

No. 632,066.

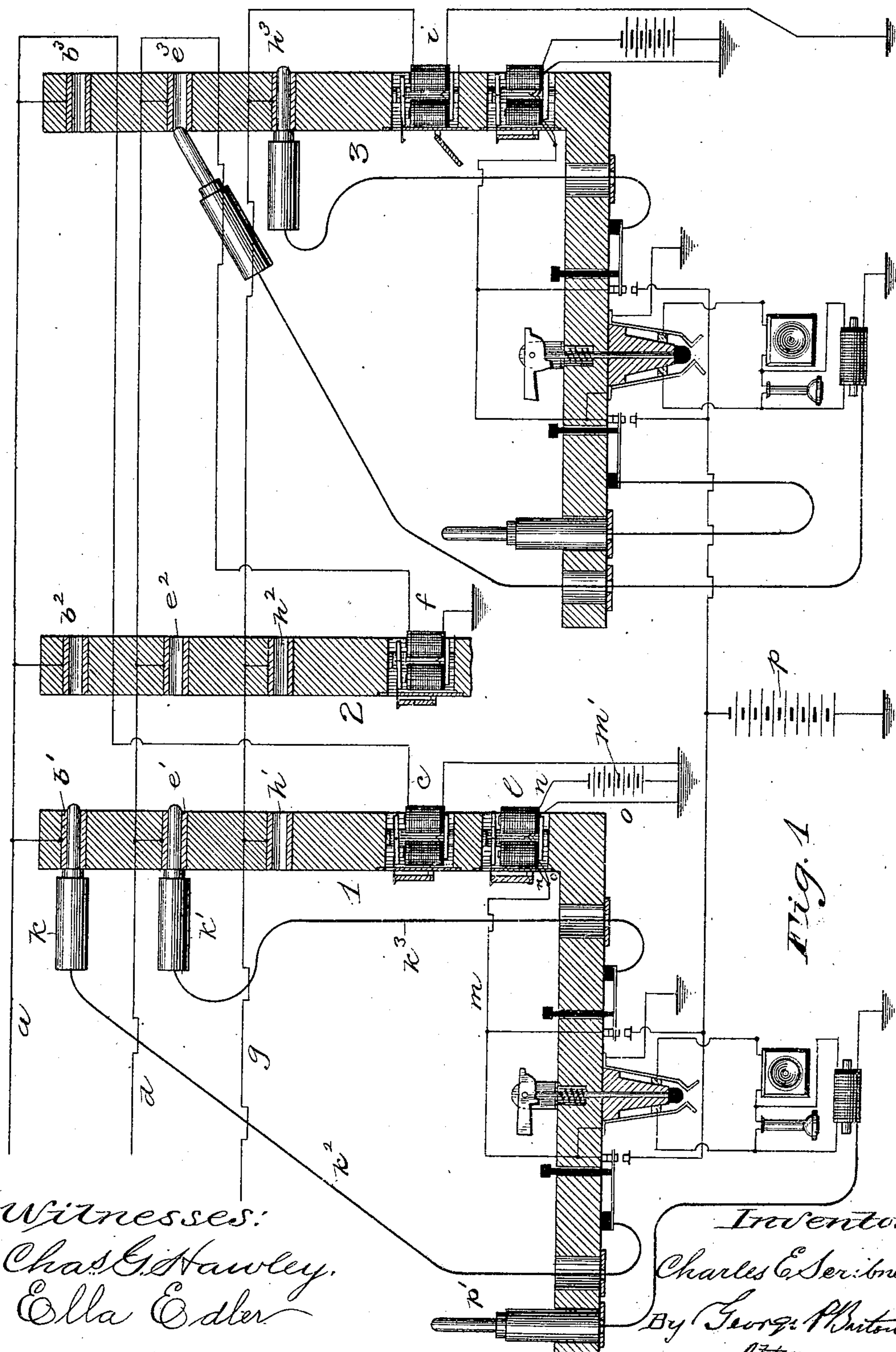
Patented Aug. 29, 1899.

