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L. A. SCHMIDT.

LOCK-OUT TELEPHONE SYSTEM.

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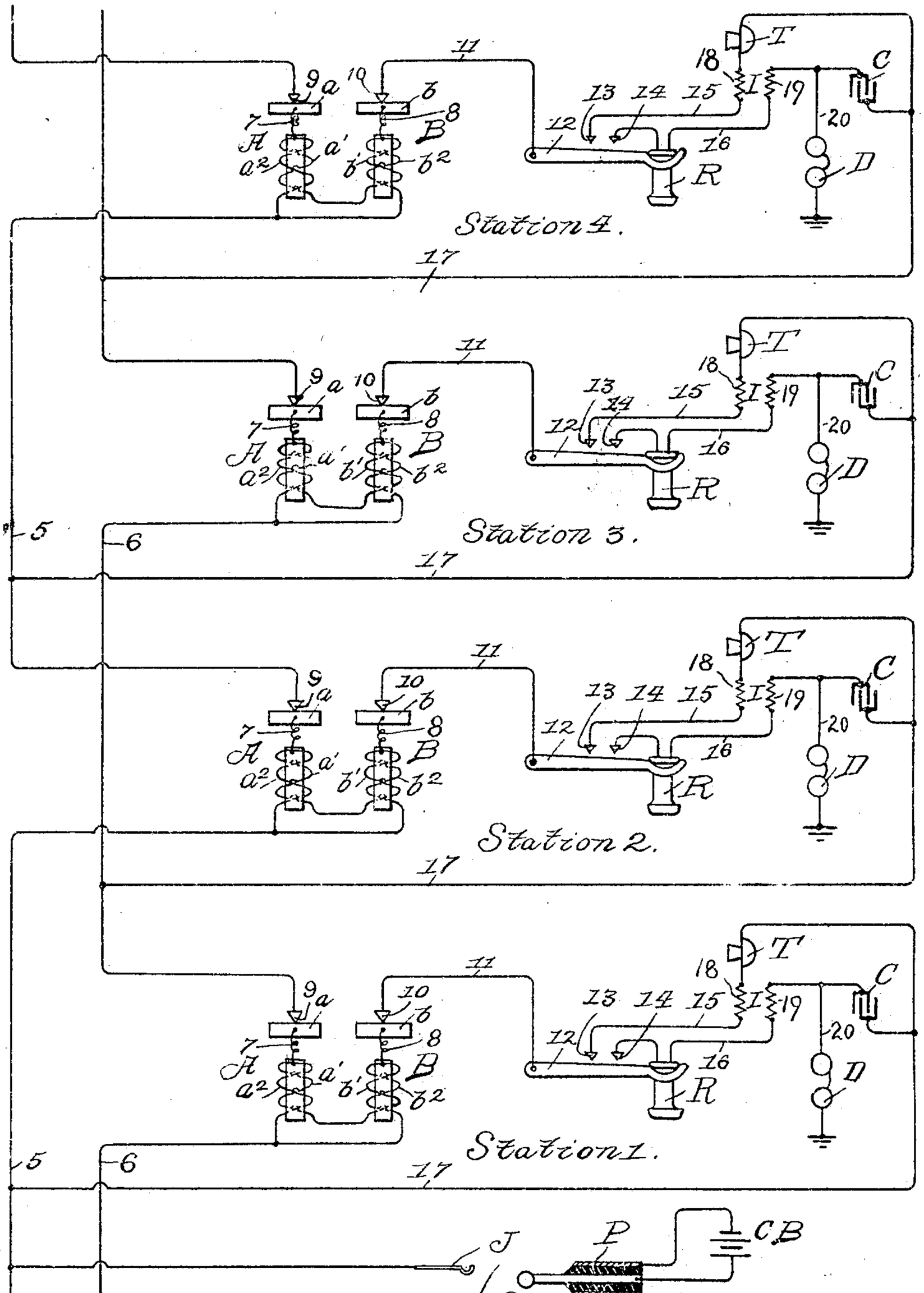

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UNITED STATES PATENT OFFICE.

