F. CATLIN.

Telegraph Repeater.

No. 204,132. Patented May 28, 1878.

FIG: 1.

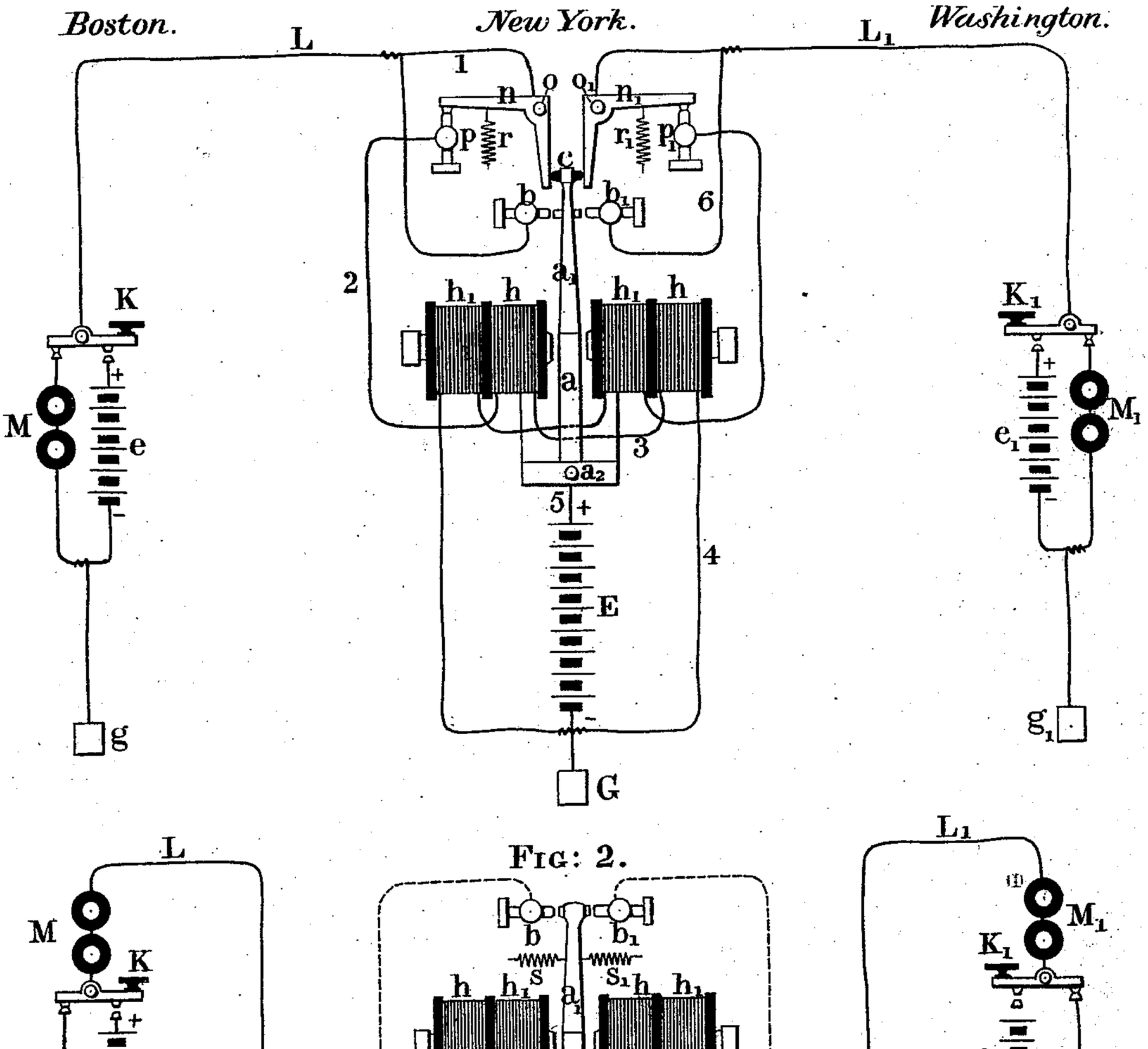
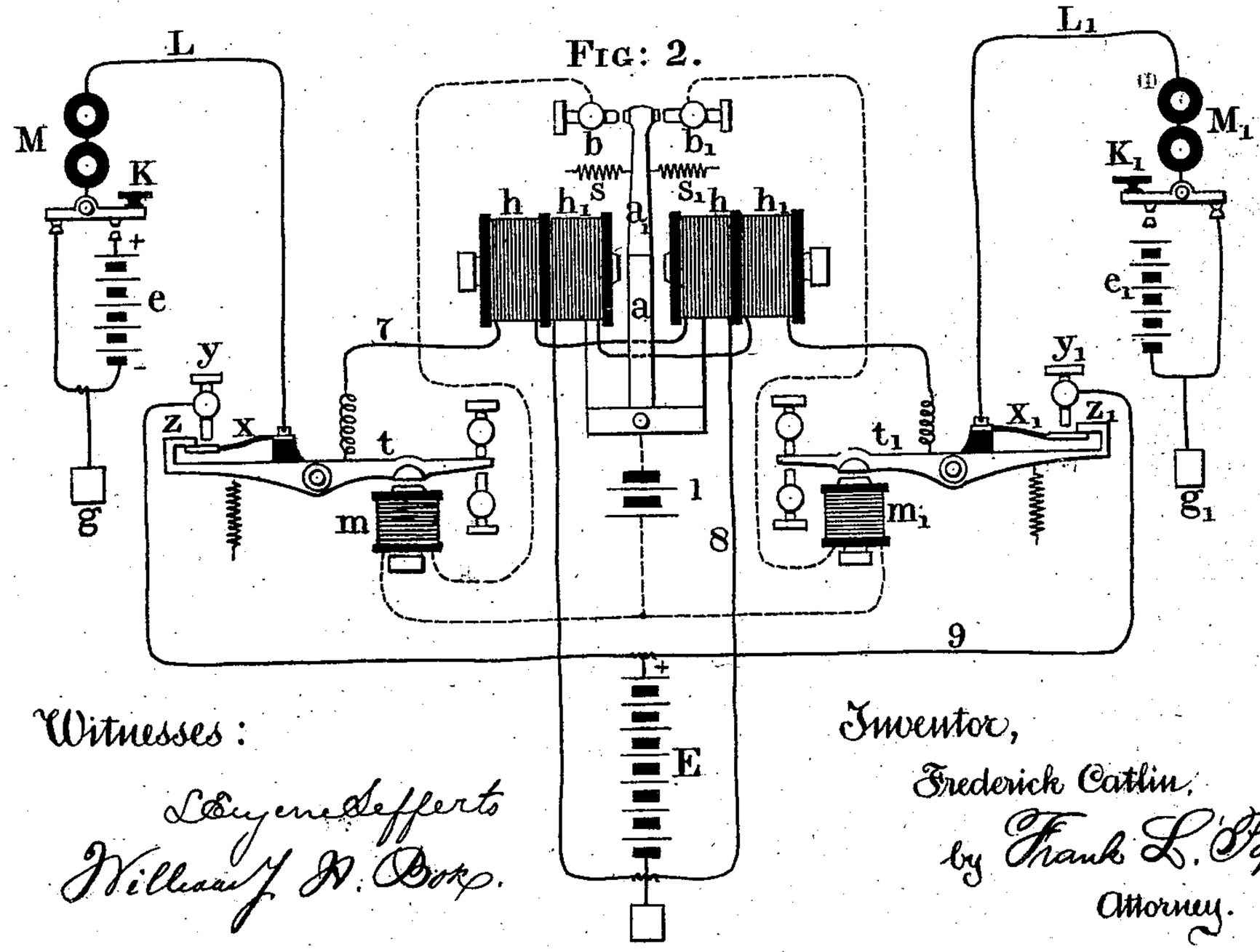