C. E. SCRIBNER.
TELEPHONE EXCHANGE SYSTEM.

(Application filed Dec. 18, 1888.)

(No Model.)

3 Sheets—Sheet 1.



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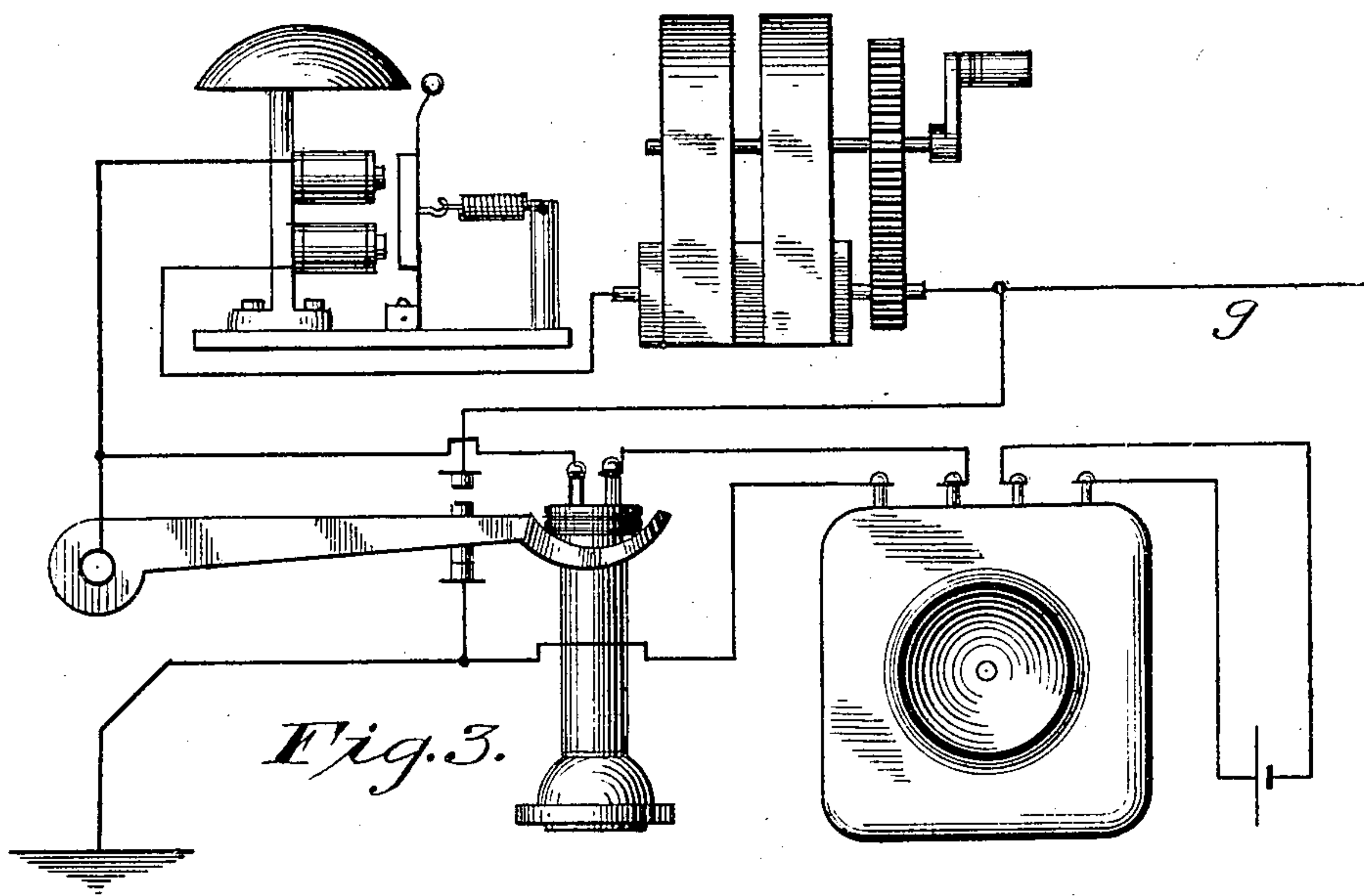
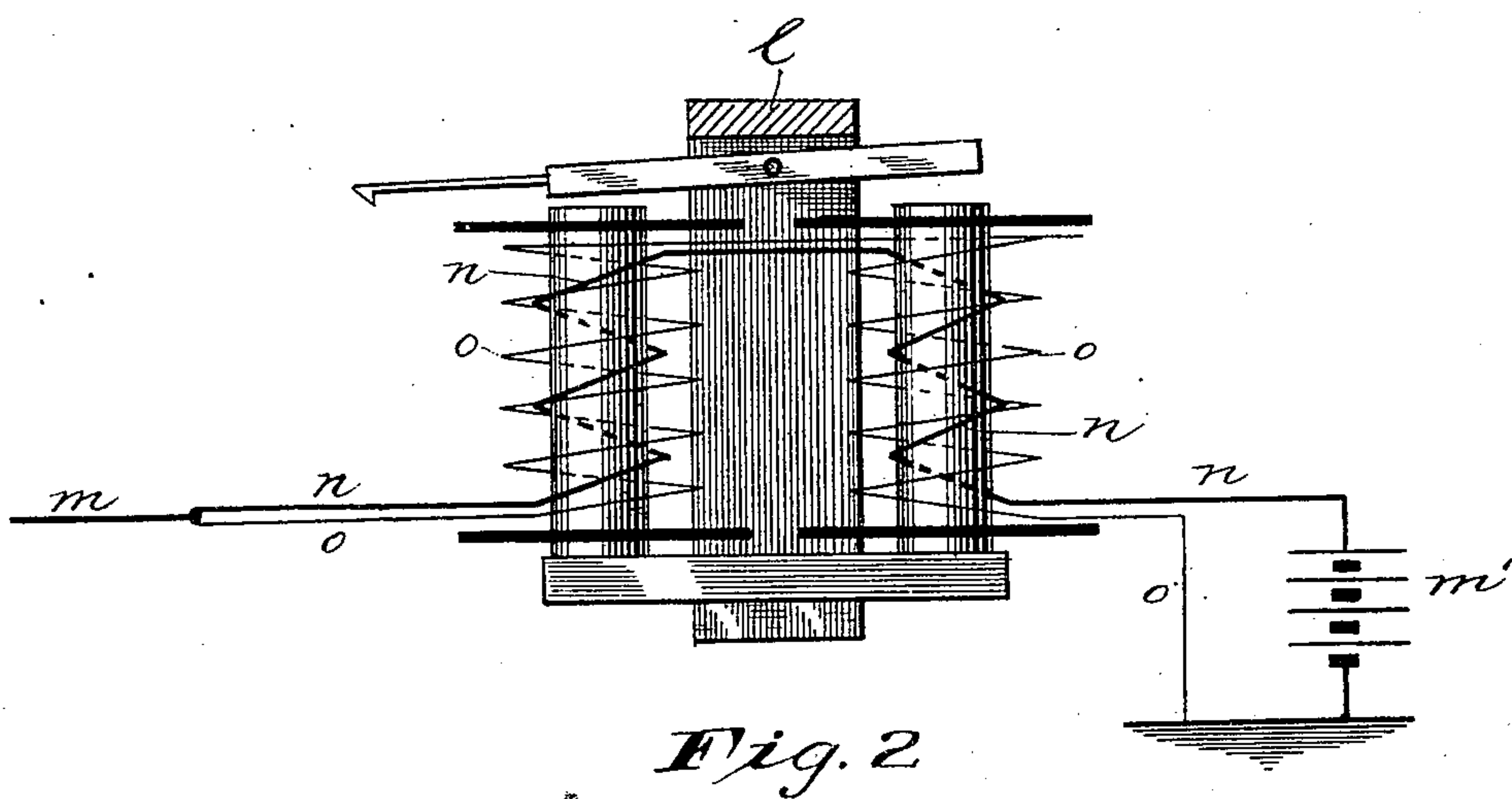
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3 Sheets—Sheet 2.



