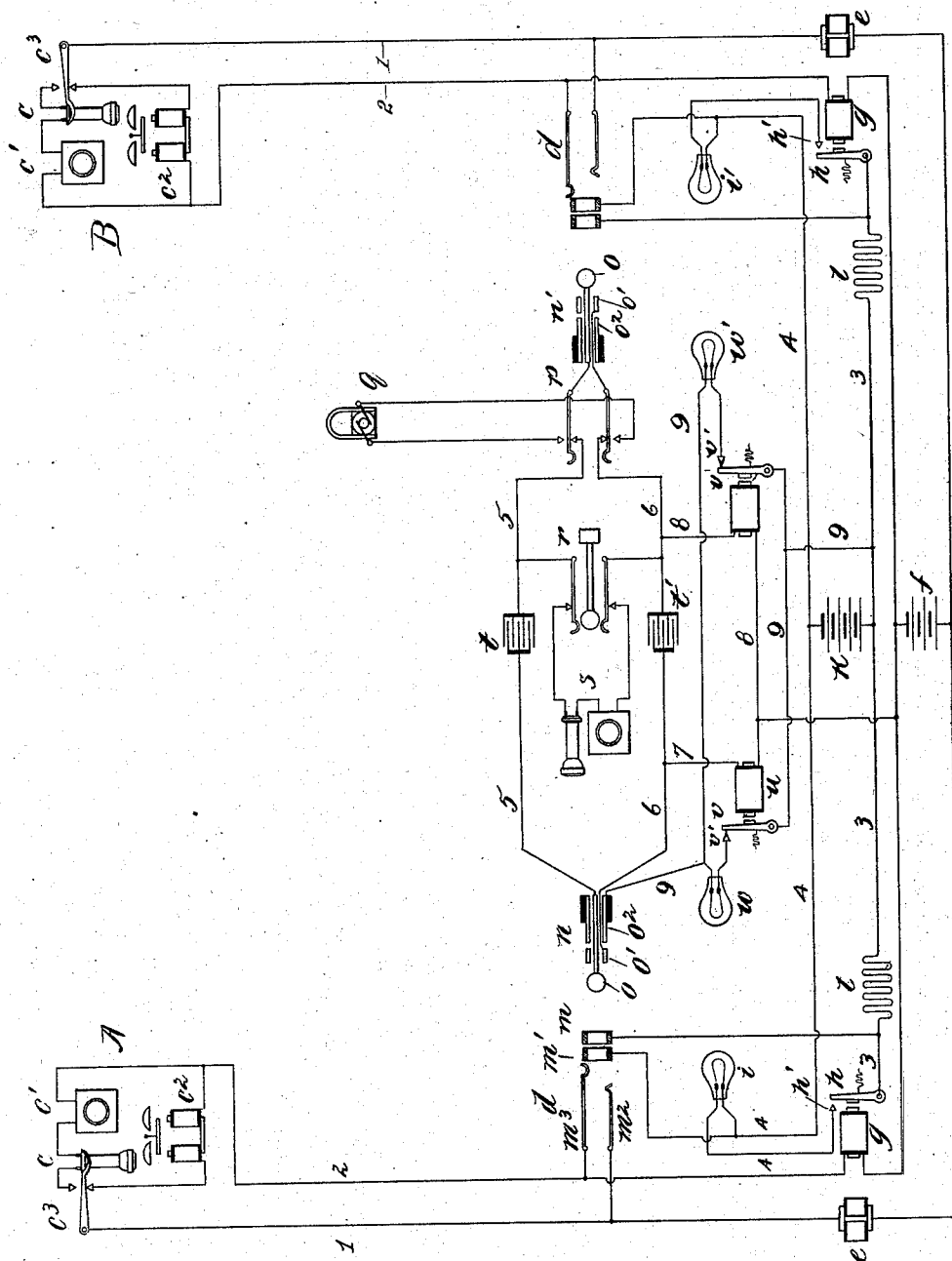


(No Model.)