FIG: 2.



Witnesses:

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UNITED STATES PATENT OFFICE.

FREDERICK CATLIN, OF NEWARK, NEW JERSEY.

IMPROVEMENT IN TELEGRAPH-REPEATERS.

Specification forming part of Letters Patent No. **204,132,** dated May 28, 1878; application filed August 27, 1877.

To all whom it may concern:

Be it known that I, FREDERICK CATLIN, of Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Telegraphic Repeaters, which improvements are fully set forth in the following specification, reference being had to the accompanying drawings.

My invention relates to that class of telegraphic repeaters which are technically termed "open-circuit repeaters;" and my improvement consists in substituting a single relay or repeating instrument provided with a polarized armature and differential helices in place of the two separate relays with non-polarized or neutral armatures which have hitherto been employed to produce the same result. By this means I am able not only to render the apparatus much more simple, but also to dispense with the necessity of frequently adjusting the relays.

In the accompanying drawings, Figure 1 is a diagram, showing the application of my invention at a repeating-station which forms the terminus of two telegraph-lines, and is arranged for the purpose of repeating signals from either line to the other upon the open-circuit method of working; and Fig. 2 is a modification of the same, in which sounders, included in and operated by a local circuit, are employed to retransmit the signals from one circuit to the other.

In Fig. 1, I have shown a relay provided with differential helices *h h h h*, arranged with their inclosed soft iron-cores on opposite sides of a polarized or permanently-magnetic armature, *a*, in a manner well understood, and which it is not necessary to describe in detail. It may, however, be stated, briefly, that the action upon the armature *a* of a current of electricity traversing the helices *h h* is exactly equal and opposite to that of the same or a similar current traversing the helices *h' h'*.

The arm *a'*, which is rigidly attached to, and mechanically forms a part of, the polarized armature *a*, although normally held in a central position, as shown in the drawing, is capable of vibrating under the influence of the electro-magnet between two adjustable fixed stops, *b b*, the armature being pivoted at a^2.

