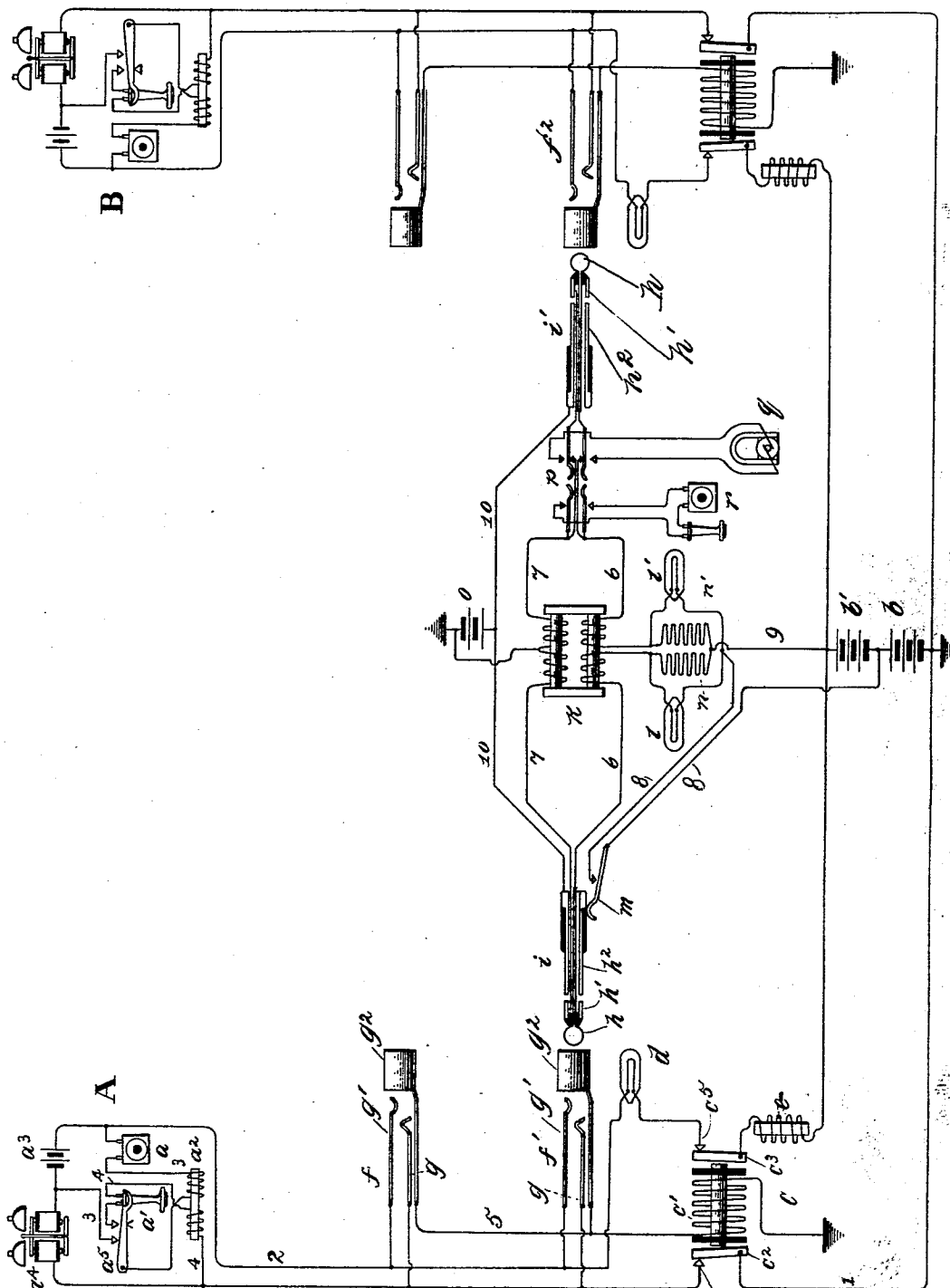


(No Model.)

C. E. SCRIBNER.
TELEPHONE SWITCHBOARD SYSTEM.

No. 563,245.

Patented June 30, 1896.



Witnesses:
John H. Sinclair

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UNITED STATES PATENT OFFICE.

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TELEPHONE-SWITCHBOARD SYSTEM.

SPECIFICATION forming part of Letters Patent No. 563,245, dated June 30, 1896.

Application filed November 4, 1895. Serial No. 567,838. (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 Telephone-Switchboard Systems, (Case No. 406,) 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.

My invention concerns the central-station equipment of telephone-lines which are provided with signal-lamps in a central switchboard and are supplied with current from a source at the central station for charging storage-batteries at the substations during the idleness of the lines.

It consists in the combination, with the telephone-line, of a relay controlling the connection of the line with the central source of current, and means for exciting the relay during the use of the line in conversation.

The invention is designed to attain several objects, among which the principal are, to provide a circuit of comparatively low resistance, over which to transmit the charging-current and to sever this low-resistance path during the use of the line; to effect the extinction of the lamp-signal in the act of making connection with the line in response to the signal, and to free the line from shunt-circuits or bridges during the transmission of call-signals from the central station to the substation.