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APPARATUS FOR TELEPHONE SWITCHBOARDS.

No. 559,411.

Patented May 5, 1896.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR TELEPHONE-SWITCHBOARDS.

SPECIFICATION forming part of Letters Patent No. 559,411, dated May 5, 1896.

Application filed February 28, 1895. Serial No. 540,036. (No model.)

To all whom it may concern:

Be it known that we, CHARLES E. SCRIBNER, residing at Chicago, in the county of Cook, and FRANK R. McBERTY, residing at Downer's Grove, in the county of Dupage, State of Illinois, citizens of the United States, have invented a certain new and useful Improvement in Apparatus for Telephone-Switchboards, (Case No. 377,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

Our invention relates to signaling appliances for telephone-switchboards. It concerns particularly a mode of operating the signals for connection and disconnection upon a switchboard in which the signals are controlled by relays in the line-circuit actuated in the use of the telephones at the substations.

The object of our invention is to provide means for operating the signals for disconnection and to prevent the waste of current through these signals while they are not in use.

Our invention is designed to be employed in connection with telephone-exchange systems in which the line-circuits are normally open at the substations, but are automatically closed during the use of the telephones at the substations, and a relay is included in the line-circuit at the central station to respond to currents in the line-circuit, a local circuit including the subsidiary signal being controlled by the relay.

It consists in providing one or more relays in connection with the plug-circuits by means of which lines are united in the switchboard, adapted to respond to currents in the line-circuit and control subsidiary signals, preferably incandescent lamps, for indicating the signal for disconnection, and in means for permitting the flow of current through these subsidiary signals only during the use of the corresponding plug-circuits.

In our invention we provide a relay in connection with the plug-circuit, having its contact-points so arranged that they are separated when the relay is excited by current in the line-circuit. These contact-points are included in a portion of a local circuit including a small incandescent lamp and ter-

minating in a contact-piece which is adapted to close the local circuit only while the connecting-plugs are in use. In a preferred form this conductor is connected with an insulated contact-piece in the plug, which is adapted to register with a corresponding contact-piece in a spring-jack, into which it may be inserted, which constitutes the other terminal of the local circuit. The local circuit including the lamp-signal is thus open during the idleness of the plug-circuit. When the plug is inserted into any spring-jack, the local circuit is closed at this point, and is thus placed in condition to permit the illumination of the lamp-signal in response to the operation of the relay in connection with the plug-circuit.

It has been found desirable in practice to employ two clearing-out or supervisory signals for each plug-circuit, acting independently of each other, each in response to an interruption of its own line-circuit by the replacement of the substation-telephone upon its switch-hook. In such case we include a condenser in the plug-circuit, and with the plug-circuit at each side of the condenser we connect a separate relay controlling a lamp-signal. These signals are, however, in different parallel branches of a single local circuit which terminates in a suitable contact-piece in the "answering-plug" of the pair—that which is first used in establishing connection with a signaling-line. In combination with this device for supplying current when needed to the clearing-out signals we provide switch-contacts in the spring-jack for short-circuiting the lamp or other subsidiary signal of the line to efface or prevent the display of its signal.

Our invention is illustrated in the accompanying drawing. Therein two substations A and B are represented, each connected by a line-circuit with appropriate apparatus in a telephone-switchboard. The instruments at the substations are of the usual character. They comprise a telephone-receiver *c* and transmitter *c'*, a signal-bell *c''*, and an automatic switch *c'''*, which is designed to complete the line-circuit alternately through the telephone and the bell as the telephone-re-

