R. E. HOUSE.

ELECTRO MAGNETS.

No. 180,093. Patented July 25, 1876.

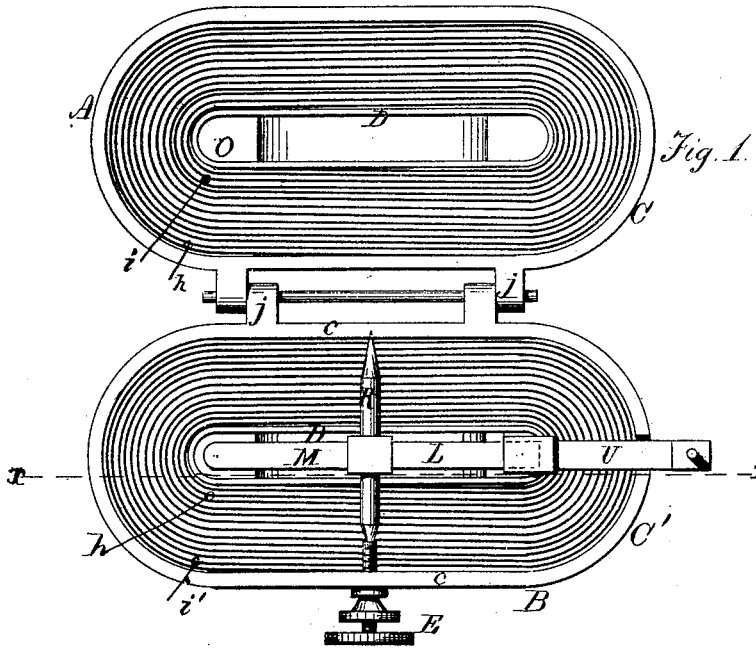

Fig. 1.

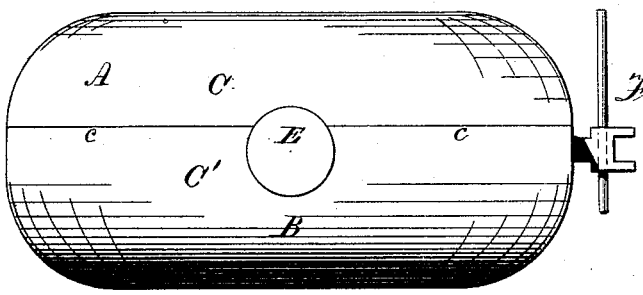

Fig. 2.

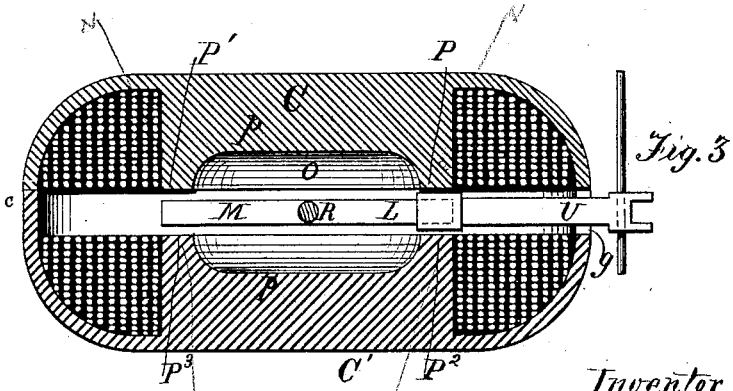

Fig. 3

Witnesses;
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UNITED STATES PATENT OFFICE.

ROYAL E. HOUSE, OF BINGHAMTON, NEW YORK.

IMPROVEMENT IN ELECTRO-MAGNETS.

Specification forming part of Letters Patent No. **180,093**, dated July 25, 1876; application filed July 1, 1876.

To all whom it may concern:

Be it known that I, ROYAL E. HOUSE, of Binghamton, in the county of Broome and State of New York, have invented an Improved Electro-Magnet; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a plan view of the electro-magnet with the covers open. Fig. 2 is a side view, showing the covers closed; and Fig. 3 is a longitudinal section, taken in line *x x* of Fig. 1.

Similar letters of reference in the accompanying drawings denote the same parts.

This invention is a modification of the iron-covered electro-magnet which I have claimed broadly in another application for Letters Patent filed in the United States Patent Office June 17, 1870; and the present application is a division of said former application. The modification consists in combining two independent insulated coils with said covers, and arranging the magnetic poles and the needle in a novel manner, so as to produce a compact electro-magnet having great power and sensitiveness, and by means of which a reciprocatory movement of the needle may be caused, either by alternately reversing the currents, or by first sending a current in one direction through one coil, and then in an opposite direction through the other coil, substantially as I will now proceed to describe.

