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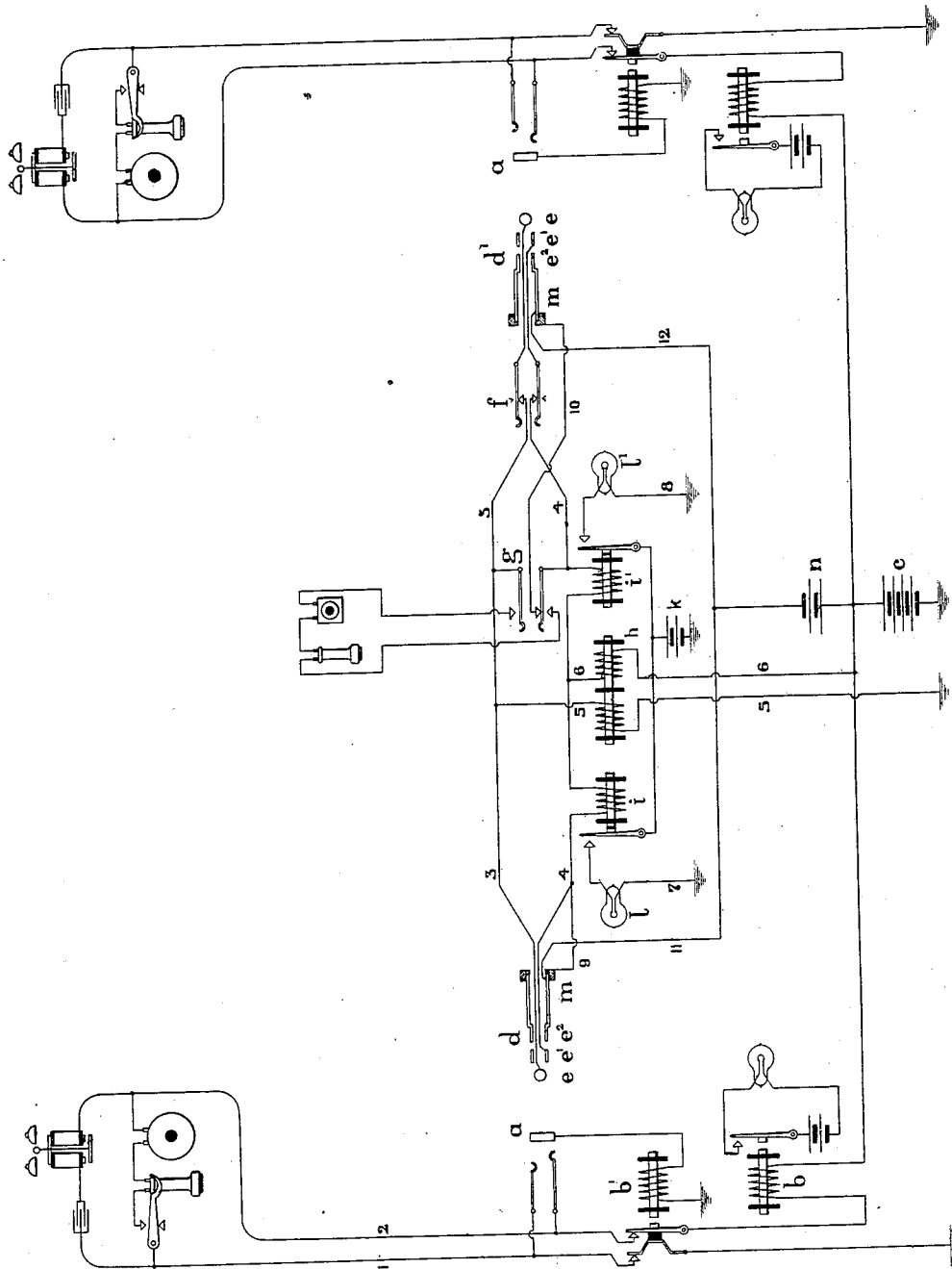
Patented May 29, 1900.

