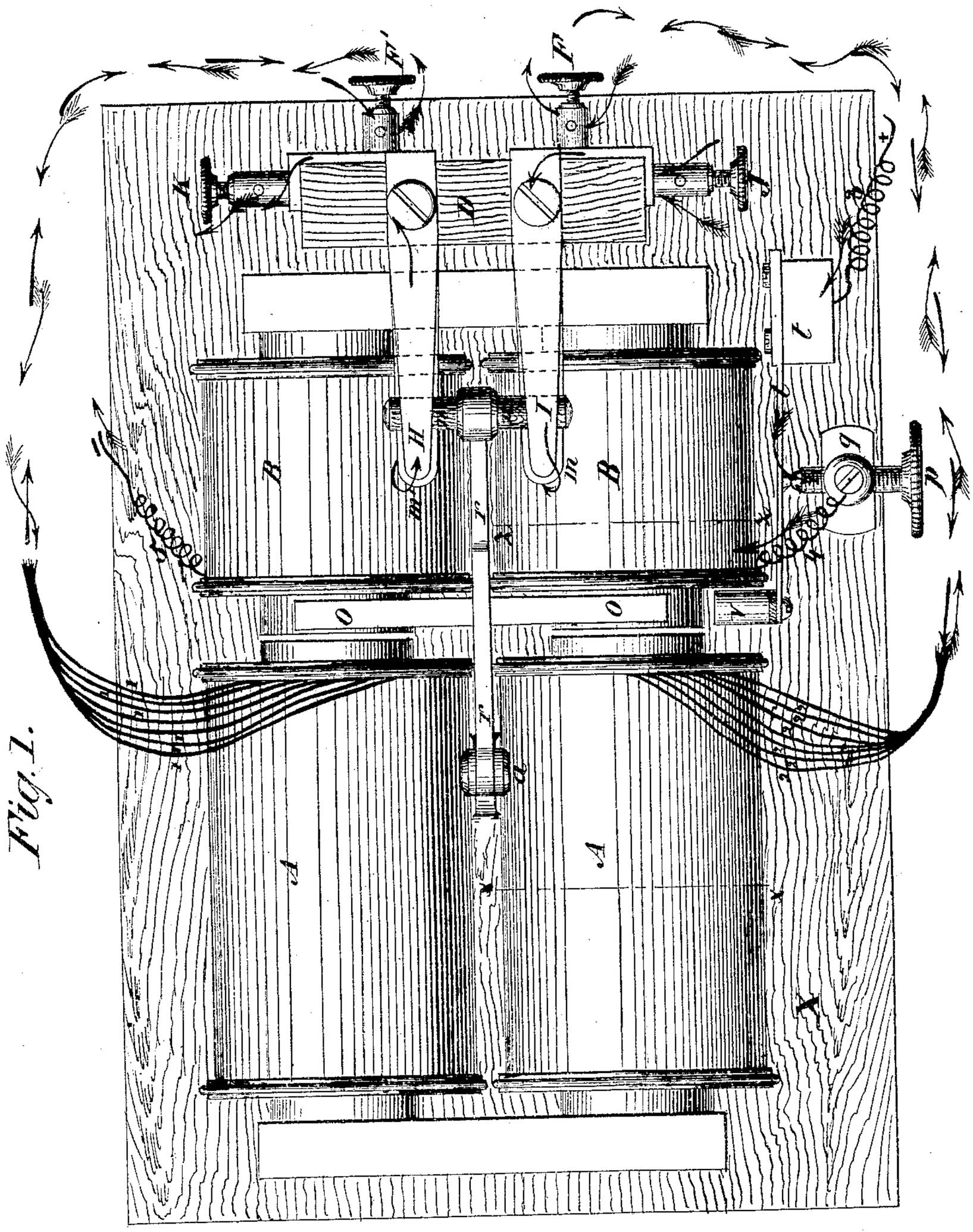
2 Sheets--Sheet 1.

J. S. CAMACHO.

Electro-Magnetic Induction Coils.

No. 138,316. Patented April 29, 1873.



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2 Sheets--Sheet 2.

