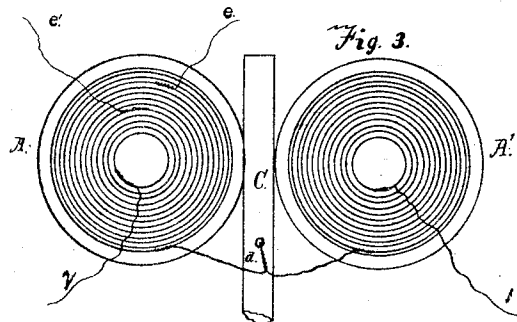
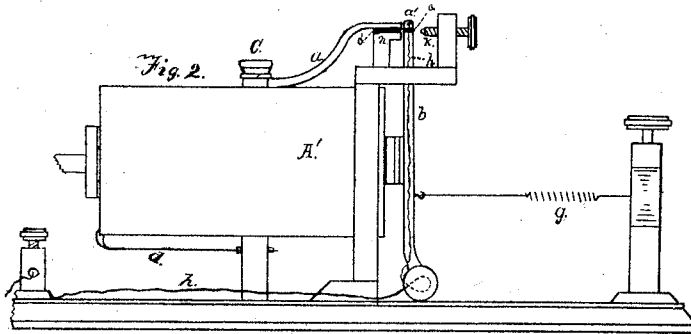
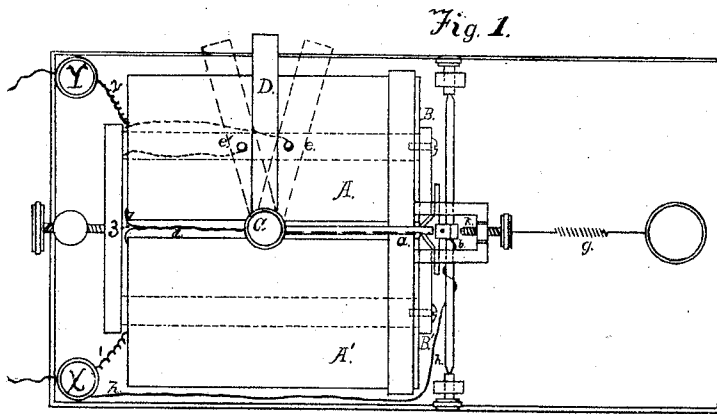


S. H. LOMBARD.
Telegraph-Relays

No. 146,463.

Patented Jan. 13, 1874.



Witnesses:
Wm J. Peyton
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UNITED STATES PATENT OFFICE.

SANFORD HOWARD LOMBARD, OF WINONA, MINNESOTA.

IMPROVEMENT IN TELEGRAPH-RELAYS.

Specification forming part of Letters Patent No. **146,463**, dated January 13, 1874; application filed November 23, 1873.

To all whom it may concern:

Be it known that I, SANFORD HOWARD LOMBARD, of Winona, Minnesota, have invented certain Improvements in Telegraph-Instruments, of which the following is a specification:

This invention relates more particularly to that class of telegraph-instruments known as "relays," although it may be applied to other instruments in which adjustment is required to compensate for the varying strength of the current. The object of this invention is to render the relay as nearly as possible automatically self-adjusting, thus avoiding the necessity on the part of the operator of watching the instrument and changing the tension of the spring usually employed. To this end my invention consists in automatically shunting the current by the action of the armature-lever around a greater or less portion of the relay-magnets, thus using the whole magnetic effect of the coils to attract the armature, but only a portion to hold it, so that when the circuit is broken the spring, if even of weak tension, will act instantaneously, whether the current be weak or powerful.

In the drawings, Figure 1 is a top view of the relay with my invention attached. Fig. 2 is a side elevation of the same. Fig. 3 is an end view of the coil-spools with their ends removed, showing the manner of attaching the cut-off wires to the coil in the spools, and to the wire between the coils.

A A' are the coils of a relay-magnet, and *b* its armature, pivoted and playing between set-screws, as usual. The main-line circuit enters at binding-post X, then, by wires 1 and 2, through A and A', to Y, and thence to line again or to earth. From X a wire, *h*, leads to a contact-point, *a'*, placed on, but insulated from, the armature-lever *b*. To the frame of the instrument is fixed, at a point so that it may connect, with *a'*, the conductor *a*, insulated from the frame, as at *c*. This conductor connects with a post, C, from which extends a conductor, *d*, to the point 3, which is the junction of the wires of the coils of A A'. The exact location of the points *a'*, conductor *a*, and post C are not material.

The operation of the device thus far described is as follows: The circuit being closed, a current passes through A A', causing the armature *b* to be attracted, whereupon the points *a'* and conductor *a* are brought in con-

tact, closing a circuit around A', and shunting it out of the main circuit. Thereupon the armature is held only by the magnetic effect of the coil A, and a weaker spring is required to withdraw the armature upon the circuit being broken.

To provide for a shunting out of circuit of still more of the magnets, I use the arrangement shown in Fig. 3: From one, two, or more places in the coil I lead wires to the exterior of the coil, as at *e* and *e'*. In this case, *e'* is attached so that about one-third of the coil A is between it and the terminal 2, while two-thirds of said coil are between *e* and that terminal. These wires are brought to the exterior of the coil, and end in small studs, as shown in Fig. 1.

To post C is attached the pivoted switch D. If this switch be turned away from the studs, the current passes through all the coil A; but if D be turned onto *e*, then the current, when the armature is attracted, goes around A', as explained, but instead of passing to 3 from post C, passes by D to *e*, and thence through that portion of the coil between *e* and 2; if onto *e'*, through that portion between *e'* and 2. By these means combined, one coil is entirely cut out, and any desired portion of the other.

It is evident these arrangements, or either, may be applied to either double or single coil relays.

I claim as my invention—

1. In combination with a relay a shunt-circuit to a portion of its coil, brought automatically into action by the movement of the armature to the magnet, and an additional shunt adjustably connected thereto by a switch, substantially as set forth.

2. In combination with the shunt-circuit *h*, the switch D and connections *e e'*, substantially as described.

3. The combination of the contact-point *a'*, conductor *a*, post C, switch D, points *e e'*, conductor *h*, and armature-lever *b*, constructed and arranged substantially as described.

In testimony that I claim the foregoing I have hereunto set my hand this 21st day of November, 1873.

SANFORD H. LOMBARD.

Witnesses:

WM. B. PHELPS,
GEO. P. WILSON.