

No. 669,501.

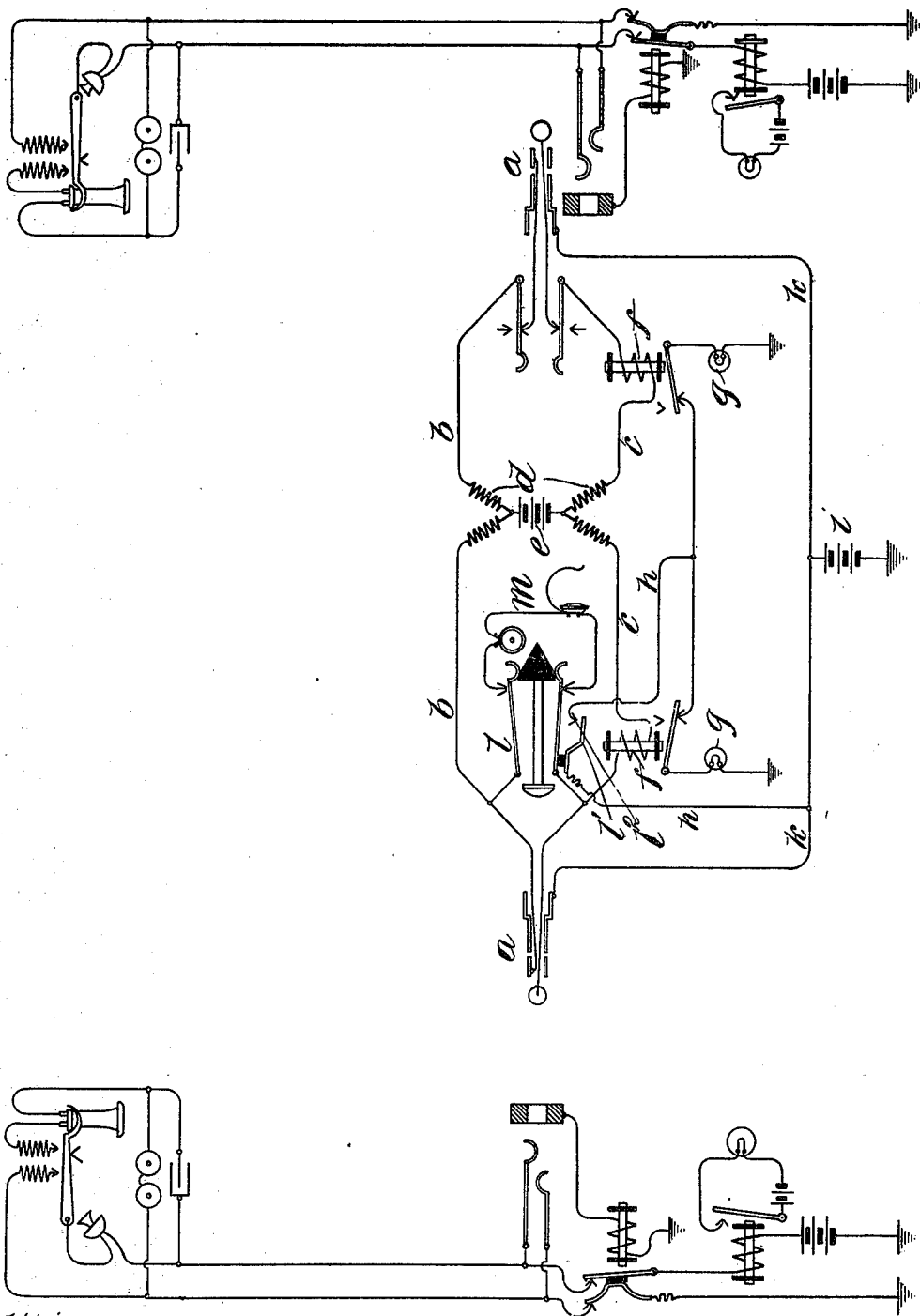
Patented Mar. 12, 1901.

O. A. BELL.

SUPERVISORY SIGNAL APPARATUS FOR TELEPHONE SWITCHBOARDS.

(Application filed July 31, 1899.)

(No Model.)



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UNITED STATES PATENT OFFICE.

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SUPERVISORY SIGNAL APPARATUS FOR TELEPHONE-SWITCHBOARDS.

SPECIFICATION forming part of Letters Patent No. 669,501, dated March 12, 1901.

