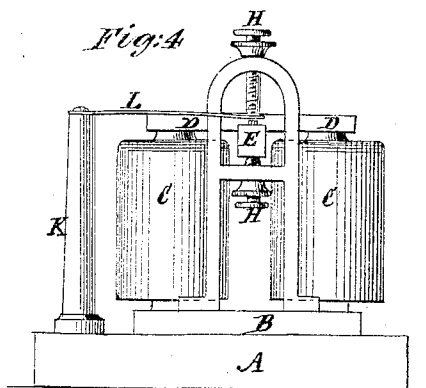
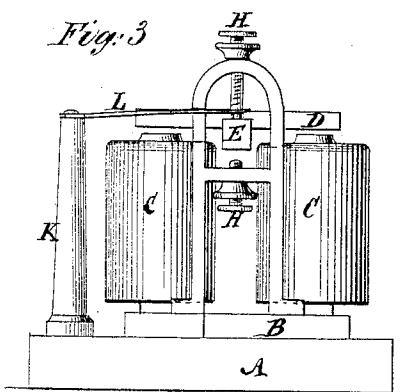
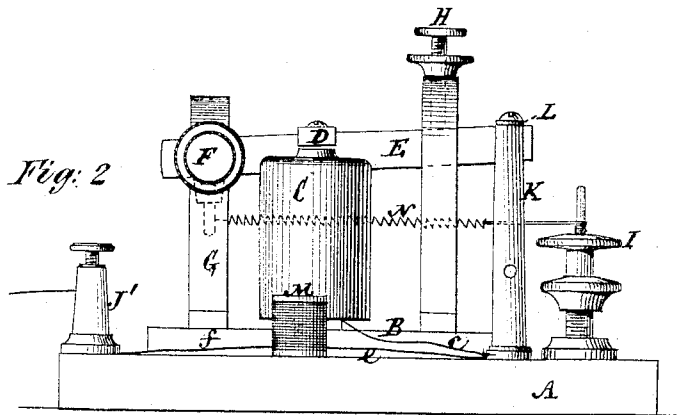
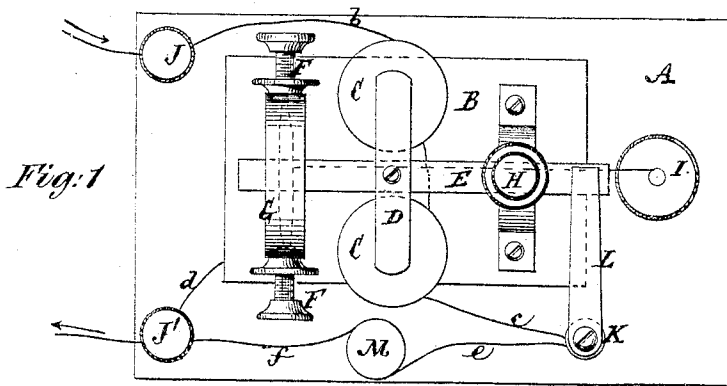


J. E. SMITH.

Circuits for Electro-Magnets.

No. 137,730.

Patented April 8, 1873.



Witnesses:
Geo. Warner
O. M. Sill

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UNITED STATES PATENT OFFICE.

JOHN E. SMITH, OF NEW YORK, N. Y.

IMPROVEMENT IN CIRCUITS FOR ELECTRO-MAGNETS.

Specification forming part of Letters Patent No. **137,730**, dated April 8, 1873; application filed March 15, 1873.