C. E. SCRIBNER.

SUPERVISORY SIGNAL FOR TELEPHONE SWITCHBOARDS.

(Application filed Mar. 15, 1897. Renewed Oct. 14, 1898.)

(No Model.)



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UNITED STATES PATENT OFFICE.

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SUPERVISORY SIGNAL FOR TELEPHONE-SWITCHBOARDS.

SPECIFICATION forming part of Letters Patent No. 650,426, dated May 29, 1900.

Application filed March 15, 1897. Renewed October 14, 1898. Serial No. 693,562. (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 Supervisory Signals for Telephone-Switchboards, (Case No. 441,) 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.

This invention concerns the signals associated with the plugs for uniting lines in a telephone-switchboard and designed to indicate to an operator the condition of the station appliances of two united lines.

The object of the invention is to increase the efficiency of the signals in the direction of imparting a decisive character to their indications.

In switching systems adapted for the automatic operation of the signals in the switchboard it is found convenient to associate with each of two united telephone-lines an electromagnetically-controlled signal constructed to display its indicator when inert, the indicator being maintained normally in a concealed position by current in the line determined in the use of the station-telephone and the display of the signal following the replacement of the station-telephone upon its switch or an equivalent act on the part of the subscriber. Signals adapted for operation in such manner become displayed during the idle condition of the plugs with which they are associated unless provided with mechanism to effect their concealment when the plugs are not in use. It will be apparent that the continued display of all signals associated with idle plugs before an operator would tend to divert her attention from the occasional display of a signal associated with a plug in use and intended for her instruction. The present invention is addressed to this phase of the operation of signals. It consists in the combination, with a connecting plug or plugs of a pair and the supervisory signal or signals associated therewith, of local-battery circuits controlled by a switch in the normal resting-seat of the plug, adapted to create the same condition in the magnets or other controlling agencies of the

signals which is attained during the employment of the plugs and the signals by the use of the station-telephone. In case of electromagnetic signals in the plug-circuit uniting the plugs a special local-battery circuit is provided for the signals, which becomes closed in registering switch-contacts in the plug and the resting-socket thereof while the plug is in its seat, and which thus tends to excite the signal or otherwise to keep it in its concealed position. I prefer to arrange a separate local circuit for each of the two supervisory signals of a plug-circuit, controlling each signal through the agency of the plug with which it is associated in the switchboard, and, further, in order that the presence of these temporary connections of the plug-circuit may not interfere with the operation of answering subscribers using only one of the plugs I associate with the operator's listening-key, which is in position at such times to connect her telephone with the plug-circuit, switch-contacts which break the local-circuit connections and free the plug-circuit from extraneous conductors.

It is not new in systems of circuits involving supervisory lamp-signals controlled with relays to employ plug-seat switches designed to break the circuits of the supervisory signals and thus to extinguish the lamps during the idleness of the plugs. Hence my present invention is not to be taken as broadly involving such circuits.

The invention is shown in the attached drawing, which represents two substations with telephone-lines extending to spring-jacks and signal-controlling magnets in a telephone-switchboard. The switchboard is provided with a single pair of plugs and their plug-circuit, together with supervisory signals, and these signals are equipped with my new appliance for effecting their concealment during the idleness of the plugs.

The telephones and signaling apparatus may be of any well-known arrangement adapted for the operation of automatic signals, current in the line from a central source being determined by a switch at the substation operated in the use of the telephone. The line conductors 1 and 2 of each line are led to contact-pieces of a spring-jack *a* at the switchboard in

the central office, after which the conductors are grounded, a line-signal *b* and a source of current *c* being interposed in the conductor 2. An electromagnetic switch *b'* is provided, designed to break the line connections with these appliances when a plug is inserted in the spring-jack. The magnet of this switch is included in a portion of a local circuit which terminates in a local contact-piece of the spring-jack.