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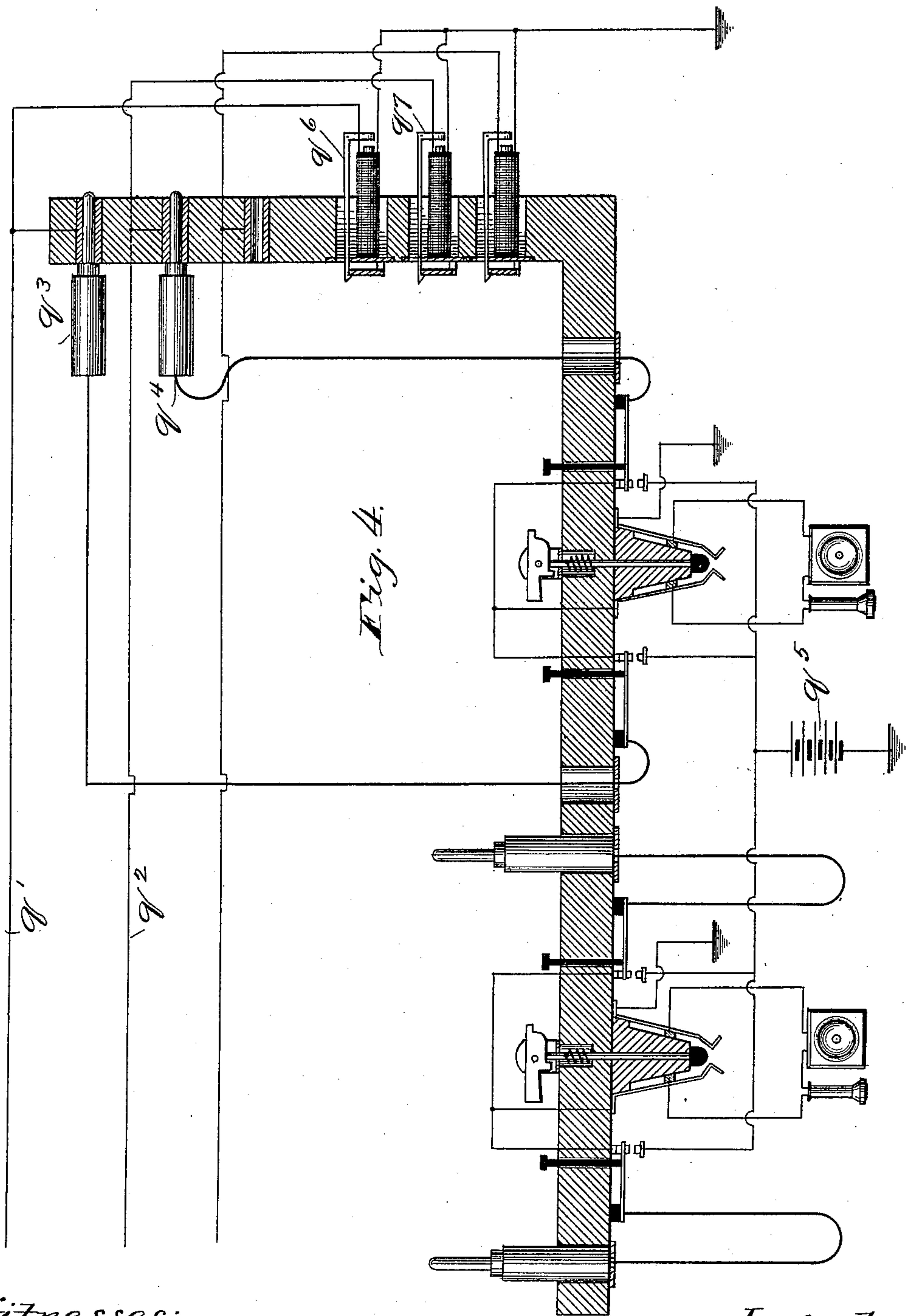
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UNITED STATES PATENT OFFICE.