The invention, when applied to metallic telephone-lines, involves a relay having two pairs of insulated switch-contacts. One pair of switch-contacts is interpolated in each line conductor between the terminal sockets or spring-jacks of the line in the switchboard and the two poles of the central charging-battery to which the line conductors extend. The magnet-winding of the relay is contained in a normally open local circuit which terminates in registering contact-pieces, one in each of the spring-jacks of the line, and the other in the connecting-plugs for use with the spring-jacks; so that the local circuit is closed and the relay is caused to separate its switch-contacts when connection is established with the line. The lamp-signal is included in one

of the line conductors together with a resistance-coil, preferably an inductive resistance. During the idleness of the line the line conductors lead directly to the source of charging-current, the resistance between the charging-battery and the local storage-battery at the substation being reduced to the practical minimum. The usual device is employed for permitting the necessary increase of current in the line-circuit to illuminate the line-signal when the substation-telephone is brought into use. When, in response to the illumination of the line-signal, a connecting-plug is inserted into a spring-jack of the line, the relay is caused to break all connections on the line at the central station excepting those effected through the spring-jack and plug, whereby the charging-current is interrupted, the illuminated signal-lamp is extinguished, and the line is freed from shunts which would interfere with the transmission of signaling and of telephonic currents over the circuit.

The drawing herewith represents a form of the invention.

In the drawing two telephone-lines are shown, leading from substations to a central station, each equipped with the appliances of my invention at the central station.

The substation equipment comprises the usual apparatus—transmitting-telephone a , receiving-telephone a' , and induction-coil a^2 , a storage-battery a^3 , a signal-bell a^4 , and a switch a^5 , operated in the use of the telephone. The circuits, however, are of novel arrangement. The battery a^3 and bell a^4 are included serially in a permanently-closed circuit between the line conductors 1 and 2. The transmitting-telephone, the primary helix of the induction-coil a^2 , and the lever and one contact-point of the switch are included in a local circuit 3 about the battery a^3 , this circuit being closed only when the telephone is removed from its switch-hook. The secondary helix of the induction-coil, the receiving-telephone a' , and the remaining switch-contact are included in a bridge 4, which becomes closed in shunt about the bell a^4 during the use of the telephone. These circuits do not constitute a portion of the present invention, and are made the subject of a separate application.

At the central station the line conductors 1 and 2 extend to the terminals of a battery *b*, which constitutes the central source of charging-current. The continuity of the portions of the line conductors extending to the battery is controlled by a relay *c* of peculiar construction. This instrument comprises a magnet *c'* and two armatures *c²* and *c³* at opposite extremities of the magnet, each armature resting, when unattracted, upon a contact-point, these points being designated *c⁴* and *c⁵*, respectively. The contact *c⁴* and armature *c²* are included in line conductor 1 and the contact *c⁵* and armature *c³* in line conductor 2. In the latter line conductor are included also a signal-lamp *d* and a resistance-coil *e*, preferably inductive.

The line conductors 1 and 2 branch to the line-contacts of spring-jacks *f* and *f'*, which may be assumed to be located upon different sections of the multiple switchboard. Each spring-jack has, in addition to its line-contacts *g* and *g'*, a thimble or ring *g²*. These rings are connected together by a conductor 5, which extends to earth through the coil *c'* of relay *c*.

The plug-circuit, by means of which the lines are to be looped into connection with one another, is of the type described in my prior application (Case No. 384) filed June 12, 1895, Serial No. 552,525, with an additional feature to adapt it to the operation of relay *c*. Each plug has three contact-pieces *h*, *h'*, and *h²*, which are constructed to register with the three corresponding parts *g*, *g'*, and *g²* of the spring-jack. The contact-pieces *h* of the two plugs *i* and *i'*, which form a pair, are united by a conductor 6, which includes two helices of an induction-coil *k* and two supervisory signal-lamps *l* and *l'*. The other line-contacts *h'* of the plugs are united through conductor 7, which includes other helices of the same induction-coil. Conductor 7 is grounded at a point intermediate of the two helices contained in it. Conductor 6 is connected by a normally discontinuous wire 8 with a central point of battery *b*, the continuity of this wire being controlled by a plug-seat switch *m*. In parallel with the two supervisory lamps *l* and *l'* are resistance-coils *n* and *n'*, whose point of junction is connected by wire 9 with the free pole of battery *b*. The local contact-pieces *h²* of the two plugs are united through a conductor 10, which is grounded through a small battery *o*.

The plug-circuit includes the switch-contacts of the usual listening and ringing key *p*, which is adapted, when its lever is moved in one direction, to connect a generator *q* of signaling-current with the plug *i'*, and when its lever is thrust in the other position to connect the operator's telephone *r* in a bridge of the plug-circuit.

As long as the line-circuit 1 2 is not in use for conversation, current flows from battery *b* over line conductors 1 and 2, charging the local storage battery *a³* at the substation.

The bell *a⁴* is supposed to be of high resistance, so that the current through lamp *d* is insufficient to illuminate it. A current of two-hundredths ampere may be found sufficient to charge the battery, and the lamp *d* may require one-tenth ampere to light it.