The usual plugs *d* and *d'* are provided in the switchboard for uniting lines. Each plug comprises three contact-pieces *e*, *e'*, and *e''*, the former two of which make connection with the line-springs of the spring-jack and the latter of which is involved in the local circuits of the supervisory signals and of the cut-off relay *b'*. The contact-pieces *e* and *e'* of the two plugs are united through the conductors 3 and 4, which constitute the plug-circuit. This plug-circuit is equipped with the usual calling-key *f* for connecting the terminals of a generator of signaling-current with the plug *d'* and with the listening-key *g* for bringing the operator's telephone into a bridge of the plug-circuit. A permanently-closed bridge of this circuit is formed by wires 5 and 6, which lead to earth and to the free pole of grounded battery *c*, respectively. The windings of an impedance-coil *h* are interposed in these conductors to prevent the shunting of telephonic current through the bridge. Relays *i* and *i'* are interposed in the conductor 4 of the plug-circuit, one at each side of the bridge-wire 6, so as to be included between that wire and one of the stations. Each of these relays when inert closes a branch circuit from a battery *k*. Relay *i* controls circuit 7, which includes a supervisory signal-lamp *l*, while relay *i'* controls another circuit 8, including a supervisory lamp *l'*. These different lamps are associated with the different plugs *d* and *d'*, respectively. The plugs *d* and *d'* rest when idle in sockets provided with metallic contact-pieces *m*, which make connection with extensions of the sleeve contact-pieces *e''* of the plugs. The contact-piece *m* in the seat of plug *d* is connected with conductor 4 of the plug-circuit by a wire 9. The similar contact-piece in the socket of plug *d'* is likewise normally connected with conductor 4 of the plug-circuit by conductor 10; but its connection is controlled by switch-contacts in the listening-key *g*, which are separated when the key is in position to connect the operator's telephone with the plug-circuit. The contact-pieces *e''* of the plug form the terminals of wires 11 and 12, which lead to one pole of the battery *n*, whose other pole is connected with battery *c*.

I may now briefly trace the operation of this system and the function of my invention. In the usual position of the apparatus the plugs *d* and *d'* rest in their seats and the operator's telephone is disconnected from the plug-circuit. The current from battery *n* flows in a circuit made up of wires 11 and 9, a portion of conductor 4 of the plug-circuit,

and wire 6, thus traversing the relay *i*. This appliance is thus excited and effects the concealment of the supervisory signal *l*, which it controls, breaking the circuit through the lamp. Similarly the same battery produces current in the circuit made up of wires 12, 10, 4, and 6 through the relay *i'*, and thus maintains the extinction of supervisory lamp *l'*. To transmit a call for connection, the subscriber at the station removes his receiving-telephone from its switch-hook, whereby the switch is permitted to close the line-circuit, and thus to determine the flow of current from battery *c*. This current traversing relay *b* excites that instrument and effects the display of the secondary line-signal which it controls. The operator responding to this call-signal raises plug *d* from its seat and inserts it into spring-jack *a*. Raising the plug from its seat breaks connection between wires 11 and 9, and thus interrupts the current through signal-controlling relay *i*. The insertion of the plug into the spring-jack *a*, however, permits current from battery *c* to flow through relay *i* and conductor 4 of the plug-circuit to wire 2 of the line-circuit, whence it returns through wire 1 of the line-circuit and conductor 3 of the plug-circuit. The relay *i* is thus again excited and brings about the extinction of the supervisory signal *l*. The insertion of plug *d* into spring-jack *a* further completed connection of wire 11 with the local circuit of cut-off relay *b'* in the registering contacts of the spring-jack and plug, whereby the cut-off relay became excited through current from battery *c* and broke the earth branches of the line conductors, leaving the line-circuit in temporary connection with the operator's plug-circuit. Meanwhile the excitement of relay *i'* is maintained by current in the circuit 12, 10, and 4. Having brought the plug-circuit into connection with the calling-line, the operator depresses her listening-key *g* to bring her telephone into a bridge of the plug-circuit. This act at the same time breaks the connection of wire 10 with the conductor 4 of the plug-circuit, and thus removes from the telephonic circuit a ground branch which would otherwise exist through wires 10 and 12 and batteries *n* and *c*. The relay *i'*, having become inert through this act, permits its armature to close the circuit including the supervisory lamp *l'*. Having learned the order of the calling subscriber in the usual way, the operator inserts plug *d'* into the spring-jack of the called subscriber and sends a call-signal to the station of the connected line by means of key *f*. It will be observed that the raising of the plug from its seat broke connection between wires 12 and 10, while the insertion of plug *d'* into the spring-jack of the line called for created a circuit through wire 12 and the circuit including the cut-off relay of the line, and thus effected the severance of the ground connections of that line. The response of the called subscriber to the call is indicated by supervisory lamp *l'*, since in

