(No Model.) 2 Sheets—Sheet 1.

J. H. CLARKE & G. W. MILLARD.

RELAY FOR TELEPHONE SYSTEMS.

No. 316,238. Patented Apr. 21, 1885.

Fig. 1.

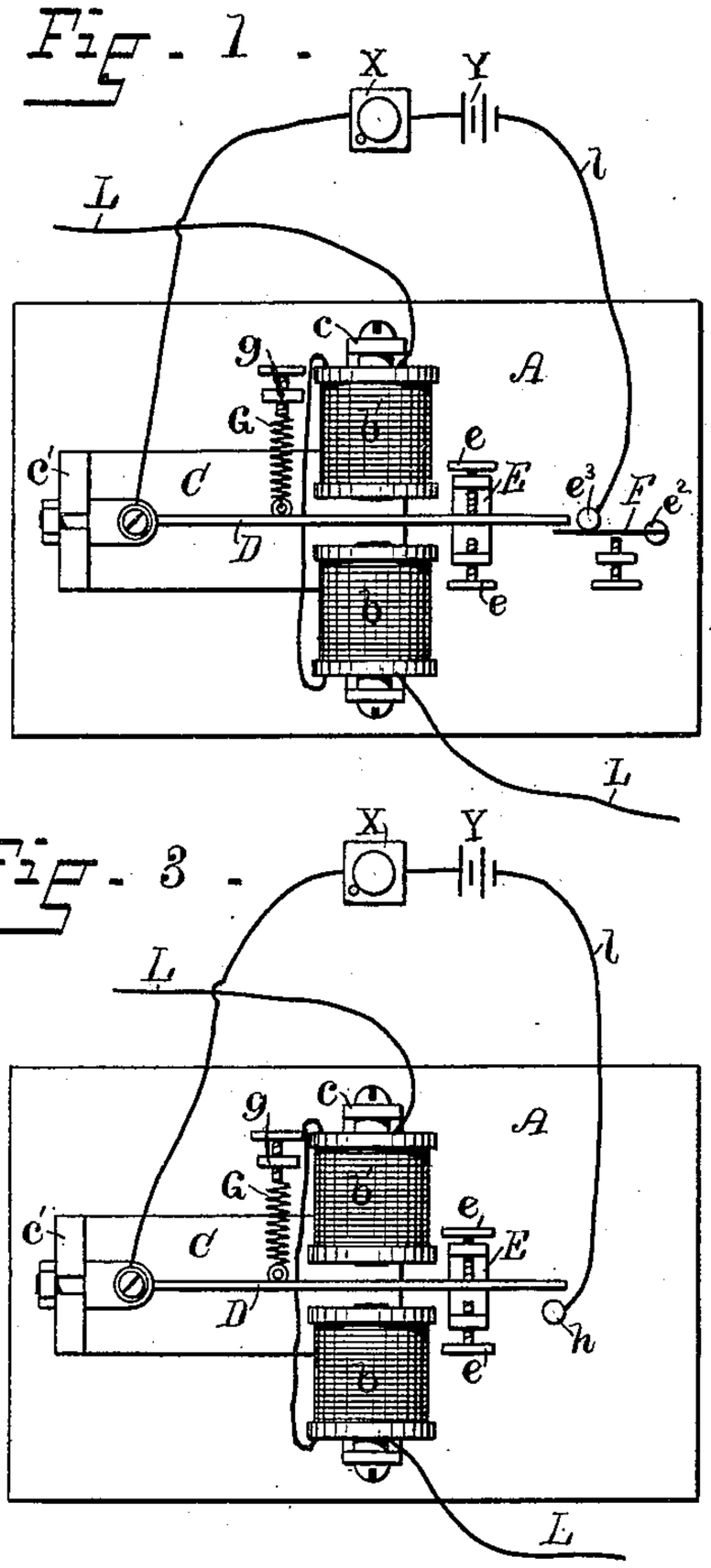

Fig. 2.