J. S. CAMACHO.

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Fig. 4.

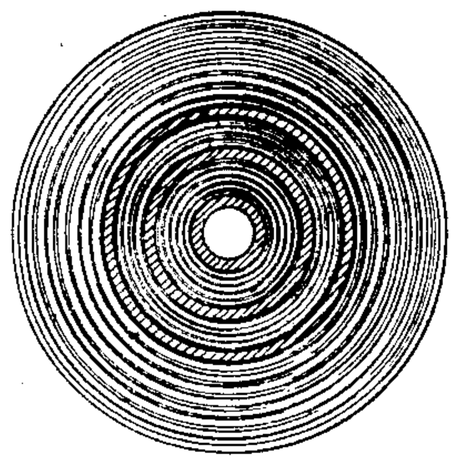


Fig. 5.

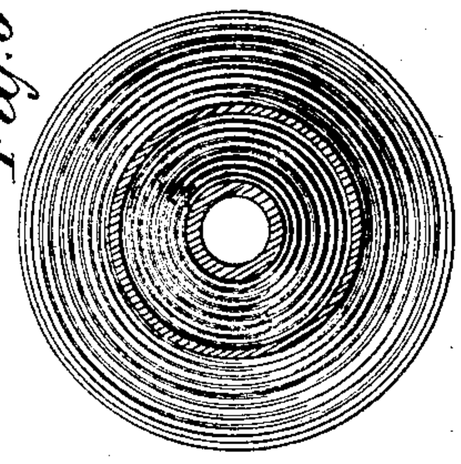


Fig. 2.

