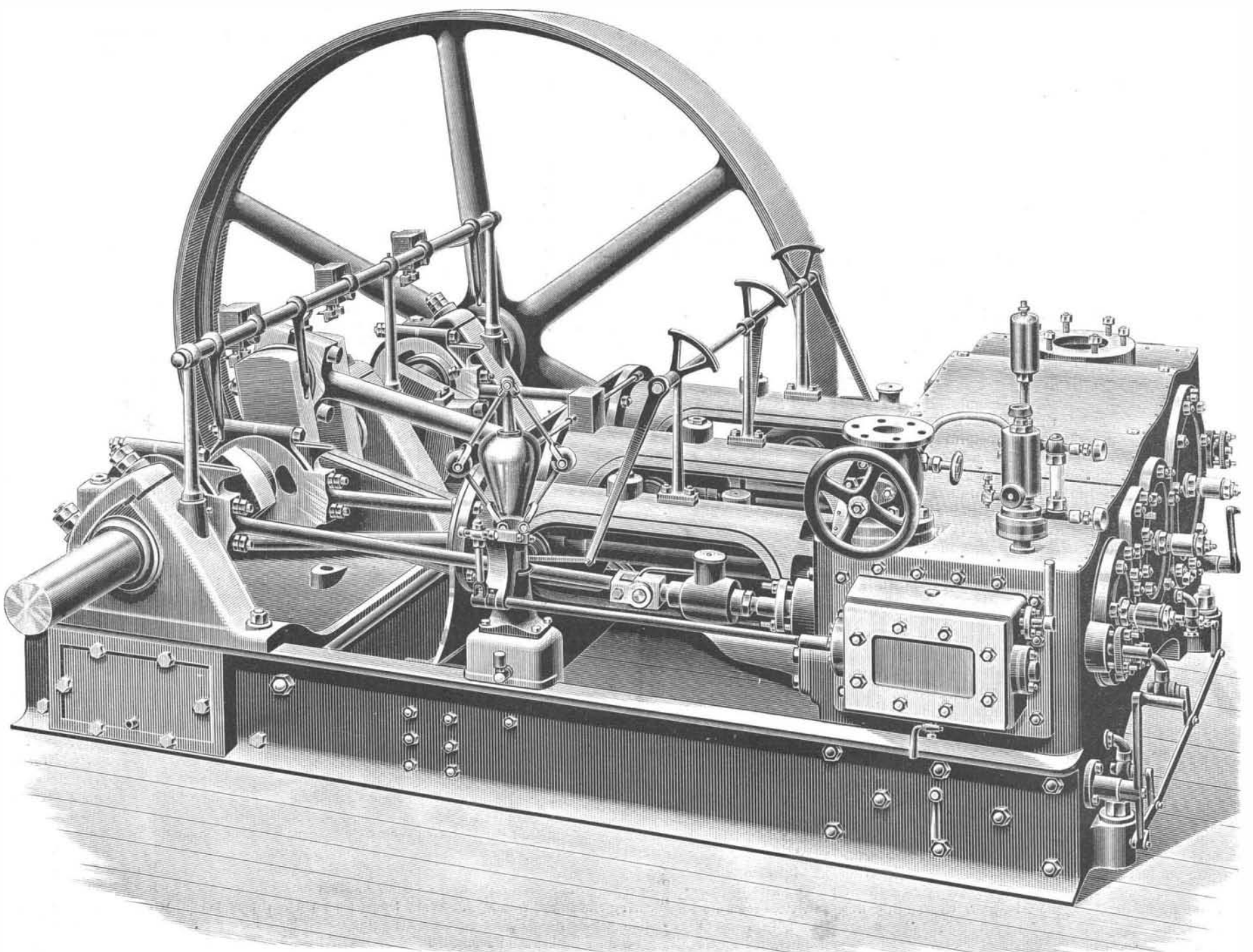


Fig. 2.—METALLO-CHROMES AND ANODES.

All the bearings and wearing surfaces are of liberal proportions. The main and crank pin bearings are lined with anti-friction metal. As this type of engine is often required to run continuously for hours without stopping, the oiling arrangements for all the moving parts are suitable for these conditions. One of these engines was tested at the Cornwall Works in March, 1889, making several continuous runs of three to five hours; diagrams were taken at frequent intervals, and the feed water carefully measured. The temporary boiler then used was rather small, and the fire had therefore to be forced, so that no coal record was kept.

The results work out to 18.6 lb. of water per indicated horse power per hour when indicating 96.8 horse power and running 141 revolutions per minute. The load was applied to two friction brake wheels 7 ft. 6 in. in

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