Application filed July 31, 1899. Serial No. 725,627. (No model.)

To all whom it may concern:

Be it known that I, ORO A. BELL, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented a certain new and useful Improvement in Supervisory Signal Apparatus for Telephone-Switchboards, (Case No. 10,) of which the following is a full, clear, concise, and exact description.

My invention relates to signals for telephone-switchboards, and has for its object to provide supervisory apparatus whereby the operator may inform herself as to the condition of any line or lines which may be connected at the central office.

Generally speaking, my invention consists in the provision of a local circuit at the central office, associated with a connected telephone-line, a source of current, and a supervisory signal included in said local circuit, means actuated in the use of the telephone at the substation for rendering said local circuit active or inactive, and thus for controlling the actuation of said supervisory signal, and switch-contacts adapted to be actuated in the use of a key, such as the operator's listening-key, at the central office for controlling the connection of the source of current with the local circuit or for otherwise rendering such circuit responsive or irresponsive to current in the telephone-line.

My invention may be applied with advantage to that type of switchboard known to telephone engineers as the "relay-switchboard," and the local circuit of the supervisory signal-lamps may be closed through the agency of a pair of contacts in the operator's listening-key. With such an arrangement the operator's listening-key is maintained depressed or in condition to connect the telephone with the plug-circuit while the plugs are not in use, the supervisory signal being thus cut out of circuit to avoid waste of energy and meaningless illumination of the lamps. When the operator brings a pair of plugs into service for making a connection between two telephone-lines, her telephone is thus left in circuit until the number of the subscriber wanted has been ascertained and both plugs inserted, whereupon the listening-key is re-

leased, cutting out the telephone and bringing the supervisory apparatus into operative connection with the united lines. The key, of course, is again depressed when a disconnection is made and the plugs are returned to their places.

My invention will be more particularly described by reference to the accompanying drawing, which illustrates diagrammatically by the use of conventional symbols two telephone-lines extending from their substations to a central office, with a pair of plugs and their connecting-circuit equipped with the supervisory apparatus of my invention.

The switchboard illustrated is of the relay type and is equipped with the usual line-signaling apparatus for indicating a call, a spring-jack being provided for each line, into which the connecting-plugs *a a* may be inserted to connect two lines together for conversation. The apparatus at the substations, as well as that which is permanently associated with each line at the central office, is well understood and needs no detailed description. It is illustrated merely to show the application of my supervisory apparatus and will be referred to only incidentally in describing the operation of the latter.

The tip and sleeve contact portions of each connecting-plug are connected by the cord conductors *b c* with the tip and sleeve portions, respectively, of its mate, these cord conductors being divided by a repeating-coil *d*, and a battery *e* for furnishing current to operate the subscribers' transmitters is bridged across these two cord conductors between the two halves of the repeating-coil after the well-known manner of the common battery system. Two supervisory relays *f f*, one for each plug, are connected with the strand *c* of the cord-circuit, receiving current from the centralized battery *e* when the plugs are in use in establishing a connection, such current being controlled, as usual, by the switching apparatus, which is automatically actuated in the use of the telephones at the substations of the lines connected. The relay associated with any particular plug then will be energized when the telephone of the line with which such plug is connected is in use,

but will be deprived of current and so rendered inert when the subscriber replaces his telephone instrument on its hook and actuates his automatic switch.

5 In the system illustrated the armature switch-levers of each relay are connected to ground each through its own supervisory signal-lamp *g*, and the back contacts of the relays are connected together and with a conductor
10 *h*, which leads to the grounded battery *i*. This battery may be the ordinary test-battery, and the conductor *h* may be tapped onto the third strand *k* of the plug-circuit, which unites the shanks or test-contacts of the plugs—that is,
15 the contacts which engage with the test-rings of the jacks when the plugs are inserted—and which is grounded through the test-battery.

The operator's listening-key *l*, which is adapted when depressed to connect her tele-
20 phone set *m* in a bridge across the cord-strands *b c*, is provided with an extra contact-spring *l'*. When the listening-key is in its elevated position, the said contact-spring *l'* is adapted to engage with a contact-point
25 *l²*, but breaks engagement with said contact-point when the key is depressed. These two contacts *l' l²* control the continuity of conductor *h*, which is connected with battery *i*, so that current may be supplied to the super-
30 visory lamps *g g* only when the listening-key is in its elevated position, the circuit including any lamp being further controlled by the supervisory relay with which such lamp is associated.