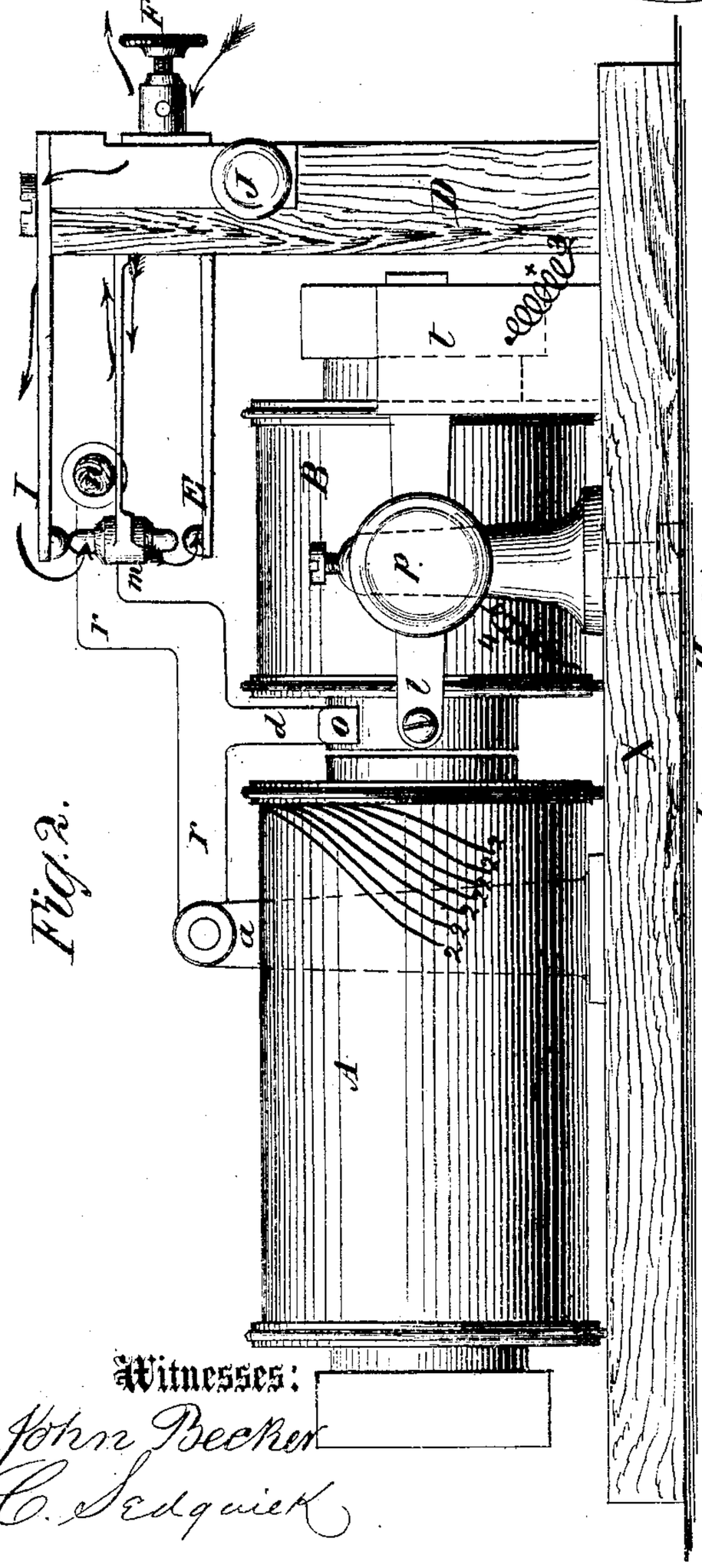
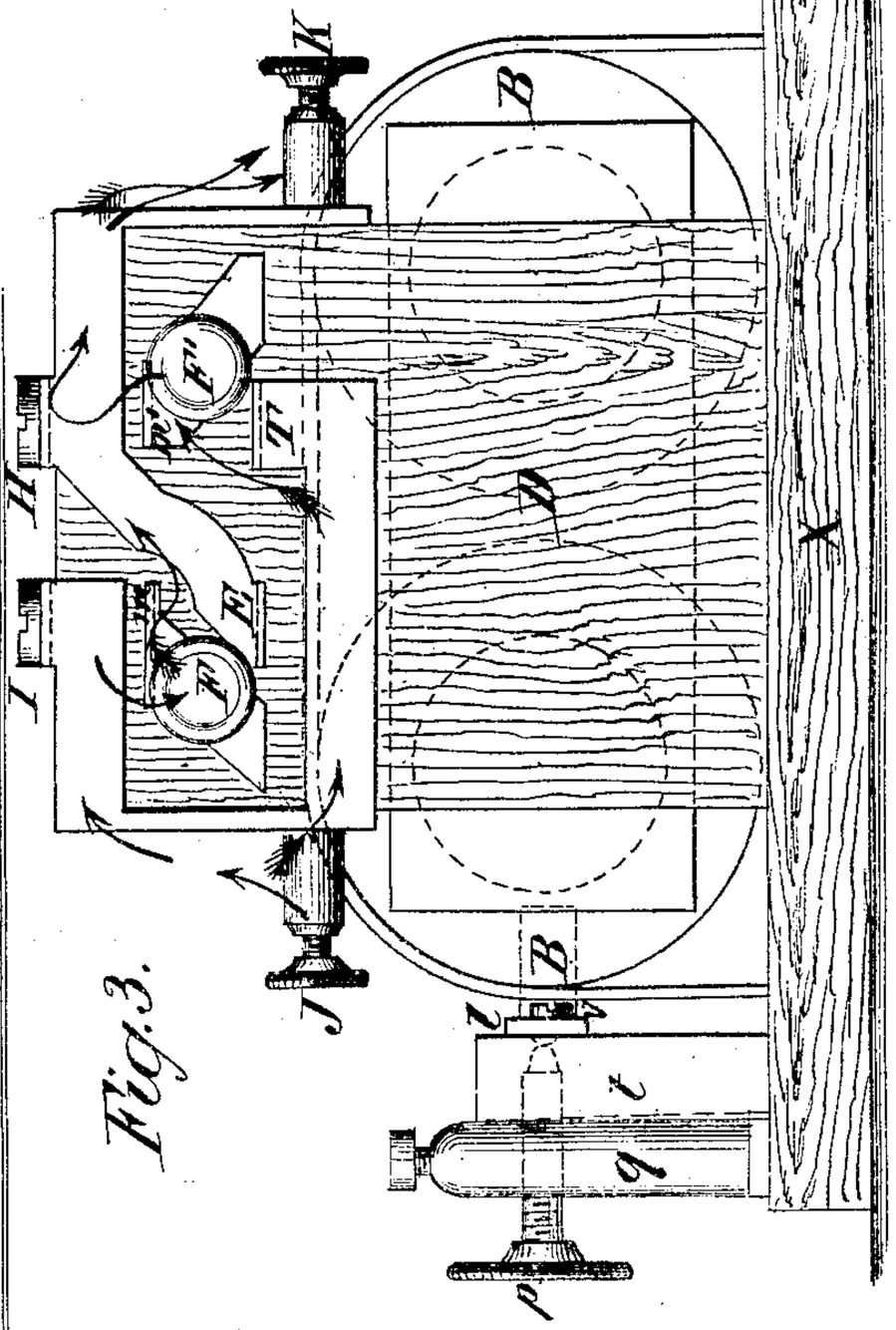


