

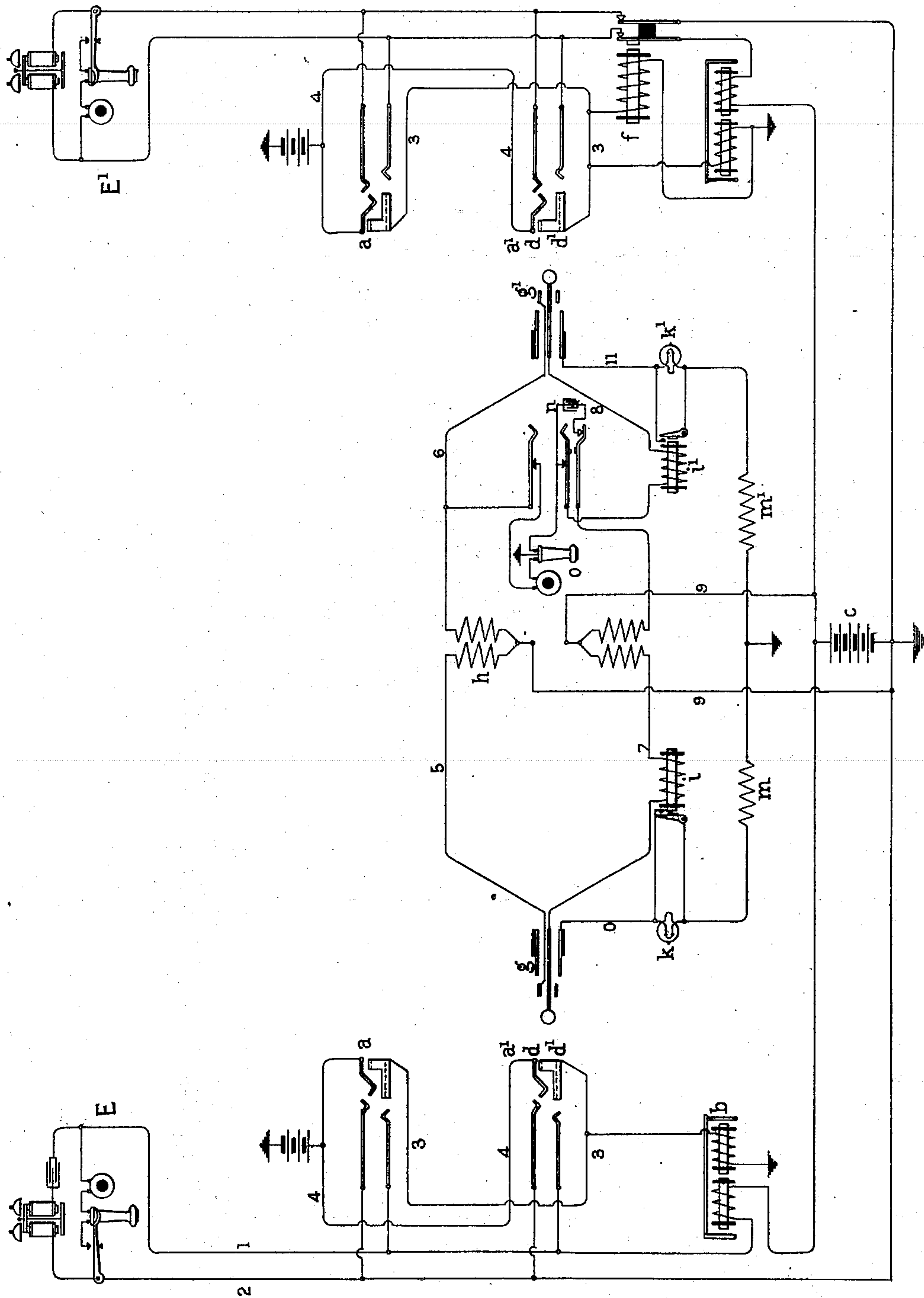
No. 654,750.

