

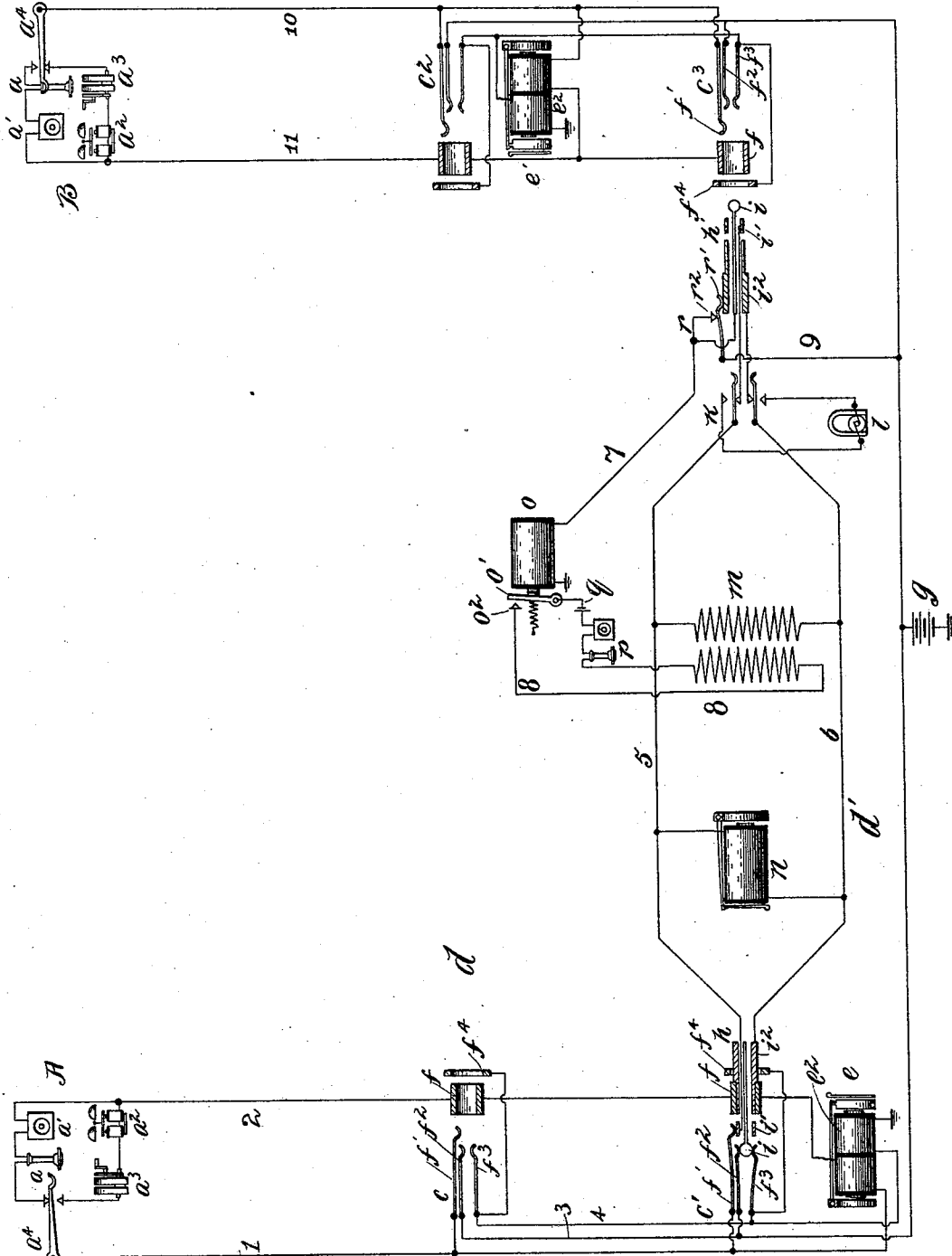
(No Model.)

C. E. SCRIBNER.

APPARATUS FOR TELEPHONE SWITCHBOARDS.

No. 543,902.

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Witnesses:

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APPARATUS FOR TELEPHONE-SWITCHBOARDS.