CHARLES E. SCRIBNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE WESTERN ELECTRIC COMPANY, OF SAME PLACE.

TELEPHONE-EXCHANGE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 632,066, dated August 29, 1899.

Application filed December 18, 1888. Serial No. 294,004. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. SCRIBNER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Telephone-Exchange Systems, (Case No. 185,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to telephone-exchange systems, certain features thereof being adapted for use in exchanges having only one switchboard, while all the features thereof may be advantageously employed in exchanges having multiple switchboards.

I will describe my invention more especially as applied in multiple systems, referring only incidentally to its application to single-board exchanges.

My invention consists, first, in the use of polarized individual annunciators in the telephone-lines, in combination with a battery connected with the connecting devices and so arranged that when any two lines are connected together the battery-current will be closed through the polarized individual annunciators in a direction to prevent their being operated; second, in extending each line from its switch or plug socket on the last board through a polarized individual annunciator and thence to ground, the annunciators being of high resistance and provided with a large number of turns to act as self-induction coils when two lines are connected together; third, in providing connecting, signaling, answering, and testing apparatus at each of the boards so arranged that communication may be had between the central office and the different subscribers' stations, as desired, to enable one subscriber to be put in communication with any other idle subscriber; fourth, in a special battery-circuit in connection with the connecting devices, whereby the individual polarized annunciators of two connected lines are prevented from being thrown down while connected for conversation, the presence of the battery-current on any lines thus connected at one board affording means for testing the lines at any other of the boards, and, fifth, in a differentially-wound clearing-out

annunciator, the battery-circuit connected through said coils, and a branch from between said coils to a pair of cords or other connecting device, the different windings of the annunciator being of a different number of turns and so apportioned that when two lines are connected by the cord the currents through the different windings will be such as to practically neutralize the core.

By the use of my invention the spring-jack switches heretofore generally used may be dispensed with, simple metallic sockets being used instead. Moreover, no special test-wires are required in multiple systems.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is a view illustrative of three telephone-lines, each connected with three multiple switchboards, each line extending from its socket on the last board to a polarized annunciator and thence to ground, the operator's apparatus being shown at the first and last boards. Fig. 2 is a detailed view showing the manner of winding the clearing-out annunciator differentially. Fig. 3 is a view of a subscriber's outfit, a single-stroke bell being shown as a signal-receiver, the magneto-generator being of the usual type adapted to send current in reversals. Fig. 4 is a diagram showing a single switchboard with three lines connected therewith and two of said lines being connected together, the clearing-out annunciators being omitted from the pairs of connecting-cords, as is sometimes desirable—as, for example, upon toll-lines.

Like parts are indicated by similar letters and figures of reference throughout the different figures.

Referring now to Fig. 1, line *a* after connecting with the sockets *b*¹, *b*², and *b*³ on the different boards passes through the individual polarized annunciator on board 1 and thence to ground. Line *d* is connected in like manner with sockets *e*¹, *e*², *e*³, and from the socket *e*³ through an individual polarized annunciator on board 2 and thence to ground. Line *g* coming from its subscriber's station (for detail see Fig. 3) is connected with its sockets *h*¹, *h*², *h*³ and thence through polarized annunciator *i* on board 3 and to ground. The lines *a* and *d* are shown connected for conversation

at board 1 between sockets b' and e' , while the annunciator of line g at board 3 is shown down, as if a call had just been sent in, while the test-plug at board 3 is shown applied to socket e^3 as in the act of testing line d .