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LOCK-OUT TELEPHONE SYSTEM.

No. 818,793. Specification of Letters Patent. Patented April 24, 1906.

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To all whom it may concern:

Be it known that I, LOUIS A. SCHMIDT, a subject of the German Emperor, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Lock-Out Telephone Systems, of which the following is a specification.

My invention relates to lock-out telephone systems, and has for its salient object to provide a simple and efficient lock-out system whereby the conditioning of the instruments of one subscriber for transmission of a message to or through the central office automatically actuates means for preventing the conditioning of the instruments of any other subscriber upon the same line for connection with "central." In general, I provide for the accomplishment of such results by providing, in conjunction with each subscriber's set of a bridging system, a pair of relays, one of which controls the bridging connections of the subscriber's set and is responsive to current-flow through the line beyond such subscriber's set to open the bridge, and the other of which relays controls the line beyond such subscriber's set or station and is responsive to the flow of current through the bridge of said station to open the line therebeyond.

In the drawing I have diagrammatically shown in a single figure an application of my invention in relation to such portions of an ordinary telephone system as are germane thereto.

In said drawing, 5 and 6 indicate the line-wires, with which are associated, preferably in alternation at successive stations, the lock-out relays A and B and associated parts of the telephone sets. Save for this alternating arrangement the subscribers' stations 1, 2, 3, and 4 are identical in their composition and arrangement, and I will therefore describe one of them only. At each station a line-wire (5 or 6) is led to a contact of the "main" or line-controlling relay A with which the armature *a* normally contacts, connection being established from said relay-armature through the relay-coils in suitable manner for the purposes to be described, the coils for this purpose being suitably connected with the same line-wire. At each station is also provided a normally open bridging connection, one end whereof normally connects the subscriber's hook-switch with the line through the armature and contact of "bridge-relay" B, and the other end whereof, normally disconnected from the first said end at the switch-hook whenever the receiver is hung, is connected to the opposite side of the line. Thus the continuity of the normal bridge connections, closable at the switch-hook, is dependent upon the functional inactivity of its bridge-relay B, while the continuity of the line beyond any subscriber's station is dependent on the functional inactivity of the main relay of such station.

The relays A and B are so associated that when the bridge connections of any subscriber's set are closed by the removal of the receiver from its hook and current is supplied to the line the main relay A is actuated to open the connection of its armature *a* with the contact 9, thereby opening the line beyond, while the relay B is permitted to remain in condition to permit contact of its armature *b* with its contact-point, and the connection, further, is such that when the bridge connections of any subscriber more remote from the central station than the subscriber's set now in question is closed and current is supplied to the line the main relay A of the subscriber intermediate the closed bridge and the central station is not actuated to open the line, while the bridge-relay of such intermediate subscriber is actuated to open its respective bridge connections. I have found that a simple and efficient manner of arranging the relays for this purpose is as follows: The line-wire to be led to the relays is divided, on the one hand, the circuit including in series both coils b^2 and b' of the compound wound bridge-relay B and one coil a' of relay A and, on the other hand, including the remaining coil a^2 of relay A, the two branches being connected to form a continuous loop which includes the two coils of the relay A and the two coils of the relay B. In the specific arrangement shown it is contemplated that the coils a' and a^2 of the magnet A be wound in opposite directions, one coil being wound from right to left and the other wound from left to right. The same relative arrangement holds for coils b' and b^2 of relay B, and it will therefore be apparent that if current is passed through the coils of either relay in the same direction—that is, through both coils

from the same end—the coils will magnetically neutralize each other, in effect, upon the core or magnet, so that the magnet will remain magnetically neutral and the armature unresponsive thereto.