In the drawings, the two independent insulated coils are represented at A B, each being wound around a bent insulated strip, D, of suitable non-magnetic metal or other material, to give the oblong form to the coils, and to leave an elongated open space, O, in the middle of each coil, as shown in Fig. 1. C C′ represent the iron cover, made, for convenience, in two pieces, preferably of soft iron, hinged to each other at *j j*, and adapted to fit closely together around their edges, so that when closed they practically become, for magnetic purposes, as one piece of iron, and will, as one piece, be magnetized by any electric or magnetic force operating upon either or both. The outside surface of each cover is continuous, and, preferably, unbroken by any openings except a slot or gain, *g*, through which the needle-lever L extends, the holes through which the ends of the helix-wires *h h i i′* project, and a screw-hole to receive an adjusting thumb-screw, E, which supports one end of the needle-shaft. A projecting rim, *c*, around the part B causes the two parts of the cover, when closed together, to leave space enough between the two helices for the accommodation of the needle-shaft, its bearings being in or supported by said rim. On the inside, each cover is provided with an elongated rib, *p*, terminating in two projections, P P^1 or P^2 P^3, which occupy the ends of the space O, and, when the covers are magnetized, become the poles of the electro-magnet. The needle M, of magnetized steel, is mounted so as to oscillate freely on a pin or rock-shaft, R, held between the screw E and the opposite side of the cover, and is arranged in such a position that one extremity of the needle extends between the poles P P^2, at one end of the space O, while the opposite extremity extends between the poles P^1 P^3 at the other end of the space O, there being sufficient room between the ends of the needle and the two nearest poles to allow it to oscillate from one to the other as the electric currents pass through the wires.

The outer or commencing end of the wire of helix A, and the inner or terminating end of the wire of helix B, are united together by a good metallic connection, and are represented at *h*. The opposite ends of both wires are shown at *i i′*. A current sent through wire *h* will, therefore, enter at the center and escape at the periphery of helix B, and will enter at the periphery and escape at the center of helix A. If sent through the wire *i*, it will enter at the center and escape at the periphery of helix A; and if sent through wire *i′*, it will enter at the periphery and escape through the center of helix B.

The coils, with their wires *h i i′*, are properly insulated from each other and from the magnetic-metal covering, and when the electro-magnet is to be used, the two parts of the cover are to be closed together and fastened by a hasp, catch, or other suitable means. The arm or lever U is attached to the lower end of the magnetic needle, so as to extend

through the slot *g*, and, provided with a hammer or connected to a valve, style, or other device to be operated thereby.

The relative position of the several parts of the electro-magnet being as represented in Figs. 2, 3, when a current of electricity is passed through the helical wire A in a suitable direction, each section C C′ of the cover will become magnetized, and the projections P P^1 of section C will acquire north polarity, while the projections P^2 P^3 of section C′ will acquire south polarity. When such current is discontinued, and a current is passed in an opposite direction through the helical wire B, the polarity of both covers becomes reversed, and the magnetic force is correspondingly changed.

Inasmuch as the permanently-magnetic needle lies with both its poles equally near the projections P P^1 of one, and the projections P^2 P^3 of the other cover, it follows that, by reversing the electric currents, or first passing a current through one helix and then through the other, a reciprocating movement will be imparted to the needle and its lever, which may be employed for any purpose to which it is adapted. I propose to use this form of electro-magnet either as a receiving-magnet or a local power, in my automatic telegraph-instruments, and, with the proper connections, to substitute it for all the purposes for which the covered helices described in my other pending applications for Letters Patent may be employed.

It is not absolutely necessary that four pole projections should be used in connection with this electro-magnet, as the needle will be operated by two—one lying on each side of the needle at either end thereof—and will operate even if the ribs *p* extend straight from one end of the space O to the other, without having terminal projections at either end; but the operation of the magnet will be more powerful and efficient when four projections are employed, arranged in the manner herein set forth.

I claim as this part of my invention—

1. The two helices, the pole projections, the needle, and the iron cover, combined substantially as described, for the purposes set forth.

2. The divided and hinged iron cover, having the projecting rim *c*, combined with the helices, pole projections, needle, and wires, substantially as and for the purposes set forth.

ROYAL E. HOUSE.

Witnesses:

E. A. ELLSWORTH,
L. HILL.