Referring now to board 1 of Fig. 1, it will be seen that the plugs k k' are connected by the cords k^2 k^3 , a usual calling-key being included in each of the cords. The clearing-out annunciator l is wound differentially and the circuit through the coils thereof may be traced from ground through battery m' and thence through winding n in one direction and thence back through winding o , having the greater number of turns in the opposite direction, and thence to ground. The strand of the cords k^2 k^3 is connected through wire m with a point between the differential coils n o , as shown. The battery m' is of such strength and its polarity such that the individual annunciators of any two connected lines, as annunciators c and f , will be retained in position as long as the connection between the lines remains. The current of battery m' is effective in locking the annunciators c f in position, while at the same time, being present at sockets b^2 b^3 and e^2 e^3 , serves, when the proper test is applied, to indicate that the lines are in use. The adjustment of the bell of each subscriber's outfit should be such that there would be no danger of calling a subscriber simply by the current from battery m' . A special calling-battery p is provided, which should be of sufficient strength to operate any subscriber's signal-receiving device or single-stroke bell when closed to his line.

The different coils n o of the clearing-out annunciator are not of the same number of turns, the coil o having the greater number. The resistance of the individual annunciators is such that the current derived through coil o will have practically the same effect upon the core as the greater current through the less number of turns in the coil n . Hence in effect the clearing-out annunciator will be neutral so far as it is affected by current from battery m' . It is evident that current from the magneto of either of two connected subscribers will operate the clearing-out signal. Since the individual annunciators are never disconnected from their telephone-lines, respectively, they should be of high resistance and preferably of many turns, so as to act as self-induction coils, for reasons well understood. Thus, as shown in Fig. 4, the annunciator may be provided with a long core and wound with, say, ten thousand turns, and its resistance may be, say, five hundred ohms. The resistance of the polarized annunciators being known, the required amount of difference in the differential windings n and o may be readily determined.

As shown in Fig. 4, the lines q' q^2 are connected together by the pair of cords q^3 q^4 . The battery q^5 is designed to be used for signaling the subscribers, an ordinary key being shown in the circuit of each cord of the dif-

ferent pairs arranged to make connection with this battery. The individual annunciators q^6 q^7 , &c., of the different lines are each wound with a large number of turns of fine wire, so that the self-induction of these individual annunciators will be sufficient to prevent any injurious effects upon the lines when connected together for conversation, although the individual annunciators remain connected therewith in ground branches, as shown. Thus simple sockets may be used as switches upon the switchboard for the telephone-lines and the individual annunciators of any two lines, when the lines are connected together between their switches or connecting-pieces upon the switchboard will be shunted.

The operation of my system as applied to multiple switchboards is briefly as follows: Suppose a call sent over line a , throwing down shutter c at board 1. Operator at board 1 at once inserts plug k in socket b' and brings her telephone into circuit, thus putting herself in communication with the subscriber of line a to receive the order, which we will say is for line d . Line d is then tested by applying test-plug p' to socket e' , and no current being indicated is evidence that the line is idle. The plug k' is then inserted, as shown, and the key in cord k^3 is closed to the calling-battery, thus sending current over line d to indicate to the subscriber thereon that he is wanted. The two subscribers are thus placed in communication, their annunciators remaining in ground branches, as shown. These annunciators being, however, of high resistance and provided with a large number of turns the ground connections will not to any injurious extent interfere with the circuit, and as the annunciators are held up by battery m' no false signals will be made. The manner in which this prevention of false signals is accomplished may be described as follows: Current flows from battery m' through one winding of the clearing-out annunciator l to the cord-circuit k^2 k^3 and thence to the plugs k k' . From these it finds circuit to the line-wires of the two lines with which the plugs are connected and thence to earth through their respective annunciators c and f . The polarity of battery m' is so arranged with respect to the magnetic polarity of the individual annunciators that these shall not attract their armatures in a manner to release their shutters. If now a signaling-current be sent from either substation as a signal for disconnection, a large portion of the signal-current will find circuit through the clearing-out drop l to earth, operating that drop. A part will pass through each of the individual annunciators to earth, but will fail to operate these, because they will be retained inoperative by the superior force of battery m' . Either connected subscriber may clear out by hanging up his telephone and operating his generator. Suppose a call be sent over line g for line d . The operator testing at board 3,

as shown, will find current on the line and will thus know that the line is busy—that is, if the line were not in use the application of plug p' to any socket would produce no response in the telephone of the operator testing, but if the line be in use a current will be shunted from the line by the grounded test-plug and passing through one helix of the induction-coil will induce a momentary current in the operator's telephone. She will thus avoid crossing in upon connected lines.