To all whom it may concern:

Be it known that I, JOHN E. SMITH, of the city, county, and State, of New York, have invented an improvement in means for economizing wear of battery and reducing spark in circuits operating electro-magnets, of which the following is a specification:

This invention, although here shown as applied to what is known as a "Morse sounder," may be used in connection with all circuits operating electro-magnets. The object of the invention is to economize battery and to diminish the electric spark between the points used to open and close the circuit. The invention consists in a combination of a resistance coil or medium and a circuit-breaking spring or lever with the armature-lever of an electro-magnet, the whole being arranged so that the usual or an unrestricted amount of electricity acts upon the electro-magnet until the armature has nearly completed its movement toward the magnet, when or after which, and during the remainder of such movement of the armature, the resistance coil or medium is brought into the circuit and remains in the circuit until the latter is again interrupted. In this manner, or by these means, not only is the wear of the battery reduced by the direct weakening of the primary current, but the magnet is kept so weak each time the circuit is broken that there is generated but a feeble magneto-electric current to consume the battery by its passage therethrough, or to injure the points of the circuit-breaker.

In the accompanying drawing, which forms part of this specification, Figure 1 represents a plan of a Morse sounder with my improvement applied. Fig. 2 is a side view of the same, and Figs. 3 and 4 end views thereof, looking in the same direction, but showing the armature and circuit-breaking spring or lever in different positions.

Similar letters of reference indicate corresponding parts.

A is a wood or other non-conducting base supporting the several parts or devices. B is a metallic bed-plate; C C, an electro-magnet or helices thereof; D, the soft-iron armature; and E the armature-lever, which is supported by screws F F, and is limited in its movements by screws H H. N is the retracting-spring of

the armature, and I the device for adjusting the tension of said spring. J J' are binding-screws.

The parts or devices thus far referred to by letter, are those of an ordinary Morse sounder, and their arrangement is the same as in other instruments of the kind.

K is a metallic post, from the top of which a spring, L, extends over lever E. This spring is so adjusted that it makes electrical contact with the lever E, as shown in Fig. 3, at all times, excepting when the latter is at or very near the limit of its downward movement, as shown in Fig. 4—that is, at or near the limit of the movement produced by the attraction of the magnet C C. M is a coil of wire or other resisting medium, one end of which connects with the post K, and the other end thereof with the binding-screw J. One end of the magnet-wire is connected with the binding-screw J', and its other end with the post K. A wire, *d*, connects the binding-screw J' with the bed-plate B.

An instrument thus constructed is put into circuit by establishing connection with the binding-screws J J', as in the case of an ordinary Morse sounder or other instrument.

The operation is as follows: On the closing of the circuit, the current passes—as, for instance—from the binding-screw J by wire *b*, to and through the magnet C C, through the wire *c*, to the post K, and from thence through the spring L, lever E, and a support, G, bed-plate B, and wire *d*, to the binding-screw J'. The current takes this course with full force until the lever E has nearly completed its downward movement by the attraction of the magnet on the armature D, when said lever leaves the spring L, as shown in Fig. 4, which causes the current to pass from the binding-screw J by way of the wire *b*, magnet C C, wire *c*, to the post K, and from thence by wire *e*, through the resistance M, and wire *f*, to the binding-screw J', thus enfeebling the current by reason of the increased resistance. So long as the circuit remains closed the current must pass through the resistance M, but as soon as the circuit is broken the lever E rises and touches the spring L, as shown in Fig. 3, thereby again forming the short route first described for the next pulsation.

Relays may be made in the same manner to throw resistance into the main circuit of a telegraph, but to whatever circuit this invention may be applied, the resistance offered by the coil or device M, must not be so great as to reduce the power of the magnet below that of the retracting spring of the armature. I find, by experiment, that in a local circuit the resistance of the coil or medium M may be twenty to thirty times that of the magnet O C.

Instead of the flat spring L there may be used a small lever drawn downward or in the requisite direction by a spring and checked in such movement by a set-screw, as used to limit the movement of lever E. This substitute is the equivalent of the spring L.

What is here claimed and desired to be secured by Letters Patent, is—

The combination of a resistance coil or medium, and a circuit-breaking spring or lever with the armature-lever, or part or parts set in motion by an electro-magnet, the whole being arranged substantially as specified, whereby the resistance is brought into the circuit only as the armature completes its movement toward the magnet, and remains in the circuit until the latter is interrupted, essentially as and for the purposes herein set forth.

J. E. SMITH.

Witnesses:

MICHAEL RYAN,
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