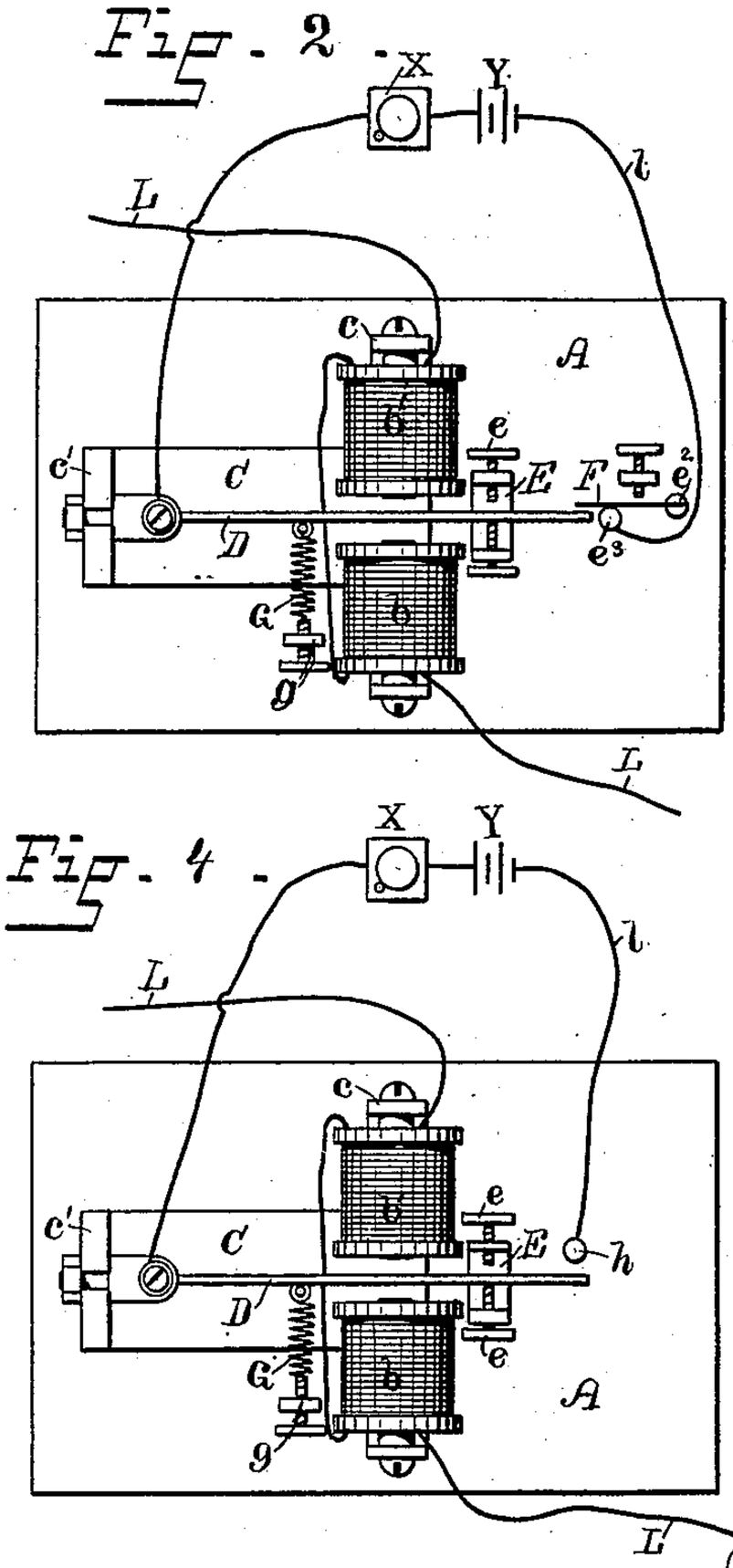

Fig. 3.

Fig. 4.

Fig. 5.