Fig. 3.



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UNITED STATES PATENT OFFICE.

JOSÉ S. CAMACHO, OF HAVANA, CUBA.

IMPROVEMENT IN ELECTRO-MAGNETIC INDUCTION-COILS.

Specification forming part of Letters Patent No. **138,316**, dated April 29, 1873; application filed October 26, 1872.

To all whom it may concern:

Be it known that I, JOSÉ S. CAMACHO, of Havana, in the Island of Cuba, have invented a new and Improved Automatic Electro-Magnetic Inductor, of which the following is a specification:

The object of this invention is to produce electric currents of great intensity, which are applicable to the production of light in light-houses, of magnetism for electro-magnetic motors, and to all other purposes requiring very intense electric currents. Another object is to combine the above-mentioned features with the advantages of economical construction, durability, portability, convenient dimensions, and to dispense with the necessity of a motor for producing the currents.

The invention is based upon the well-known property of soft iron, which causes, when a silk-covered copper wire is in a multitude of coils contained within a cylinder of this metal, and when, by contact with a magnet charged by an electric current, said cylinder is magnetized, an induced current to be developed in said wire in one direction, which current is reversed as soon as the magnet is withdrawn from the cylinder. The intensity of these alternately-reversed induced currents is the more marked the more rapidly the soft-iron cylinder is magnetized and demagnetized. By guiding all these currents in equal manner—*i. e.*, utilizing the same alternately as though they were continuous—and causing them to pass in a continuous stream over a conductor, all the effects of the voltaic pile are obtained.

In the accompanying drawing, Figure 1 represents a plan or top view of my improved automatic electro-magnetic inductor. Fig. 2 is a side elevation of the same. Fig. 3 is a rear elevation of the same. Figs. 4 and 5 are transverse sections of the electro-magnets A and B, taken, respectively, on the planes of the lines *x x* and *z z*, Fig. 1.

Similar letters of reference indicate corresponding parts.

The letter X in the drawing represents a table or platform of hard wood or other material, of suitable size and shape. Upon it is secured the electro-magnet B B, and at one side thereof the interrupter *l*, which is a thin elastic plate of copper or equivalent metal, fastened at one end to a support, *t*, of similar material. A wire, 3, connects the metallic support *t* with one pole of an electric battery of five or six, more or less, elements. The other end of the plate *l* carries a projecting block, V, of soft iron, insulated, by a piece of ivory or otherwise, from the plate *l*. The plate *l* is, furthermore, in contact, though not connected, with a screw, *p*, bearing against the same by virtue of the spring in *l*. This screw *p* communicates, by its support *q*, metallically with the end 4 of the wire of the electro-magnet B B. The other end 5 of said wire of the electro-magnet B B connects with the other pole of the battery. Opposite the poles of the electro-magnet B B, and very near to the same, are those of a large double coil, A A, in which there are rolled up seven, more or less, copper wires, parallel to each other, each about fifteen hundred meters in length, more or less, and all covered with rubber and spun with silk, or protected in equivalent manner. Between the two cylinders A A is fastened to the table X a post or block, *a*, to which one end of a lever, *r*, is pivoted. The other end of this lever carries a cross-bar, *n*, of ivory or other non-conducting material. To a vertical arm, *d*, of the lever *r* is, furthermore, fastened an armature, *o*, of soft iron, which is held at a very short distance from the poles of the electro-magnet B B. The lever *r* is, by the ivory cross-piece *n*, supported on two very elastic plates or flat springs, *m m′*, of copper or other metal. These plates *m m′* are fastened to a wooden block, D, that projects from the platform X. Above and below the spring-plates *m* and *m′* are four others, H, I, T, and E, disposed as follows: The plate H is over *m′*, T under *m′*, I over *m*, and E under *m*. The plates H and E are in metallic connection with each other and with a screw, K, as shown in Fig. 3, while the plates I and T are in metallic communication with each other and with a screw, J, as shown in the same figure. The plates *m* and *m′* are in metallic communication only with screws F and F′, respectively, which are applied to the back of the standard D. The ends of the wires of the coils A A are, when quantitative electricity is required, put in connection with the pressure-screws F and F′, respectively; but when tensive electricity is wanted the