ceiver is removed from or replaced upon the switch-hook. The instruments at the substations are connected by line-wires 1 and 2 with the line-contacts of spring-jacks d d' in the switchboard. The conductor 1 is continued through an impedance-coil e to one pole of a battery f . The other conductor is extended to the other pole of the same battery through the electromagnet of a relay g . The contact-points h h' of the relay control a local circuit 3 4, which includes the subsidiary signal i , together with a local battery k and a resistance-coil l , the lever of the relay being connected, through the resistance-coil and through conductor 3, with one pole of the battery, and the anvil h' being connected, through conductor 4, including the signal, with the other pole of the battery. The lever of the relay is also connected with the local contact-piece m of the spring-jack d , while the other pole of the battery is connected with the remaining contact-piece m' . Connecting-plugs n n' are provided for the use of the operator in establishing connection between the different spring-jacks. Each of these plugs comprises two contact-pieces o and o' , which are adapted to engage with the line-contacts m^2 and m^3 , respectively, of the spring-jacks, and with a tubular sleeve o^2 , which is arranged to make connection with the local contacts m m' of the spring-jack and thus to establish electrical connection between them when the plug is inserted into the spring-jack. The contact-pieces o of the spring-jacks are united through the conductor 5 of the plug-circuit and the contact-pieces o' through conductor 6. Conductors 5 and 6 of the plug-circuit include the switch-contacts of a calling-key p , which is adapted to loop a generator q of signaling-current into circuit with the plug n' , and they are extended by branches to the switch-springs of a listening-key r , by which the operator's telephone set s may be connected with the plug-circuit. Condensers t and t' are included in the conductors 5 and 6, respectively. From the severed portions of the conductor 6 two branches 7 and 8 are led through relays u and u' , and are connected with the signaling-battery f . The contact-points v v' of these relays are included in parallel branches of a conductor 9, which extends from the conductor 3 of the local circuit and terminates in the contact-piece o^2 of the answering-plug n . A lamp-signal or supervisory lamp is included in each of these parallel branches, the signal controlled by relay u being designated w and the other w' . These signals are in practice associated with the connecting-plugs in such a way that the signal of either lamp refers to the corresponding plug. The line-signals i are also associated with the spring-jacks of the corresponding line in such a manner that the illumination of the lamp calls attention directly to the corresponding spring-jack. The batteries f and k may be common to the different lines of the telephone-exchange.

In the normal condition of this apparatus the substation-telephones rest upon their switch-hooks. The line-circuits 1 and 2 are complete at the substations through the high-resistance bells c^2 . Current flowing from battery f through this circuit of high resistance is, however, insufficient to operate the relay g , so that the latter permits the local circuit 3 4 to remain incomplete. The connecting-plugs rest in suitable sockets. The relays u and u' , being unexcited, permit their levers to complete the local branch 9; but since this is open at the contact-piece of the plug n the lamps w w' are not illuminated.

Assuming that subscriber at station A wishes to have his line connected with that to station B, he removes his telephone-receiver c from its switch-hook. The latter, rising, closes the line-circuit 1 2 through the telephone apparatus at the substation. The path through these instruments is of comparatively low resistance. A sufficient current is therefore created in the line-circuit by battery f to excite relay g . This relay closes its contact-points h h' , completing the local circuit 3 4 through the signal i and illuminating the lamp. The call-signal of the subscriber is thus indicated to the attendant, who inserts answering-plug n into the spring-jack d corresponding to the signal-lamp, at the same time throwing the listening-key r into position to connect her telephone set with the plug-circuit. The operator is then in position to receive the order of the subscriber for connection with line to station B. When plug n was inserted into spring-jack d , the local contact-pieces m m' were directly connected together through the sleeve o^2 of the plug, whereby the lamp i was short-circuited and its signal was thus effaced. At the same time the local circuit through conductor 9, including the supervisory signals w and w' , was completed by the contact of sleeve o^2 with the contact-piece m' of the spring-jack. A circuit is now provided from the signaling-battery f through relay u to the conductor 6, and thence through conductor 2 of the line-circuit, the substation instruments, conductor 1 of the line-circuit, and impedance-coil e , so that the relay becomes excited and separates its contacts v v' . The clearing-out signal w is therefore not illuminated. No such circuit as yet exists through relay u' . The lamp-signal w' is therefore lighted, but its signal is ignored by the operator. Having received the order for connection with line to station B, the operator inserts plug n' into the spring-jack of that line and throws the calling-key p into position to connect the generator q with line to station B, and thus rings the bell c^2 at that station. When the signaled subscriber removes the telephone from its switch-hook, the subscribers are in position to communicate with each other. By the closure of the low-resistance path between the line conductors at station B a circuit is provided through relay u' similar to that traced