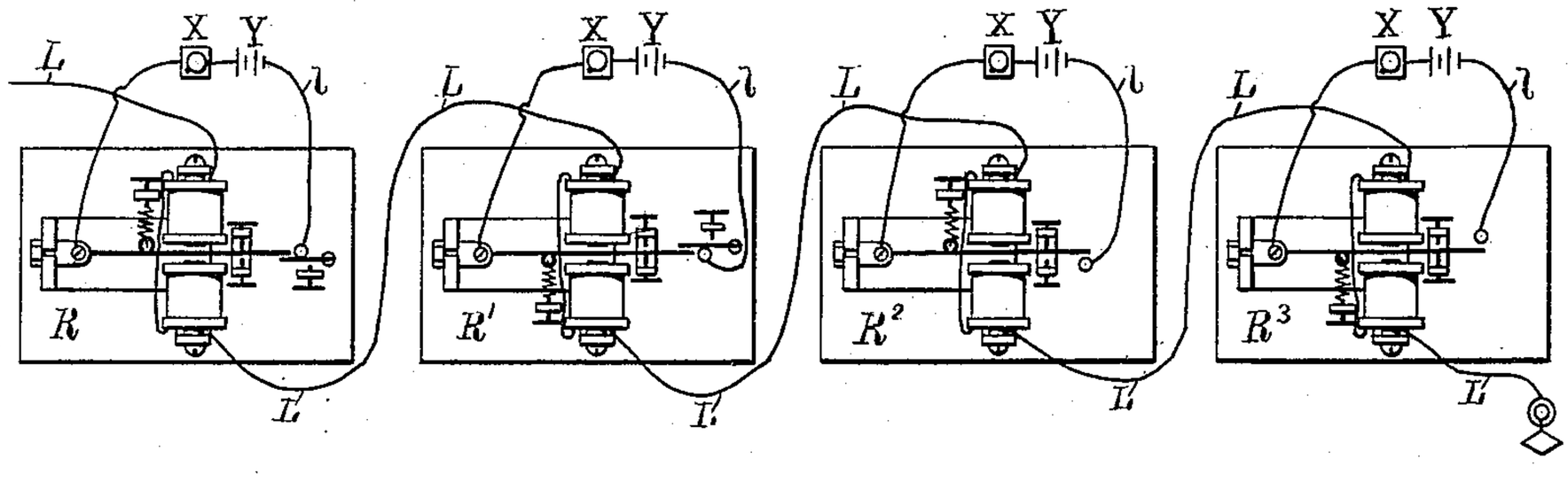

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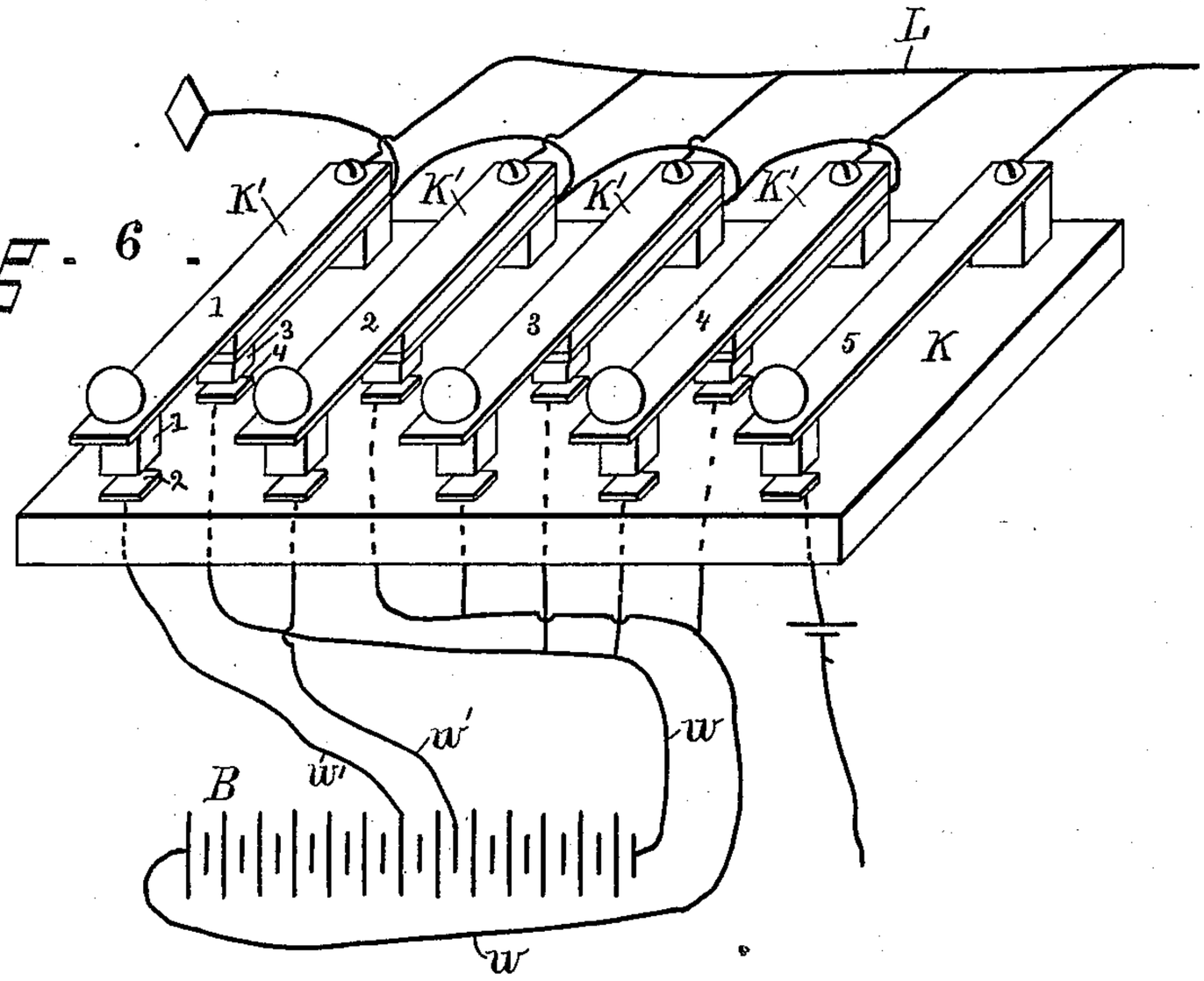
Fig. 6.