35 The above description of the circuit connections and apparatus will, I believe, be sufficient foundation for a statement of the operation of the supervisory signaling apparatus of my invention without further detailed
40 account of the particular system which I have chosen to illustrate the application of my invention.

When the connecting-plugs are in their idle condition, the listening-key is kept de-
45 pressed, thus cutting off the battery from the supervisory circuits. Suppose that the subscriber at one of the substations should desire a connection. By removing his telephone from its hook a signal is transmitted in the
50 usual manner, to which the operator responds by inserting one of the plugs of a pair into the spring-jack of the calling-line. Since the listening-key is normally depressed, she may converse with the subscriber immediately to
55 learn the number of the subscriber wanted. As soon as this information has been obtained the listening-key *l* is released, whereby the telephone set is cut out of circuit and the continuity of conductor *h* is completed at the
60 switch-contacts *l' l²*, thus bringing the supervisory apparatus into action. The supervisory lamp of the calling-station will of course remain dark, since current from the centralized battery is afforded a path of low resistance
65 through the calling-line, and the supervisory relay *f*, associated with such line, is energized and attracts its armature, breaking

the supervisory signal-circuit; but until the called subscriber responds his supervisory relay will remain inert and the circuit through
70 his supervisory lamp will thus be completed. When the called subscriber responds, his supervisory lamp also will be extinguished, and this condition will obtain until the con-
75 versation is finished, when the supervisory lamps of both substations will be lighted by the deenergization of relays *f f* and the consequent completion of the supervisory circuits. The operator observing the signal for
80 disconnection thus given removes the plugs from the spring-jacks. Since, however, the local circuits including the supervisory signal-lamps are dependent upon connection of
85 the plugs with spring-jacks, but are associated only with the plug-circuits, the lamps will remain lighted until the operator de-
presses her listening-key and breaks the circuit that supplies current. This she does im-
90 mediately on disconnection to avoid waste of energy and meaningless illumination of the lamps, the listening-key remaining normally
depressed while the plugs are idle.

Having thus described my invention, I claim as new, and desire to secure by Letters
95 Patent, the following:

1. A central-office apparatus for telephone-switchboards, consisting of a plug and its
100 cord-circuit for making connection with a telephone-line, a local circuit including a source of current and a supervisory signal, a supervisory relay connected with the plug-circuit
for controlling said local circuit, an operator's telephone set, a listening-key for connecting
105 the same with the cord-circuit, and switch-contacts, actuated by the listening-key, for controlling the aforesaid local circuit, substantially as set forth.

2. A central-office apparatus for telephone-switchboards, consisting of a plug and its
110 cord-circuit for making connection with a telephone-line at the switchboard, a local circuit associated with the plug and cord circuit and independent of connection with the telephone-
115 line, a supervisory signal and a source of current in said local circuit, a source of current for the cord-circuit and means controlled by the flow of current in the cord-circuit for rendering
the said local circuit active or inactive, to display or conceal the signal, an operator's
120 telephone set, a listening-key for connecting the same with the cord-circuit, and switch-contacts actuated by the listening-key for controlling
said local circuit and rendering the same responsive or irresponsive to current in the
125 cord-circuit, substantially as described.

3. The combination with telephone-lines
130 extending from substations to a central office, of a pair of plugs and link conductors uniting them, for making connection between the lines, a supervisory relay associated with the pair of plugs, a local circuit, including a subsidiary supervisory signal, controlled by said
relay, a source of current in the circuit, and a manually-operated switch-key controlling

said local circuit, whereby said subsidiary signal may be rendered independent of the supervisory relay, substantially as set forth.

4. A central-office apparatus for telephone-
5 switchboards, consisting of a plug and its
cord-circuit, for making connection with a
telephone-line, a local circuit including a su-
pervisory signal, a relay controlled by the
10 flow of current in the cord-circuit for control-
ling said local circuit, an operator's telephone
set and a listening-key for connecting the
same with the cord-circuit, switch-contacts

actuated in the use of the listening-key, a
source of current, and a conductor, whose
continuity is controlled by the said switch- 15
contacts, connecting said source of current
with the local circuit, substantially as de-
scribed.

In witness whereof I hereunto subscribe
my name this 14th day of June, A. D. 1899. 20
ORO A. BELL.

Witnesses:

H. STROBRIDGE,
W. BENTLEY.