With the arrangement shown to secure the desired magnetic effect upon the armatures of the relays the windings of each main relay A should be in parallel with the line-wire to which the relay is connected and arranged for series connection with the wire of the corresponding bridge, while the bridge-relay B is conversely arranged with its coils disposed for parallel connection in the bridge-wire and series connection in the line-wire. Specifically, 7 indicates a wire connected at one end between the coils a' and a^2 of relay A and at its opposite end connected to the armature a of said relay, while 8 indicates a wire connected between the coils of relay B and to the armature of said relay. The contact 9, with which armature a normally contacts, is connected directly in the line, while the contact 10 for armature b is a part of the bridge connection. Otherwise stated, the main line and bridge divide at the commencement of what I have termed the "loop," the coils a^2 and b^2 being respectively in the line and bridge circuits, so that through them current flows always in the same direction, while the coils a' and b' are connected in a shunt across the line and bridge wires beyond coils a^2 and b^2, so that the direction of current-flow therethrough depends upon whether current flows through the line beyond the station or through the bridge at the station, the direction reversing accordingly as the line beyond or bridge is closed.

The connection of the telephone set may be made in any usual manner to leave the bridge-wire normally open, in the specific arrangement shown by way of illustration the contact 10 being connected by wire 11 with the switch-hook 12. The upper contacts 13 and 14 have connection by wires 15 and 16 (including, respectively, the primary and secondary windings 18 and 19 of the induction-coil I and the transmitter T and receiver R, respectively) with the bridge-wire 17, connected with the side of the line opposite to that with which the relays of the subscriber's station are connected. The wire 16 is also shown as including a condenser C and has tapped thereto the ground-wire 20, including bell D.

At the central station I have illustrated diagrammatically only a portion of the usual cord connections, J indicating the usual jack, having its contacts connected with the respective sides of the line, and P indicates the plug, having its sleeve and tip connected, as usual, with the respective sides of a central battery C B. Any usual means for enabling the subscriber to call the central station and other auxiliary apparatus incident to telephone installation may of course be employed, but are not here illustrated.

In general the operation of my improved system will be as follows: Under normal conditions the line is open at each subscriber's station, there being no connection afforded at any point between the line-wires 5 and 6. If now a subscriber—say at station 3—removes his receiver from its hook and the operator at central station, responding to the call received through any convenient apparatus, (not shown,) "plugs in" at the jack J, current flows from the central battery C B through the line-wire 6 to the relays of the calling subscriber and there divides, one branch including in series coils a' and a^2 of the relay A and coil b' of relay B and the other branch including coil b^2 and relay B and the circuit, thence continuing through the wire 8, armature b, contact 10, wire 11, switch-hook 12, contacts 13 and 14, and wires 15, 16, and 17 to the return-conductor 5. It will be apparent under such conditions the current flowing in series through the coils a' a^2 of relay A—that is to say, in opposite directions through the oppositely-disposed windings—energizes said relay and causes the magnet to attract its armature a, thereby opening the line-circuit at contact 9 beyond the bridge of the calling subscriber. On the other hand, current-flow through the relay B is in parallel through the coils b' b^2—that is to say, in like direction through the oppositely-disposed windings—so that said relay remains neutral and its armature in contact with the point 8. Accordingly, the bridge of the calling subscriber remains closed. It will be seen, however, that at all intermediate stations between the station of the calling subscriber and the central office current flows through the relays A and B of said intermediate subscribers, the flow being, on the one hand, through the windings b^2 b' of relay B in series and thence through winding a' of relay A, and on the other hand, through winding a^2 of relay A alone, the branches joining at wire 7 and the main circuit continuing through armature a and contact 9. Thus the coils of relay B being connected in series in the circuit and the windings of relay A being connected therein in parallel, the relay B is energized and the relay A remains neutral. Accordingly, at these intermediate stations the bridge-lines are opened at the contact 10, while the main line remains closed. It will be apparent now that if any subscriber beyond the station of the calling subscriber attempts to get connection with central or with the main line he is prevented from so doing on account of the rupture of the main line at the station of the calling subscriber, due to the energization of the main relay A of said calling subscriber, while all subscribers inter-

mediate the calling subscriber and central station are prevented from obtaining connection with the line by the opening at their own stations of their bridge-lines at the point 10, due to the energization of the bridge-relay B.