his response and removal of his telephone for use current is permitted to flow through the relay *i'* and the line conductors, which excites that relay and breaks circuit through the corresponding supervisory lamp. While the subscribers remain in conversation the supervisory lamps *l* and *l'* are dark. If either subscriber replaces his telephone upon the switch, the corresponding supervisory lamp becomes lighted, since such an act deprives the corresponding relay *i* or *i'* of current. The simultaneous illumination of both lamps *l* and *l'* may be accepted as an indication that the conversation is finished and the plugs may be removed from the spring-jacks and returned to their resting-seats. This final act establishes connection between the conductors 11 and 9 and 12 and 10, respectively, and again renders supervisory signals *l* and *l'* inert. Obviously this mode of maintaining the concealed or inert condition of the supervisory signals may be applied to any form of signal in which the display of the signal is determined by a change in the current through a device in the plug-circuit, whether the signal be a target controlled by an electromagnet or a lamp or other contrivance in a circuit controlled by the magnet.

My invention is defined in the following claims:

1. The combination with a pair of connecting-plugs, their plug-circuit and signal-controlling magnets connected with the plug-circuit, one for each plug, adapted for uniting telephone-lines having switches at their stations determining the flow of current in the line during the use of the telephones, of a seat for each plug, local-circuit connections for each signal-controlling magnet and switch-contacts in each seat actuated by the plug in the seat to complete the said circuit connections for the corresponding signal-controlling magnet, as described.

2. In combination, two connecting-plugs, their plug-circuit, a bridge of the plug-circuit including a source of current, a supervisory relay in a conductor of the plug-circuit between the said bridge and each plug, the said appliances being adapted for use with telephone-lines provided with switches to close

the lines during the use of the telephones, and local-battery circuits including a winding of each signal-controlling magnet, and registering contacts in the plugs and the normal resting-seats thereof closing the local circuit, as described.

3. In combination with a pair of connecting-plugs and their plug-circuit, a bridge of the circuit including a source of current, a supervisory-signal-controlling magnet in the plug-circuit between said bridge and each of the plugs, said plugs and plug-circuit being adapted for uniting lines provided at their stations with switches closing the line-circuits during the use of the telephones, an operator's listening-key, and local circuits of the signal-controlling magnets, a switch for each plug closed when the plug is in its seat to close the corresponding local circuit and switch-contacts on the listening-key adapted to break one of said local circuits in connecting the operator's telephone with the plug-circuit, as described.

4. In combination, a telephone-line and means for determining current in the line during the use of the telephone, a spring-jack for the line, a line-signal and a cut-off relay adapted to sever the connection of the line with said signal when excited, a plug and the plug-circuit thereof for use with the spring-jack, a bridge of the plug-circuit including a source of current, a signal-controlling magnet in the plug-circuit responsive to current in the telephone-line, a conductor terminating in a contact-piece of the plug, a battery-circuit including the cut-off relay adapted to be closed between said contact-piece of the plug and a contact-piece of the spring-jack, a resting-seat for the plug, and local-circuit connections including the winding of the signal-controlling magnet closed between said contact-piece of the plug and a contact in the seat, substantially as described.

In witness whereof I hereunto subscribe my name this 25th day of January, A. D. 1897.

CHARLES E. SCRIBNER.

Witnesses:

ELLA EDLER,
MYRTA F. GREEN.