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UNITED STATES PATENT OFFICE.

JOSEPH H. CLARKE AND GEORGE W. MILLARD, OF PROVIDENCE, R. I.

RELAY FOR TELEPHONE SYSTEMS.

SPECIFICATION forming part of Letters Patent No. 316,238, dated April 21, 1885.

Application filed March 27, 1884. (No model.)

To all whom it may concern:

Be it known that we, JOSEPH H. CLARKE and GEORGE W. MILLARD, of the city and county of Providence, and State of Rhode Island, have invented certain new and useful Improvements in Relays for Telephone Systems, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

Our invention relates to those devices which are employed in signaling subscribers from the central office; and the object of our invention is to provide an apparatus whereby any particular subscriber on a circuit containing a number of subscribers may be called or signaled without sounding such call or signal on the instruments of the other subscribers.

To the above purpose our invention consists in the peculiar and novel construction and arrangement of the relays whereby they are adapted to utilize currents differing in strength and quality to signal a like number of subscribers all in the same circuit, and the signal of any particular subscriber being sounded only on the instrument of that subscriber, an additional subscriber being signaled in the usual manner, so that the same signal may be capable of calling a number of subscribers without error or confusion.

In order that our invention may be fully understood, we will proceed to describe it with reference to the drawings, in which—

Figure 1 is a plan view of the weak positive-current relay. Fig. 2 is a similar view of the weak negative relay. Fig. 3 is a similar view of a strong positive relay. Fig. 4 is a similar view of a strong negative relay. Fig. 5 is a diagram showing the arrangement of the relays and their electrical connections. Fig. 6 is a diagram showing the apparatus for selecting and applying the currents.

Under this system there are in each circuit four relays, two of which are to be operated by weak currents and the remaining two by strong currents, while one of the two weak-current relays is to be operated by a weak positive current, and the other weak-current relay is to be operated by a weak negative current. Again, one of the strong-current relays is to be operated by a strong positive current, and the other strong-current relay is to be operated by a strong negative current. The four relays for each circuit are arranged with the weak-current relays nearer to the central office and the strong-current relays farther from the central office, the said relays being placed each at a suitable point in the circuit—as, for instance, in the apartments of one of the subscribers. Each of these relays consists of a suitable base-board, A, upon which is mounted a pair of magnets, *b b'*, and these magnets are supported in longitudinal alignment upon a magnetized metal cross-bracket, *c*, upon one end of an L-shaped magnetized metal frame, C, which is suitably secured to the base-board. An arm, D, is pivoted at one end to the portion *c'* of the frame C and extends between the two magnets, the free end of said arm extending out somewhat beyond the two magnets, and passing between two adjusting-screws, *e e*, which are mounted in a support, E, placed just beyond the magnets *b b'*.

F designates a spring-plate, one end of which is held in a support, e^2, while the opposite or free end of said plate extends parallel with the arm D, and passes somewhat beyond the free end of said arm, so as to permit of the ends of the arm and plate coming into contact under certain predetermined conditions hereinafter explained. The spring-plate F rests normally, owing to its resilience, against a stop, e^3, which is placed upon the base-board A and upon the same side of the plate as the arm D.

G designates a spring, one end of which is secured to one side of the arm D, and the other end of which is secured to a post, *g*, upon the base-board A, in such manner as to permit of the ready adjustment of the tension of the spring, the arrangement being such that the spring G, acting by contraction, draws the arm D away from the spring F and against the magnet *b*.

The weak positive relay and the weak negative relays are constructed alike, excepting, as will be seen by comparing Figs. 1 and 2, that the arms D move in opposite directions; the springs G and F and the posts are in transposed position; the spring G of the strong positive-current relay is adjusted to a stronger tension than that of the weak positive-current relay, for a purpose hereinafter described.