before through relay *u*. Hence this relay attracts its armature and interrupts the circuit through lamp *w'*. The obscuring of this signal therefore indicates to the operator that the subscriber at station B has responded to the call. It will be noted that from the moment of the insertion of plug *n'* in the spring-jack *d'* the signal *v'* of that line was short-circuited, so that when the line-circuit is completed at the substation the corresponding line-signal is not illuminated.

When either subscriber replaces his telephone upon its switch-hook, the circuit through the corresponding relay *u* or *u'* is interrupted and the signal-lamp *w* or *w'* is illuminated. When both signals have become thus illuminated, the operator may assume that the conversation has been terminated and may remove the plugs from the spring-jacks.

Obviously the connection of the conductor 9 with the sleeve of the answering-plug *n* is not essential, as it might terminate in the corresponding contact-piece of the other plug, or other means for closing the local circuit through the conductor only during the use of the plug might be applied by those skilled in the art without the exercise of invention.

In accordance with the foregoing specification, we define our invention in the following claims:

1. The combination with a connecting-plug in a telephone-switchboard, of a supervisory signal associated therewith in a circuit normally open at two points, registering contacts in the plug and spring-jack adapted to close the said circuit at one point, and a relay controlling the break at the other point, the relay being connected with the circuits of the plug to respond to current therein, substantially as described.

2. The combination with a pair of connecting-plugs and the plug-circuit thereof, of two supervisory signals, one associated with each of said plugs, in branches of a local circuit terminating in registering contacts of one of said plugs and the spring-jack adapted to receive the same, and two relays connected with the plug-circuit, each controlling the current through one of said supervisory signals, substantially as described.

3. The combination with a telephone-line, of spring-jacks forming terminals of the line, a signal connected therewith normally free to indicate currents in the line associated with one of the spring-jacks, a connecting-plug in a spring-jack, means for preventing the dis-

play of said signal while the plug is in the spring-jack, a plug-circuit terminating in the plug, a clearing-out signal associated with the plug, a local circuit including the clearing-out signal completed through registering contact-pieces of the spring-jack and the plug, and a relay controlling the continuity of the local circuit, the relay being connected with the plug-circuit to respond to currents therein through the line, substantially as described.

4. The combination with a telephone-line provided with a switch at the substation for closing the circuit of the line during the use of the telephone, a relay in the line-circuit together with a source of current, a local battery, a circuit thereof including a signal-lamp associated with a spring-jack connected with the line, said circuit including the contact-points of the line-relay, a connecting-plug and the plug-circuit thereof, contact-points in the spring-jack connected with the terminals of the line-signal, adapted to be crossed together by the plug when inserted into the spring-jack, another branch of the local circuit terminating in the contact-piece of the plug adapted to register with said local contact-pieces of the spring-jack, a clearing-out signal included in said branch, and a relay controlling the continuity of the branch, the relay being connected with the plug-circuit to respond to currents therein; whereby the line-signal may be displayed when the switch at the substation is operated, and whereby the line-signal is short-circuited and a clearing-out signal is substituted therefor to be controlled by a separate relay.

5. The combination with the connecting-plug and the circuit thereof, of the spring-jack to receive the plug, registering contact-pieces in the plug and spring-jack constituting the normally-separated terminals of a local circuit, two clearing-out signals in parallel branches of the local circuit, and independent relays controlling the different branches, the relays being connected with the plug-circuit to respond to currents through the different plugs, respectively, of the pair, substantially as described.

In witness whereof we hereunto subscribe our names this 19th day of January, A. D. 1895.

CHARLES E. SCRIBNER.
FRANK R. McBERTY.

Witnesses:

ELLA EDLER,
LUCILE RUSSELL.