The system herein described is of special advantage on account of its simplicity and cheapness. The problem of wiring large boards, which has been considered heretofore one of the most difficult, is made easy, since only half the number of connections are required by my system herein, the special test-circuits, one for each line, as hereinbefore used, being dispensed with; also, it will be observed that the spring-jack switches, which are very expensive owing to the superior workmanship and material required, are dispensed with.

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

1. The combination with two telephone-lines each provided with a different connecting-piece on each of two or more switch-boards, and each permanently connected to ground through its individual polarized annunciator, of a connection between said lines at one of the boards and a battery closed in derived circuit through said annunciators to hold them in position to prevent false signals.

2. A pair of plugs connected together and to a grounded circuit between two unbalanced differential windings of an annunciator in said grounded circuit, a battery in said grounded circuit between the coil having the lesser number of turns, and circuits including resistance with which said plugs are adapted to be connected, the resistance of said circuits and the difference in the differential windings being apportioned to cause the current through the coils to have practically the same effect upon each, and practically neutralize the annunciator-core.

3. In combination, two telephone-lines, connection sockets in branches from each line, a conductor uniting two sockets of the different lines, and an individual annunciator in a permanently-closed branch from each line of high resistance and self-induction, substantially as described.

4. The combination with two telephone-lines connected together, of permanent ground branches, one from each line including a polarized annunciator, of a battery closed through said annunciators to retain them in position.

5. In combination, two telephone-lines, a conductor temporarily uniting the two lines, an individual annunciator for each line in a

permanently-closed branch of the line of high resistance and self-induction, and means applied through the instrumentality of said conductor adapted to render said individual annunciators irresponsive to signaling-currents in the lines, substantially as described.

6. In combination, two telephone-lines, a socket connected with each line, a connecting-plug in each socket, a link conductor uniting the two plugs, an individual annunciator for each line in a permanently-closed branch from the line of high resistance and self-induction, a clearing-out annunciator connected with said link conductor, and means applied through the instrumentality of each of said plugs and sockets adapted to render the individual annunciators irresponsive to signaling-currents in the lines, substantially as described.

7. The combination with a telephone-line circuit, of an individual annunciator connected in a permanent branch circuit between the different sides thereof, said annunciator being arranged to be retained unresponsive to signaling-currents through it by a continuous current through it, and a source of continuous current in a branch circuit between the different sides of the circuit; substantially as described.

8. The combination with a telephone-line circuit of an individual annunciator adapted to remain unresponsive to signaling-currents when a continuous current traverses its coils, connected in a permanent branch between the different sides of the said circuit, and a pair of connecting plugs and cords and a battery adapted to be connected between the different sides of the line-circuit when connection is made with said line, to prevent the subsequent operation of the individual annunciator; substantially as described.

9. The combination with a telephone-line of means for sending signaling-current over the same, said means being located at the substation thereof, said line being provided with a permanently-closed branch of high impedance at the central office, a signal-receiving instrument located in said branch, a connection socket located in the line at the central office, a connecting-plug constituting a temporary terminal of another telephone-line adapted to be inserted in the said socket, and means applied through the instrumentality of said connecting plug and socket adapted to render the said signal-receiving instrument irresponsive to currents sent from the subscriber's station.

In witness whereof I hereunto subscribe my name this 1st day of December, A. D. 1888.

CHARLES E. SCRIBNER.

Witnesses:

LESTER CLEMENT BARTON,
CHAS. G. HAWLEY.