Patented July 31, 1900.

F. R. McBERTY.
SWITCHBOARD FOR TELEPHONE LINES.

(Application filed Dec. 26, 1899.)

(No Model.)



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UNITED STATES PATENT OFFICE.

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SWITCHBOARD FOR TELEPHONE-LINES.

SPECIFICATION forming part of Letters Patent No. 654,750, dated July 31, 1900.

Application filed December 26, 1899. Serial No. 741,577. (No model.)

To all whom it may concern:

Be it known that I, FRANK R. MCBERTY, a citizen of the United States, residing at Evanston, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Switchboards for Telephone-Lines, (Case No. 81,) of which the following is a full, clear, concise, and exact description.

This invention concerns apparatus for supervising and switching telephone-lines equipped for the automatic control of signals and for the supply of current for exciting the substation-transmitters from a central source in the switchboard.

The invention comprises several features, which have for their purpose, respectively, to provide for the automatic operation of line-annunciators and for the automatic effacement of the displayed line-signals in making connection with the lines, to provide for severing the normal extensions of the line-circuit through the line-signals in the case of such lines only as must be free from grounded connections during their use, to furnish means for exciting supervisory signals temporarily associated with united lines, and to avoid unnecessary current-disturbances in lines in the process of switching them together.

The invention has in view the adaptation of existing switchboards, particularly the so-called "bridging-boards," to signaling and supplying current for the transmitting-telephone from a central source in the switchboard.

In the bridging apparatus referred to each telephone-line is provided with a spring-jack in each section of the multiple board of the type represented in Patent No. 400,969, dated April 9, 1889, to H. B. Thayer, or some essentially-similar form with plugs adapted to the spring-jacks and with a line-signal in some section of the switchboard like that described in Patent No. 634,095, dated October 3, 1899, to C. E. Scribner, (Case No. 252.) The spring-jacks not being specially adapted as agents for applying a continuously-flowing current in the switchboard are subject to accidental contacts, which create troublesome noises in the telephones of lines in the process of uniting them. The line-annunciators are permanently connected in bridges of the lines, and

no means is provided for breaking these annunciator-bridges in special cases where they prevent the normal operation of the line, such as long-distance connections or party-lines adapted for selective signaling. The present invention aims to obviate these various obstacles to the employment of a common source of current in the bridging-board and to secure the advantages of automatic signals in common battery-transmission therein. To this end its several features consist in the following apparatus and circuits: In connection with the local circuit of each selective-signal line which traverses the restoring-magnet of the line-annunciator thereof is arranged an electromagnetic switch or cut-off relay, of which the switch-contacts control the bridge including the actuating-magnet of the line-annunciator. With that contact-piece of the plug which is designed to close this local circuit and in so doing to come into direct connection with a battery applied to a local contact-piece of the jack I associate a third flexible conductor, forming the terminal of a circuit including the supervisory signal, together with a resistance-coil, and I provide in the plug-circuit the usual supervisory relay controlling a shunt about the signal, the plug-circuit being equipped with a bridge including the common source of current, and for the purpose of preventing the formation of abnormal currents in the process of making connection with the line called for the tip or testing contact of the calling plug is normally disconnected from the remainder of the plug-circuit, its connection therewith being controlled by the operator's telephone-key, and is connected with special appliances to permit making the test.

The invention is diagrammatically illustrated in the attached drawing. At the substation the transmitting and receiving telephones are placed in a normally-open-bridge of the line which is closed by the telephone-switch when the telephone is taken for use. The polarized call-bell is placed in a permanently-closed bridge of the line, in which a condenser is interposed to prevent the passage of continuous current from the central battery through this bridge. The line conductors 1 and 2 are led from the instruments at

the substations to spring-jacks a and a' in the switchboard, and thence line-wire 1 extends through the line-magnet of a line-annunciator b to the free pole of the common signal-battery c , while line-wire 2 is extended to earth. The restoring-magnet of the line-annunciator is included in a conductor 3, which forms a part of the local-battery circuit 3 4, which is open at normally-separated multiple terminals d and d' of the spring-jacks a and a' .