It will be apparent that changes might be made in the specific winding and arrangement of the relay-coils and like construction details without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a telephone system, a central station, parallel conductors therefrom, a plurality of normally open telephone sets bridged between said conductors, and in association with each such set means for controlling the continuity of a conductor therebeyond comprising a relay having its normally open armature arranged to control the continuity of the line, and having a winding in shunt between the said conductor and the bridge connections, whereby current flows therethrough in one direction to cause the attraction of the armature, and opening of the line therebeyond when the bridge is closed at such station, and in the other direction to leave the armature unattracted and the line closed when a circuit is completed at a point more remote from central station than such station referred to.

2. In a telephone system, a central source of current-supply, two conductors extending therefrom, a plurality of normally open telephone sets bridged between said conductors, and in association with each set, means for controlling the continuity of the normal bridge connections of such set comprising a relay having its armature arranged to control the bridge and to close the normal bridge connections, said relay having a winding in shunt between a line conductor at the bridge wherethrough current flows in one direction to cause the attraction of the armature and the opening of the bridge when the line-circuit is completed beyond such station, and to leave said armature unattracted when the bridge at such station is closed.

3. In a telephone system, a central station, line conductors leading therefrom, a plurality of normally open telephone sets bridged between said conductors, and at each subscriber's station means for controlling the continuity of the line beyond such station, and for controlling the continuity of the normal bridge connections of such station, such means comprising contact devices and relay-coils, said relay-coils being connected in shunt across the line and bridge conductors so that current-flow therethrough is in one direction, proper to actuate the contact devices to open the line and maintain the bridge closed when the bridge at such station is closed, and so that current flow therethrough is in the opposite direction, suitable to open the bridge connection and maintain the line-contacts closed when the bridge at a station more remote from central is closed.

4. In a lock-out telephone system, a line conductor, a return-conductor, at each of a plurality of subscribers' stations a normally open bridge having associated therewith a telephone set including means for closing the normal opening of said bridge, a relay controlling the continuity of the line beyond the bridge, having opposite coils in parallel in the line and in series in the bridge, and a bridge-relay controlling the continuity of the normal bridge connections having opposing coils in series in the line and in parallel in the bridge.

5. In a telephone system, a central source of current-supply, line conductors extending therefrom, telephone sets at the respective subscribers' stations, and means at each station for automatically opening the bridge when a station therebeyond is conditioned for communication with central, and automatically opening the line therebeyond when such station is conditioned for communication with central, such means at each station comprising two relays controlling respectively the bridge and line connections, and each having coils wound to substantially neutralize each other in magnetic effect when a talking-circuit is completed through the connections which it controls.

6. In a lock-out telephone system, parallel line conductors and bridge telephone instruments, and at each subscriber's station a bridge-controlling relay and a line-controlling relay, each of said relays having two coils adapted when connected in parallel in a circuit to neutralize the relay-magnet, and when connected in series to energize the same, and each relay having also an armature connected to a point between the coils of the relay, said relay-coils being arranged in series in a loop connected at a proper point with a line conductor, the contact of one relay-armature being also connected with the same line conductor, whereby the line-circuit is established through the armature of said relay, and the contact-point of the armature of the remaining relay being connected through the telephone instruments with the opposite line conductor, whereby the bridge-circuit is established through the armature of said relay.

7. In a telephone system, a central station, line conductors extending therefrom, normally open bridged telephone sets, and in conjunction with each set electromagnetic devices controlling the continuity of the bridge and line connections, such devices being wound and connected for the passage of current through coils thereof in one direction when the bridge connections of such stations

are closed, and for the passage of current therethrough in the opposite direction when the bridge connections at a station more remote than central are closed, a contact-bearing armature in the line arranged to respond to the magnetic conditions produced by current-flow through the bridge of such station to open the line therebeyond, and a contact-bearing armature arranged to respond only to the magnetic conditions produced by current-flow through the line therebeyond to open the bridge.

In testimony whereof I hereunto set my hand in the presence of two witnesses.

LOUIS A. SCHMIDT.

In presence of—

GEO. T. MAY, JR.,

GEORGE L. CHINDAHL.