SPECIFICATION forming part of Letters Patent No. 543,902, dated August 6, 1895.

Application filed December 8, 1894. Serial No. 531,301. (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 Apparatus for Telephone-Switchboards, (Case No. 369,) 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 switchboards of telephone-exchange systems, particularly to the mechanism controlling the connection of the operator's telephone with the circuits of the plugs employed for uniting different telephone lines at the switchboards. Its object is to perform the connection and disconnection of the telephone with the plug-circuit automatically at suitable stages in the process of making connection between lines.

In the telephone switchboards ordinarily employed each line, as is well known, terminates in a spring-jack or connection socket on the switchboard, and suitable plugs adapted to fit the sockets are provided for making electrical connection with them, the plugs being united in pairs by flexible conductors. Each pair of plugs has hitherto been provided with a switch-key, by which the operator might connect her telephone set with the corresponding plug-circuit, to permit of communication with a subscriber in whose spring-jack one of the plugs was inserted, this connection being ordinarily necessary, however, only after the insertion of a plug in the spring-jack of a subscriber making a call, for the purpose of ascertaining with what line connection was desired. It is of course necessary for the operator to remove her telephone from the circuit after the connection has been completed. It has heretofore been proposed to render this connection and disconnection of the telephone with the plug-circuit automatic by means of a relay and circuit connections, such that the relay should be actuated to connect the telephone upon the insertion of the first plug of a pair into a spring-jack in answering a call and to disconnect the telephone upon the insertion of the other plug in completing the connection.

It has been found, however, that an operator in attendance upon a large number of subscribers finds it convenient to insert the first or answering plugs of several pairs into the spring-jacks of different subscribers who have signaled the exchange as rapidly as possible and to receive their orders and complete the desired connections successively thereafter. This requirement prohibits the connection of the telephone with a plug-circuit simultaneously with the insertion of the answering-plug into a spring-jack and necessitates such connection at a later stage in the process of establishing connection.

In my invention I provide a switch which is actuated by the withdrawal of the final or test-plug from its normal resting socket or seat and acts to connect the telephone with the plug-circuit and an electromagnetic switch or relay, which is operated by the insertion of the same plug into a spring-jack to disconnect the telephone. In general, then, the operation of my system is as follows: The operator having received a call-signal, inserts the answering-plug of a pair into the spring-jack of the calling subscriber. She then raises the connecting-plug from its socket, whereby her telephone becomes connected with the plug-circuit, and, finally having learned the number of the line with which connection is desired, she inserts the connecting-plug into the spring-jack of that line. By this final act her telephone is automatically severed from the plug-circuit.

In practice I have found it desirable to employ a relay or electromagnetic switch for determining the connection of the telephone with the plug-circuit, the operation of the relay itself being controlled by the plug-seat switch and by other switch-contacts and circuit connections brought into play in the completion of the connection by the insertion of the connecting-plug into the spring-jack. The relay is included, together with a battery, in a local circuit, which is divided into two parallel branches, one of which is controlled by the plug-seat switch—the switch being arranged to close the circuit while the plug is in its socket—and the other of which is controlled by co-operating contact-surfaces in the spring-jacks and the connecting-plug respect-