As will be observed from the Patent No. 400,969 before mentioned descriptive of the spring-jacks the springs d , which form the terminals of the battery of all the spring-jacks in a strip in the switchboard, are formed integral with a ribbon of metal in the strip of spring-jacks.

In lines like that extending to station E' , which may be a party-line or a noisy line, which it is desirable to free from permanent ground branches in the exchange during the use of the line, a cut-off relay f is provided which is preferably connected in a multiple branch of the conductor 3 in parallel with the restoring-magnet of the line-annunciator, its switch-contacts being interposed in the extensions of line conductors 1 and 2 of the corresponding line. It may, however, if desired, be placed in series with the restoring-magnet in the same conductor.

Plugs g and g' are furnished in the switchboard united by a plug-circuit 5 6 and 7 8. Conductors 5 and 7 are united into a closed circuit through a wire 9, which closed circuit includes two windings of a repeating-coil h . Similarly, conductors 6 and 8 form a closed circuit having a portion of the bridged conductor in common with the circuit before traced, the latter circuit including two other windings of the same repeating-coil. The bridge of the plug-circuit thus formed leads through the common source of current c , or, in other words, the point of junction of wires 5 and 6 is connected with earth, while the point of junction of wires 7 and 8 is connected with the free pole of battery c . Conductors 7 and 8 include each the magnet-winding of a supervisory relay, the latter being designated i and i' . Each of these relays controls the display of a secondary supervisory signal k or k' . The sleeve of each plug, which in the bridging-board is not utilized as the terminal of a circuit but merely serves to cross together the contact-pieces d and d' of a spring-jack into which it is inserted, now becomes the terminal of a conductor which includes the secondary supervisory signal, together with a resistance-coil. Thus conductor 10, terminating in the sleeve of plug g , includes the signal-lamp k and the resistance-coil m . The sleeve of the other plug is the terminal of conductor 11, which includes the supervisory signal k' and the resistance-coil m' . The means whereby either supervisory relay controls its secondary signal is a shunt of the signal traversing the switch-contacts of the relay. Each pair of plugs is furnished with the usual

calling-key for applying a source of calling-current to the plug g' , which for the sake of clearness is not shown in the drawing, and with a listening-key n for bringing the operator's telephone o into a bridge of the plug-circuit. This operator's key is designed to break the continuity of the conductor 8, while the telephone is applied to the circuit and to connect the portion of the conductor leading to the tip of the plug directly with one side of the operator's telephone for the purpose of testing, at the same time interposing a condenser in the break thus produced in the conductor 8. Thus in the normal position of the telephone-key the conductor 8 is complete. While the telephone is connected with the plug-circuit, the circuit of the common battery to the tip of the plug is broken, while the inductive continuity of the circuit is maintained to permit the transmission of telephone-currents through the operator's telephone.

Taking the telephone for use at the substation by closing the line-circuit through the telephones there produces a current through the individual line-signal b , which displays the indicator of the annunciator. The operator answering the call inserts plug g into the answering-jack a' of the calling-line. Thereby the conductors 3 and 4 of the local circuit are united through the sleeve of the inserted plug, the restoring-magnet of the line-annunciator is excited, and the displayed indicator is replaced. At the same time a branch circuit is formed from the conductor 4, through the sleeve of the plug and conductor 10 terminating therein, by which the supervisory signal k is incited. The insertion of the plug into the spring-jack a' produces, however, a circuit for the battery c through the conductors 5 and 7 of the plug-circuit to the telephone-line, and a current flowing in this circuit excites the supervisory relay i and closes the shunt about the signal k , which thus remains concealed. Having learned the subscriber's order for the required connection, the operator tests the line called for by applying the tip of plug g' to the test-ring of a spring-jack thereof, the operator's listening-key being still in position to connect her telephone with the plug-circuit. If the conductors 3, leading to the test-rings of the line tested, be connected with the conductor 4, leading to the free pole of the local battery, a current will flow at each application of the test-plug through the conductor 8 of the plug-circuit and a portion of the operator's telephone to earth, which will indicate the busy condition of the line. If no "busy-test" click is heard in the telephone, the operator inserts the plug g' fully into the spring-jack. As the plug is thrust into the spring-jack the tip of the plug comes in contact successively with the thimble of the spring-jack, with the battery-spring, with the longer line-spring, and, finally, with the shorter line-spring; but inasmuch as the plug is disconnected from the battery in the