The strong positive and the strong negative current relays are constructed like the weak positive and weak negative current relays, excepting that in the strong-current relays the posts *h*, with which the arms D make contact, are used in lieu of the spring-plates F and supports e^2 of the weak-current relays, however the posts are transposed in relative position, and the springs G are varied in relative tension the same as in the weak-current relays.

Now, referring to Fig. 5, the arrangement of the electrical conductors will be described.

The main line L from the central office connects the different relays by attachment to the electro-magnets of each relay in the usual manner, and from the last strong-current relay the line runs to the instrument of the additional subscriber, which is the ordinary instrument used for telephone purposes, and is operated by a magneto-current. Now, let it be supposed that subscriber No. 1 on main line L is to be called; a weak positive current is thrown on the line and affects the relay R as follows: The arm D is drawn by the magnet *b* with sufficient force only to disconnect the free end of the arm from the adjusting-screw *e*, and to bring said arm into contact with the spring-plate F, but without disconnecting said plate from its post e^3, thereby closing local circuit *l* and ringing bell X with battery Y. As all of the bells are on local circuits, each governed by its respective relay, the weak positive current affecting only relay R, the other local circuits remain open and the respective bells connected therewith do not ring. Again, subscriber No. 2 is signaled; by throwing the weak negative current to line, the relay R′ only will be affected and the bell in the local circuit connected therewith will be rung in the manner previously described with reference to subscriber No. 4.

Subscriber No. 3 is signaled by throwing the strong positive current to line, which current in passing through relay R overcomes the tension of its spring G and spring-plate F, disconnecting the latter from its post, and thereby keeping the circuit of relay R open. This strong positive current being of sufficient strength to overcome the tension of the spring G of the relay R^2 causes the arm D to make contact with the post *h*, thus closing the local circuit *l′* and ringing bell X^2 with battery Y^2. The relays R′ R^3 are not affected by this positive current, being adjusted to respond only to a negative current.

Subscriber No. 4 is signaled by throwing the strong negative current, which affects relay R^3 in the same manner as relay R^2 was affected by the strong positive current.

The fifth subscriber is signaled in the usual manner by a magneto-current, and hence no particular description of the operation is necessary.

The selection of the current of the desired quality and strength is accomplished in the following manner: From the ends of a battery, B, (see Fig. 6,) of sufficient power to operate relays R^2 R^3, wires *w* are run to a key-board, K, terminating in closing-points, and from two intermediate points of the battery are run wires *w′* to closing-points on the key-board K, the latter wires serving to convey weaker currents of opposite polarity. By means of the double keys K′ these wires may be connected with the main line L and grounded at the pleasure of the operator. For example, if subscriber No. 1 is to be called, key No. 1 is depressed, whereby its closing-points 3 4 send the negative pole of the battery to ground, while the closing-points 1 2 send the weak positive current to line. In the same manner each subscriber is called by his respective key, as is shown in the drawings. Thus it will be seen that by this arrangement one group of cells is made to do the work of several groups arranged in the ordinary manner.

It will be evident that more than four or five subscribers in each circuit may be signaled by simply multiplying the number of instruments and varying the tension of the springs G.

Having thus described our invention, we claim—

1. An improved relay system for telephones, consisting of a series of relays arranged to be operated by strong and weak currents of positive polarity and a series of strong and weak currents of negative polarity, the weak-current relays consisting each of a suitable base-board carrying a support, E, with two adjusting-screws, *e*, and a frame, C, having a cross-piece, *c*, an arm, D, a spring for controlling said arm, and a plate, F, and the strong-current relays having each the post *h*, in lieu of the supports E and the spring-plates F of the weak-current relays, as set forth.

2. The relay system consisting of a series of relays arranged to be operated by currents of opposite polarity and of greater and less intensity, the weak-current relays consisting each of a suitable base-board carrying a support, E, with two adjusting-screws, *e*, and a frame, C, having a cross-piece, *c*, an arm, D, a spring for controlling said arm, and a plate, F, and the strong-current relays having each the post *h*, in lieu of the supports and spring-plates of the weak-current relays, in combination with the key-board having the double keys *k′*, the battery, the wires *w*, running from the ends of the battery to closing-points on the key-board, and the wires *w′*, running from intermediate points of the battery to closing-points on said key-board, whereby currents of opposite polarity and of greater and less intensity are selected for the corresponding relays, as described.

In witness whereof we have hereunto set our hands.

JOSEPH H. CLARKE.
GEORGE W. MILLARD.

Witnesses:
J. A. MILLER, Jr.,
M. F. BLIGH.