When the telephone at station A is removed from its switch-hook, in rising it closes the bridge 4 of the line-circuit, which is of comparatively low resistance. The current in the circuit is thus permitted to rise to one-tenth ampere, whereby the lamp *d* is lighted and caused to indicate the call. The operator at the central station then raises plug *i* from its socket and inserts it into the spring-jack *f'* at her section of the switchboard. The line-circuit is thus continued through the registering line-contacts of the spring-jack and plug to the plug-circuit 6 7, and at the same time a local circuit is closed from battery *o* through conductor 10, contact-piece *h²* of the plug, ring *g²* of the spring-jack, and wire 5, including the magnet of relay *c*. This relay is thus caused to attract its armatures *c²* and *c³* and interrupt the connection between the line conductors 1 and 2 to the battery *b*. The line-lamp *d* is thereby extinguished. The raising of the plug *i* from its resting contact permits the plug-seat switch *m* to complete the conductor 8, whereby a circuit is established from battery *b* to the supervisory signal *l*, and thence through conductor 6 of the plug-circuit to line conductor 1, returning by line conductor 2 and conductor 7 of the plug-circuit to earth at the central station. This supervisory signal is, however, shunted by the portion *b'* of battery *b* and the resistance-coil *n*, in the manner fully described in the prior application referred to, so that the supervisory lamp is not illuminated.

The operator may bring her telephone into connection with the plug-circuit by means of the key *p* to learn the order of the calling subscriber, and may then insert plug *i'* into the spring-jack of the line called for and throw the key into position to connect generator *q* with that plug. The insertion of the plug into the spring-jack, as *f²*, of the line called for, brings about the disconnection of the line conductors of that line from battery *b* through the agency of its relay, so that the signaling-current finds no shunting-path at the central station. After the key *p* has been returned to its normal position, leaving both the telephone *r* and the generator *q* disconnected from the plug-circuit, the lamp *l'* will remain lighted until subscriber at station B has responded to the signal and removed his telephone from its switch-hook, there being a complete local circuit from the portion *b'* of battery *b* through conductor 8, lamp *l'*, resistance-coil *n'*, and conductor 9. At the response of the subscriber signaled, this lamp becomes shunted, and, by its extinction, indicates his response.

When both subscribers have terminated their conversation and have replaced their

telephones upon their switch-hooks, both supervisory signals / and /' will be lighted. This condition of the supervisory signals may be accepted by the operator as indicating the completion of conversation, and she may remove the connecting-plugs from the spring-jacks and return the apparatus to its normal condition.

I claim as new—

1. The combination with a telephone-line, of a local storage-battery in the line-circuit at the substation, a source of charging-current at the central station, a relay controlling the connection of the said source of current with the line, a local circuit including the electromagnet of the relay, and switch-contacts adapted to complete the local circuit in establishing connection with the line, as described.
2. The combination with a telephone-line, of a source of current at the central station thereof with which said line is connected, a visible signal in the line, a switch at the substation operated in the use of the telephone to close the line-circuit to excite the signal, a relay controlling the connection of the line with the said source of current, and a local circuit containing the electromagnet of the relay terminating in registering contacts of a spring-jack of the line, and of a plug adapted for insertion therein, substantially as described.
3. The combination with a metallic-circuit telephone-line containing a local storage-battery at its substation and connected with the opposite poles of a source of charging-current at a central station, of a relay having two pairs of switch-contacts, one pair included in each of the line conductors, spring-jacks connected with the line, a local circuit terminating in contact-pieces of said spring-jack, and means for closing the local circuit at the substation when connection is made with the line, the electromagnet of said relay being contained in the said local circuit, substantially as described.

4. In combination with a metallic-circuit telephone-line, a high-resistance bell and a local storage-battery in the line-circuit at the substation, a normally open low-resistance circuit including a telephone and a switch adapted to close the same circuit at the substation, a source of charging-current at the central station connected with the telephone-line, a signal-lamp in the line-circuit, a relay controlling the connection of the source of current with the line, and a local circuit including the electromagnet of the relay terminating in contact-pieces of the spring-jacks of the line and in registering contact-pieces of the connecting-plugs adapted for insertion therein, as described.

5. The combination with a telephone-line having at its substation a low-resistance and a high-resistance bridge and a switch for closing the low-resistance bridge, of a source of current normally connected with the line at a central station, a signal-lamp in the line, and switch-contacts adapted to interrupt connection between said source of current and the line, a spring-jack, connecting-plug and plug-circuit for making connection with the line, and mechanism adapted to operate said switch-contacts when the plug is inserted into the spring-jack, a supervisory signal-lamp in a branch from the plug-circuit to the said source of current, and another source of current and a resistance-coil in shunt about the said supervisory signal-lamp, whereby the line signal-lamp is lighted when the substation telephone is brought into use and is extinguished when connection is made with the line and the supervisory signal is substituted for the line-signal, as described.

In witness whereof I hereunto subscribe my name this 17th day of September, A. D. 1895.

CHARLES E. SCRIBNER.

Witnesses:

ELLA EDLER,
LUCILE RUSSELL.