plug-circuit no currents are produced by the accidental contacts in the jack of sufficient strength to be troublesome in the telephone of the calling subscriber. When the plug is in place, the operator disconnects her telephone from the circuit, whereby connection of the common battery *c* with the called line is completed. The called line is in this case a party-line and is furnished with means for breaking the normal bridge of the line including the line-annunciator. When the plug is inserted in the jack to complete the connection, the local circuit 3 4 is closed and the cut-off relay *f* is excited, leaving the line free from all unnecessary connections in the switchboard. Current in the same local circuit thus formed excites the supervisory signal *k'*, which latter remains displayed until the subscriber called removes his telephone from its switch for use, when the signal becomes shunted by the supervisory relay. The resistance-coil in circuit with the signal in each of the conductors 10 and 11 maintains a sufficient difference of potential to permit the shunting of the signals without undue waste of energy. In practice the signals may be of, say, ten ohms and the coils of thirty ohms resistance.

The invention is defined in the following claims:

1. The combination with a telephone-line, a spring-jack forming a terminal of the line, and a plug and plug-circuit for making connection with the spring-jack, of a local circuit terminating in normally-separated opposed contacts of the spring-jack adapted to be crossed together through the sleeve of the plug, and a magnet in the local circuit, a branch of the local circuit terminating in said contact-sleeve of the plug, a secondary supervisory signal in the last-mentioned branch, and a supervisory relay in the plug-circuit controlling said signal, as described.
2. The combination with a telephone-line, a self-restoring line-annunciator thereof, a spring-jack forming a terminal of the line in the switchboard, and a plug and plug-circuit for making connection with the spring-jack, and a local-battery circuit terminating in

normally-separated contact-pieces of the spring-jack adapted to be crossed together through a local contact-piece of the plug, said local circuit including the restoring-magnet of the annunciator, of a supervisory relay and a source of current in the plug-circuit, a branch of the said local circuit in multiple with the restoring-magnet, a secondary supervisory signal and a resistance-coil in said branch, and a shunt of the secondary signal controlled by the supervisory relay; whereby the line-annunciator is reset and the secondary signal is excited for control by the relay when connection is made with the line, as described.

3. The combination with a telephone-line and a self-restoring line-annunciator in a normal bridge of the line-circuit, a spring-jack for the line, and a local circuit including the restoring-magnet of the line-annunciator and normally open at separated contacts in the spring-jack adapted to be closed together by an inserted plug, of an electromagnetic switch controlling the bridge of the line-circuit, the actuating-magnet of the said switch being in the same local circuit with the restoring-magnet of the line-annunciator, as described.

4. The combination with telephone-lines and a plug and plug-circuit forming a temporary extension of one of the lines, a source of current connected with the plug-circuit, and an operator's listening-key, of switch-contacts on the listening-key adapted to connect the telephone with the plug-circuit and to sever the conductive connection between the tip of the plug and the said battery; whereby the plug may be inserted into the spring-jack of a line without producing disturbances in the telephone of the line connected with the plug as described.

In witness whereof I hereunto subscribe my name this 5th day of October, A. D. 1899.

FRANK R. McBERTY.

Witnesses:

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FLORENCE E. SUMMERS.