

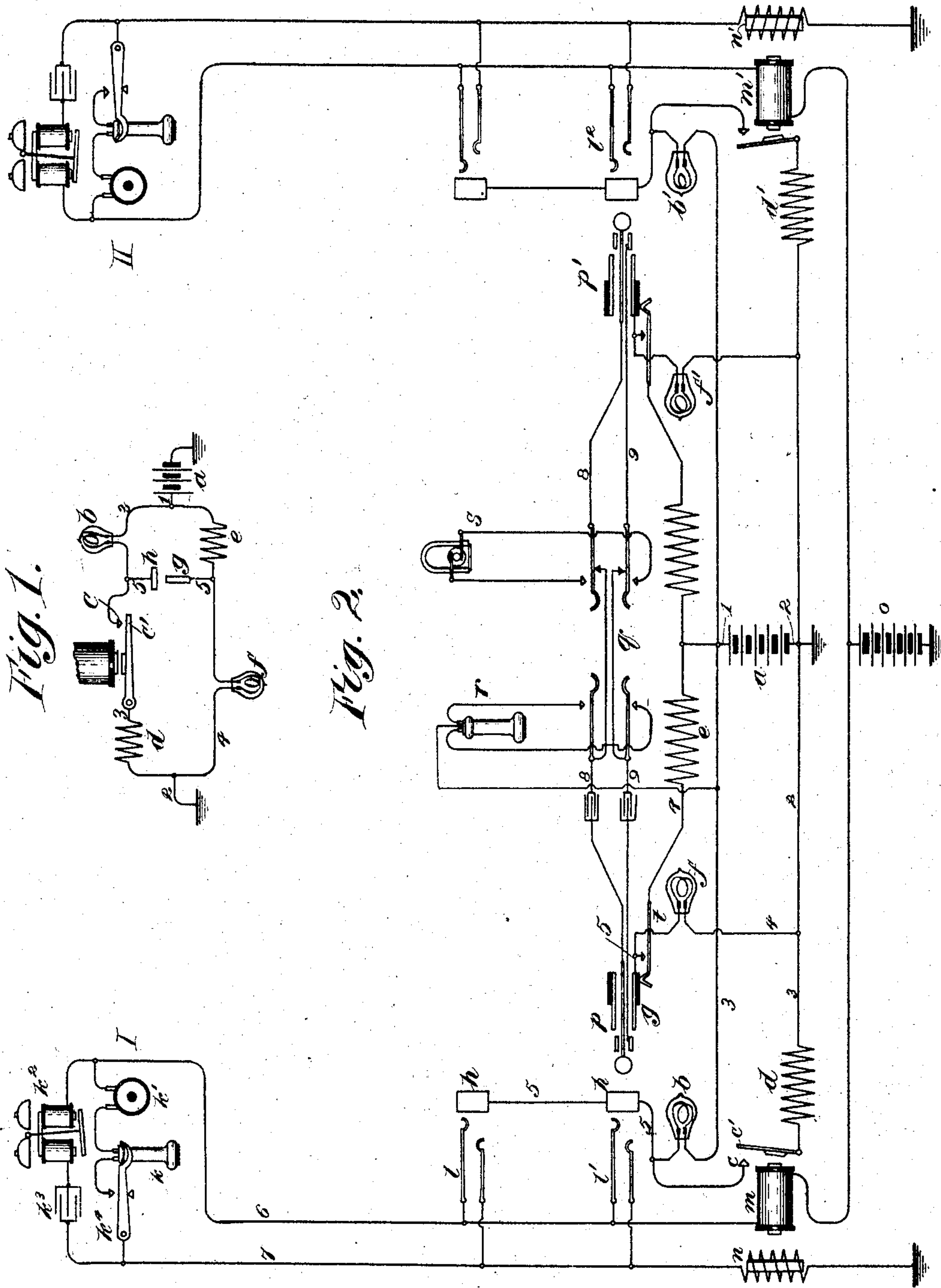
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APPARATUS FOR TELEPHONE SWITCHBOARDS.

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NO MODEL.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR TELEPHONE-SWITCHBOARDS.

SPECIFICATION forming part of Letters Patent No. 772,896, dated October 18, 1904.

Application filed December 26, 1899. Serial No. 741,576. (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 Apparatus for Telephone-Switchboards, of which the following is a full, clear, concise, and exact description.

My invention concerns signals of telephone-lines in switchboards. It applies particularly to subsidiary signals associated with the line and controlled by a relay responsive to currents in the line.

In switchboards for telephone-lines it is customary to associate permanently with each line a signaling device which may be actuated or displayed by means controlled at the corresponding substation and to substitute for this line-signal when connection is made with the line a supervisory or clearing-out signal which also may be controlled from the substation, the line-signal being meantime inoperative. It will be understood that in some switchboards—in those of the multiple type, for example—the connection with a line may be made at a point distant from the line-signal, in which case the supervisory signal furnishes the subscriber with means of signaling to the operator in charge of the connection. This invention applies to such signals; and it consists in an arrangement of circuits and apparatus for effacing or rendering inoperative the line-signal when connection is made with the line, for substituting therefor a supervisory signal, and for bringing the latter signal under the control of the same relay which normally determines the excitement of the line-signal.