ively, which complete the circuit when the plug is inserted into any spring-jack. The relay is constructed to disconnect the telephone when its magnet is excited. In a particularly satisfactory arrangement of the devices the relay does not connect the telephone directly with the plug-circuit, but with one helix of a repeating-coil, whose other helix is permanently bridged across the cord-circuit. This avoids all common connections between different plug-circuits, while permitting the use of but a single pair of switch-contacts on the relay. In the invention as thus organized the magnet of the relay is excited as long as the connecting-plug rests in its socket, the local circuit being completed through the plug-seat switch and the circuit between the repeating-coil and the telephone being thus interrupted. When the plug is lifted from its socket the previously-existing local circuit is broken and the telephone is brought into connection with the repeating-coil. When the plug is finally inserted into a spring-jack to complete a connection the other branch of the local circuit is closed through the contact-piece of the plug and the co-operating contact-surface of the spring-jack into which it is inserted, and the relay-magnet is again excited. My invention is illustrated in the accompanying drawing. Two sub-stations are shown connected by lines with a telephone-switchboard, which is equipped with a pair of connecting-plugs to which my invention is applied. The apparatus of the sub-stations A and B is of the usual type. It may comprise a telephone a and transmitter a' , a bell a^2 , a generator a^3 of signaling-current, and an automatic telephone-switch a^4 for switching the telephonic apparatus and the signaling appliances alternately into connection with the line. The station A, for example, is connected by line-wires 1 2 with two spring-jacks c and c' , which may be assumed to be located upon two different sections d and d' of a multiple switchboard. The conductors 1 and 2 of the line are united through the main or line-coil of a self-restoring annunciator e , which is located at section d' of the switchboard. Each of the spring-jacks comprises, in addition to the line-contacts f and f' , a pair of local contact-pieces f^2 and f^3 . The springs f^2 are connected together by a conductor 3 and through a battery g to earth. Springs f^3 are united by another conductor 4, which is also grounded, and which includes the restoring-magnet e^2 of the line-annunciator. In addition to its contact-pieces each spring-jack has a test-ring f^4 , which is in electrical connection with the spring f^3 . The arrangement of the circuits and apparatus of the line to station B is in all respects the same, the line-annunciator e' being located at section d of the switchboard, however. But one pair of connecting-plugs h h' is shown. Each plug comprises a spherical conducting-tip i ,

which is adapted to enter between the springs f^2 and f^3 and to cross them together, a short sleeve i' in position to register with the spring f' , and a longer sleeve i^2 , adapted to make connection with the thimble f of the spring-jack. The sleeves i' of the two plugs are united by conductor 5 and the sleeves i^2 by conductor 6. These conductors include the switch-contacts of the calling-key k , which is adapted, when its plunger is depressed, to loop a generator l of a signaling-current into circuit with the connecting-plug h' . The primary helix m' of a repeating-coil m is connected in a permanent bridge-wire between the conductors 5 and 6. A clearing-out signal n is also connected permanently in a bridge between conductors 5 and 6.

The tip i of plug h has no circuit connection. The tip i of plug h' , however, forms the terminal of a conductor 7, which is grounded through a relay o . The switch-contacts o' o^2 of this relay control a local circuit 8, which includes the secondary helix of the repeating-coil m , the operator's telephone p , and a battery q . The portion of this circuit which includes the telephone and the battery may be common to all the plug-circuits belonging to one operator, the contact-levers o' of the relays of the different plug-circuits being connected together and to one terminal of the telephone and the other terminal of the telephone being connected with the secondary helices of the different repeating-coils. Each connecting-plug h' rests normally in a socket or seat which is provided with a "plug-seat switch," comprising a spring r' , which is adapted to be forced aside by the insertion of a plug in its socket, and an anvil r^2 , against which this spring is pressed. The switch-contacts r' r^2 control a branch 9 from conductor 7 through the battery g to earth. The relay o is thus in a local circuit 7, which is divided into two parallel branches, one of which is through the contact-points r' r^2 of the plug-seat switch and the other, when the plug h' is inserted into a spring-jack, through the tip i of plug h' and the spring f^2 of the spring-jack.

To trace the operation of the system, let it be assumed that subscriber at station A wishes to communicate with subscriber at station B. The first or call-initiating subscriber, by rotating his signaling-generator a^3 , operates the annunciator e of his line at the central station. The attendant at the switchboard d' , upon which this annunciator is located, perceiving the signal, inserts one plug h of a pair into the spring-jack c' of the corresponding line. If the signal be one of a number of call-signals occurring at the same time, the operator may insert answering-plugs of different pairs of cords into the spring-jacks of all the different lines calling. Presently she raises the plug h' from its socket, thus permitting the plug-seat switch r to open the local circuit through relay o , thus effecting the completion of the circuit 8, including her telephone and