An insulated pin, *c*, on the arm *a*, at each vibration of the said arm, presses against one of the two contact-levers *n* and *n'*, which are pivoted at *o* and *o'*, and when in their normal positions are held against the adjustable contact-stops *p* and *p'* by means of springs *i* and *i'*.

In the diagram, Fig. 1, the repeating-instrument, for convenience of explanation, may be supposed to be situated at New York, and connected with a line, L, extending to Boston, and another line, L', extending to Washington.

The operation of the apparatus is as follows: Suppose the operator at Boston transmits a signal by depressing his key *k*, a positive current from the battery *e* traverses the line L to New York, and passes by the wire 1 to the contact-lever *n*, and thence, by stop *p* and wire 2, to helix *h*, wire 3, helix *h*, and wire 4, to the earth at G. The effect of this current passing through the helices *h h* of the relay is to deflect the armature *a* to the right. This movement of the armature causes the pin *c* to separate the contact-lever *n'* from the stop *p'*, thereby breaking the previously-existing connection between the line L and the earth at G, immediately after which the arm *a* makes contact with the stop *b'*, forming a connection, by which a corresponding signal is sent over the line L from the New York battery E, as follows: Leaving the positive pole of battery E, which has its negative pole permanently connected with the earth at G, the current traverses the wire 5, armature and lever *a a'*, stop *b*, wire 6, line L', and thence through the back stop at the key K' at Washington and the receiving-instrument M' to the earth at *g'*.

In transmitting signals from Washington to Boston, the entire operation is precisely reversed, the armature *a* being deflected in the opposite direction.

In case the operator who is receiving wishes to interrupt the operator who is sending, he has merely to depress his own key, which will give notice to the latter by its effect upon his receiving-instrument.

In Fig. 2 I have shown a modification of the hereinbefore-described apparatus, in which two repeating sounders or transmitters operated by a local battery are employed and the contact-levers *n n'* dispensed with. These transmitters are precisely similar to those employed in duplex and quadruplex telegraphs, and con-

sist of a local magnet, *m*, which actuates, by means of an armature attached thereto, a lever, *t*. Upon the latter is mounted an insulated spring, *x*, connected with the line. When the local magnet *m* is inactive, the spring *x* rests against the stop *z* on the lever, which is connected with the earth; but whenever it attracts its armature, the spring *x* is brought in contact with the stop *y*, or battery-contact, and detached from the earth-contact *z*, the construction being such that one contact is always completed before the other is interrupted, and vice versa.

The operation in this case is as follows: When the operator at Boston depresses his key K, a positive current from battery *e* traverses the line L, spring *x*, stop *z*, transmitter-lever *t*, wire 7, helices *h h*, and wire 8, to the earth at G. This deflects the armature *a*, which is normally held in a central position by springs S S′ to the right, bringing it in contact with stop *b*′, and thereby closing the local circuit of the battery *l* through the magnet *m*′ of the repeating sounder or transmitter. The latter instantly attracts its armature, the effect of which is to break the existing contact between spring *x* and stop *z*, and form another one between *x*′ and *y*′. The positive current from main battery E now traverses the wire 9, stop *y*′, and spring *x*′ to the line L′, to Washington, where it passes through the receiving-instrument *m*′ and back-contact of key K′ to the earth at *g*′.

The receiving-instruments *m m*′ at the terminal stations may be placed in the circuit of the earth-wire, as in Fig. 1, or in that of the line-wire, as in Fig. 2.

In the latter case the sending-signals of the sending-operator will be responded to by his own receiving-instrument, as well as by the instrument at the distant station, and in the former case the distant instrument only will respond. This will render the description intelligible without further explanation.

The construction of the relay or repeating instrument may be varied according to circumstances. It is only essential that it should be provided with differential helices and a polarized armature; but I usually prefer to make it of the form shown in the drawings.

By making use of a combination of two repeating-instruments at the repeating-station, one constructed in the manner hereinbefore described and the other similar to it, excepting that it is provided with three pairs of helices instead of two, the same principle of action may be applied to three circuits, so that signals transmitted through either one of the three circuits will be repeated into the remaining two.

I claim as my invention—

1. A repeating telegraphic instrument or relay provided with two independent sets of helices, so arranged as to have equal and opposite effects upon its armature, in combination with two independent line-wires, substantially as specified.

2. An armature so arranged with reference to an electro magnet or magnets provided with opposing helices as to be movable in either of two directions from a central position, according to the preponderance of magnetic effect in one or the other of the said opposing helices, and a main battery, having one of its poles connected with said armature and the other with the earth, in combination with two contact-levers and two fixed stops, one of each being permanently connected to each of two independent lines or circuits, substantially as specified.

3. The armature *a* and arm a^1, in combination with the contact-lever *n* and stop *b*, connected to one line-wire, L, and the contact-lever *n*′ and stop *b*, connected to another line-wire, L, substantially as specified.

In witness whereof I have hereunto set my hand this 20th day of August, A. D. 1877.

FRED. CATLIN.

Witnesses:

WM. ARNOUX,

FRANK L. POPE.