The novel feature of the invention consists in a local circuit including a battery, a subsidiary signal, and switch-contacts controlling the continuity of the circuit, a shunt-circuit adapted to be closed about the line-signal, and another shunt containing a supervisory signal adapted to be completed about the switch-contacts. In applying this circuit to a telephone-line the switch-contacts are controlled

by an electromagnet which receives current, and thus becomes excited while the line is in use. The shunt about the line-signal and that about the switch are closed through registering contact parts in the spring-jack and connecting-plug when connection is made with the line. In this system of circuits the line-signal becomes displayed to indicate a call when the relay closes its switch-contacts as the substation apparatus is brought into position for use. That signal is short-circuited, and thus effaced, when connection is made with the line, and the supervisory signal is displayed when the relay permits its switch-contacts to separate, thus opening the shunt about it, presumably when the substation-telephone is no longer in use. When the supervisory signal is associated with the connecting plug and cord usually employed in telephone-switchboards for uniting lines, it is preferable to include in the circuit through the supervisory lamp the switch-contacts of a plug-switch by which the circuit shall be closed only during the use of the plugs in a connection. By this device waste of energy is avoided.

The invention is represented in the accompanying drawings.

Of the drawings, Figure 1 is a diagram of the circuits of the invention separate from the other apparatus and circuits of the switchboard. Fig. 2 shows the circuits of the switchboard complete as far as an understanding of the application and use of the invention require in connection with two telephone-lines extending to telephone-substations.

The circuit of the invention (seen in Fig. 1) is a local circuit 1 2, which is represented as a grounded circuit, including a battery *a*, and divided into two parallel branches 3 and 4. In one of these branches, 3, are a lamp *b*, a pair of switch-contacts *c c'*, and preferably a resistance-coil *d* in the order of naming. In the other branch, 4, are a resistance-coil *e* and a lamp *f*. From a point of conductor 3 between the lamp and the switch-contacts a conductor 5 is led to a point on wire 4 inter-

mediate of the resistance-coil and the lamp. This conductor is normally interrupted in contact-pieces g h . The coils d and e should be of low resistance. Each may have a resistance equal to about two-thirds of that of a lamp. When the switch-contacts c c' are closed together, the lamp b becomes lighted by the current in wire 3. Then if the conductor 5 be closed by bringing together the parts g and h the lamps b and f will be extinguished, being shunted by the coils e and d , respectively. Then if the switch-contacts c c' be separated the lamp f will be lighted because of the breaking of the shunt about it. If desired, the waste of current when the lamps are shunted may be diminished by including in the circuit next each lamp a small additional resistance. The relations of the resistances in the different portions of the circuit may be adjusted to suit varying requirements or conditions. I will now describe the application of this circuit and apparatus to the well-known mechanism of a telephone-switchboard to effect the objects announced in the foregoing general statement.

Each substation, as station I, is provided with telephones k k' , a call-bell k^2 , a condenser k^3 in circuit with the bell, and a telephone-switch k^4 for closing the line-circuit through the telephone instruments. This apparatus is connected by line-wires 6 7 with spring-jacks or terminal sockets l and l' in a switchboard at a central station, the line conductors being led finally, the former through a relay m and the latter through an impedance-coil n , to earth. A battery o is interposed in the common earth branch of the line conductors 6 of the different lines. The usual plugs p and p' , with their connecting plug-circuit 8 9, are furnished in the switchboard for uniting lines by means of their spring-jacks. A condenser is included in each plug-circuit to maintain the independence of operation of the relays of two united lines. The usual listening and ringing key q is provided for connecting the operator's telephone r or the generator s of calling-current with the plug-circuit. In associating the circuit of Fig. 1 with this organization the lamp b is placed near a spring-jack of the line and serves as the subsidiary line-signal. The contact-points of relay m are utilized as the switch-contacts c c' . The lamp f operates as a supervisory signal and is located near the plug p . The severed portions of conductor 5 terminate in the contact-piece g of the plug p and in the contact-rings h of the spring-jacks l and l' . A plug-switch t is placed in the resting-socket of the plug, and its switch-contacts are interposed in conductor 4 to prevent the flow of current through the lamp f except while the plugs are in use.

It will be understood that the conductor 3 of the local circuit, with its included line-lamp and switch-contacts, is provided for each line,

while a conductor 4, with the supervisory signal, is associated with each connecting-plug.

While I have for convenience shown the local and line batteries o as separate batteries, it will be understood, of course, that in practice these may be one and the same battery.