the secondary helix of repeating-coil *m*. Her apparatus is thus brought into position to permit of communication with the subscriber signaling from station A. Having learned his order, she proceeds to test the line called for—namely, that of station B—by applying the tip *i* of plug *h'* to the test-ring *f*⁴ of spring-jack *c*³ of that line upon her section of the multiple switchboard. It will be understood that if no connection already exists with any spring-jack of this line a circuit is formed through the relay from tip *i* to test-ring *f*⁴, thence through conductor 4, and restoring-coil *e*² of the line-drop; but as this circuit contains no source of current the apparatus will remain inert. If the line were in use a connection would exist from battery *g* through the springs *f*² and *f*³ of the spring-jack, in which a plug was inserted, to the test-ring *f*⁴ of spring-jack *c*³, and current would find circuit through tip *i* of plug *h'* and relay *o*. The relay being thus excited by the application of the plug to the test-ring, would open the circuit 8, including the telephone, and by the breaking of the current set up by battery *g* in this circuit would produce a click in the telephone. This click in the telephone would thus signify to the operator the "busy" condition of the line. Finding the line to station B not in use, the operator inserts the plug *h'* fully into the spring-jack *c*³. By this means the circuit from station A is continued through conductors 5 and 6 of the plug-circuit to the corresponding contact-pieces of the spring-jack, and thence through the conductors 10 and 11 of line to station B. At the same time one circuit is completed from battery *g* through spring *f*², tip *i* of the plug, spring *f*³ and restoring-coil *e*² of the line-drop, the current in which locks the line-drop and prevents its disturbance by subsequent signaling-currents in the line. Another circuit is completed from spring *f*² through tip *i*, conductor 7, and relay *o*. The current in this circuit excites the relay, whereby the contact-points *o'o*² are separated and the circuit from repeating-coil *m* through the operator's telephone is interrupted. The operator may now depress the plunger of calling-key *k* and transmit a signaling-current to station B. When the subscriber at that station has responded to the call and removed his telephone from the switch-hook the circuits are in position to permit of communication between the different sub-stations. When the conversation is terminated either subscriber may transmit a signal for disconnection by rotating his generator *a*³, whereby the clearing-out annunciator *n* will be operated, its operation notifying the operator that the connection is no longer required.

It will be obvious to those skilled in the art of telephony that other forms of mechanism might be employed to accomplish more or less

indirectly the results which are attained by the specific apparatus herein described, and I therefore do not limit myself to this particular apparatus; but

I claim as new and desire to secure by Letters Patent—

1. The combination with a telephone circuit, of a plug constituting the terminal of the circuit, a plug-seat-switch for the plug controlling the connection of an operator's telephone with the circuit, a relay also controlling the connection of the telephone with the circuit, the relay being itself controlled by circuit connections closed by the insertion of the plug into a springjack, substantially as described.

2. The combination with a telephone circuit, of a plug constituting the terminal thereof, a plug-seat-switch therefor controlling the connection of an operator's telephone with the circuit, a relay also controlling the connection of the telephone with the circuit, a normally open local circuit through the relay, and switch contacts adapted to be closed together to close the local circuit when the plug is inserted into a springjack, the relay being arranged to disconnect the telephone from the plug circuit when its magnet is excited, substantially as described.

3. The combination with a telephone circuit terminating in a plug, of a plug-seat-switch for the plug, a local circuit divided into two parallel branches, one of which is normally closed in the plug-seat-switch, and the other of which is open at contact points which are adapted to be closed together by the insertion of the plug in the springjack, a relay included, with a source of current, in the local circuit, and a telephone circuit whose connection with the circuits of the plug is controlled by the relay, substantially as described.

4. In combination, several pairs of connecting plugs, a plug circuit uniting the members of each pair, a repeating coil for each pair having one of its helices in the plug circuit and the other helix in circuit with an operator's telephone common to all the plug circuits, a plug-seat-switch for one plug of each pair controlling the circuit of the corresponding repeating coil with the telephone, a relay also controlling said circuit, and circuit connections adapted to operate the relay to open the said circuit when the plug is inserted into a springjack, substantially as described.

In witness whereof I hereunto subscribe my name this 8th day of November, A. D. 1894.

CHARLES E. SCRIBNER.

Witnesses:

ELLA EDLER,

FRANK R. McBERTY.