ends of these wires are respectively connected with each other to form one continuous wire seven times the length of one, the ends of such united wire being also respectively connected with the screws F and F′.

The operation of the apparatus is as follows: The current from the battery enters the instrument by the wire 3, passes through the support *t*, plate *l*, and screw *p* to the wire 4, through the electro-magnets B B, and returns to the battery by the wire 5. When the coils B B are thus magnetized by the current passing through them they attract the iron block V, and thereby withdraw the plate *l* from contact with the screw *p;* consequently, the current will be interrupted, and, the magnetism of the coils B B ceasing, the plate *l* will, by its own spring-power, resume contact with the screw *p*, and thus re-establish the current. Thus the current will be alternately interrupted and re-established, the changes taking place with indescribable rapidity as long as the battery supplies the requisite power. By the magnetism of the coils B B the electro-magnets A A also become magnetized, producing in their wires an instantaneously-induced current. Whenever the coils B are magnetized they also attract the armature *o* of the lever *r*, and press the ivory end *n* of said lever upon the spring-plates *m m′*, bringing the same in contact, respectively, with the plates E and T. The current produced in the wires of the coils A A, whose ends 2 2 are in communication with the screw F, will then be directed to the screw F; thence to the plate *m*, (see Figs. 2 and 3;) from there to the plate E, as shown by the barbed arrows in the several figures; from E it will pass to the screw K, and thence, by a conductor, to the locality where it is to produce the desired effect, returning, by another conductor, to the screw J, plates T and *m′*, screw F′, wires 1 1, to the coils A A. As soon, however, as the current in the coils B B is stopped the lever *r* will be elevated by the spring-plates *m m′*, on which it rests, the said plates *m m′* coming, by the same means, in contact with the plates I and H, respectively, so that the current from A, though directed in opposite direction to the former, as indicated by the unbarbed arrows, will still reach the conductor by the screw K and leave it at J. The current, namely, will pass from A A, through the wires 1 1, to the screw F′, plate plate *m′*, plate H, screw K; thence to the conductor to produce the required effect, and will return to the screw J, plates I and *m*, screw F, and wires 2 2, to the coils A A. Thus the induced current, though alternating in direction as regards its passage from the cords A A, will, on the conductors that start at K and return at J, always run in the same direction, thus producing the desired effect continuously.

As to the construction of the coils A A and B B, I prefer to make the same substantially as described in my United States Letters Patent of July 16, 1872, and as indicated in Figs. 4 and 5.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The armature-lever *r*, arranged in combination with the spring-plates *m m′* and plates H, I, T, and E, to operate substantially as herein shown and described.

2. The plates H and E, arranged, respectively, over the plate *m′* and under *m*, and connected, metallically, with the screw K, as specified.

3. The plates I and T, arranged, respectively, over the plate *m* and under *m′*, and connected, metallically, with the screw J, as set forth.

4. The coils A A, connecting their wires with the screws F F′, and plates *m m′*, as and for the purpose set forth.

5. The coils B B and A A, arranged in an apparatus in conjunction with the lever *r*, as set forth.

JOSÉ S. CAMACHO.

Witnesses:

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U. S. Consular Clerk.