In this system the removal of the substation-telephone from its switch—as, for example, at station I—causes the corresponding relay to attract its armature and close the branch 3 which it controls. The line-lamp b is thus lighted. Its illumination constitutes a call-signal to the operator, who responds by inserting a plug p into spring-jack l' of the calling-line. This act brings her telephone r into connection with the line (the key q having been placed in proper position) and permits her to receive the subscriber's order for the connection required. The lifting of the plug from its socket allows the plug-switch t to close the break in wire 4 of the local signal-circuit. The insertion of the plug in the spring-jack completes conductor 5 of the local circuit through the sleeve of the plug and the thimble of the spring-jack, and thus effects the extinction of the line-lamp b . Supervisory lamp f also remains dark, being shunted by the closed switch-contacts c c' of relay m . After testing the line called for by applying the tip of the other plug, p' , of the pair to the test ring or thimble h of the spring-jack l' of the line the operator inserts the latter plug into the spring-jack tested and operates the key q to ring the bell at the station II. The removal of the plug p' from its socket effects the completion of branch 4 of the corresponding local circuit. The insertion of the plug in the spring-jack l' closes the break in conductor 5. Hence the supervisory lamp associated with that plug becomes lighted, since the shunt-circuit about it is not yet closed at the line-relay and the line-lamp b' of line to station II is shunted or short-circuited. When the subscriber at station II, responding to the call, removes his telephone from its switch-hook, the line-relay m' of that line becomes magnetized and closes the break in conductor 3 of that line. The supervisory lamp of plug p' is thus deprived of current. Its extinction is a notification to the operator that the called subscriber has answered. While the subscribers continue in conversation both supervisory signals remain dark. When either replaces his telephone on its switch, the corresponding supervisory lamp becomes lighted, and when finally both return their telephones to their normal positions both supervisory lamps are lighted. This last condition may be accepted by the attendant as an indication that conversation is completed and the lines may be disconnected.

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

1. In combination with a signaling-circuit,

a line-signal and switch-contacts in series therewith controlling the circuit, a shunt-circuit for the line-signal not embracing said switch-contacts, an independent shunt around the switch-contacts not embracing said line-signal, and a supervisory signal in said independent shunt-circuit, and a switch adapted to close both said shunts, whereby in closing said switch the control of the switch-contacts over the line-signal is destroyed and the supervisory signal is brought under their control instead.

2. In a supervising-circuit for telephone-lines, the combination with a signaling-circuit, a line-signal therein and switch-contacts serially in the circuit with said line-signal, said switch-contacts being controlled from the telephone-substation, a shunt for the line-signal not embracing said switch-contacts, an independent shunt around the switch-contacts not embracing said line-signal, a supervisory signal in said last-mentioned shunt, a spring-jack for the line and a plug and plug-circuit to make connection therewith, and switch-contacts closed in inserting the plug in the spring-jack, adapted to complete both said shunts, whereby prior to connection with the line the line-signal is controlled by the switch-contacts, but after connection with the line the supervisory signal alone is controlled by the switch-contacts, as described.

3. The combination with a telephone-line having a relay responsive to currents in the line, of a subsidiary signaling-circuit including a source of current and divided into two parallel branches, a line-signal and the switch-contacts of, said relay included in one of the branches, a subsidiary signal included in the other branch, and switch-contacts closed in the act of making connection with the line to form a cross-conductor between the said branches intermediate of the switch-contacts and the line-signal in one of said branches to shunt the line-signal and to bring the supervisory signal into shunt of the relay-contacts, substantially as described.

4. The combination with a telephone-line having a relay responsive to currents in the line, a spring-jack of the line and a plug and plug-circuit for making connection with the line, of a subsidiary signaling-circuit including a source of current and divided into two parallel branches, the contacts of said relay being included in one of said branches, a line-

signal permanently associated with the line in the same branch, a resistance-coil and a supervisory signal associated with the plug in the other branch, and a conductor normally open at registering contacts of the connecting-plug and spring-jack adapted to unite the two branches from points intermediate of the line signal and the relay-contacts in one branch, and of the resistance-coil and the supervisory signal in the other branch, and thereby to shunt the line-signal and bring the supervisory signal under the control of the relay when connection is made with the line, substantially as described.

5. The combination with a circuit including serially a source of current, a line-signal and switch-contacts controlling the continuity of said circuit, of a conductor in parallel with the portion of said circuit including the line-signal and switch-contacts, a supervisory signal in said conductor, a cross-conductor adapted to be established from the conductor between the line-signal and the switch-contacts, to the conductor between the supervisory signal and the source of current, and means for connecting said cross-conductor, as described.

6. The combination with a telephone-line including a relay responsive to currents in the line, and a subsidiary signal-circuit including serially a source of current with a line-signal and switch-contacts of said relay, of a conductor in parallel with the portion of said circuit including the line-signal and switch-contacts, a supervisory signal in said conductor, a cross-conductor adapted to be established from the conductor between the line-signal and the switch-contacts, to the conductor between the supervisory signal and the source of current, and switch-contacts controlling the continuity of the conductor and controlling the connection of the cross-conductor as described, established in making connection with the telephone, whereby connection with the line brings the supervisory signal under the control of the line-relay and takes the line-signal out of the control of said relay, substantially as described.

In witness whereof I hereunto subscribe my name this 1st day of December, A. D. 1899.

FRANK R. McBERTY.

Witnesses:

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