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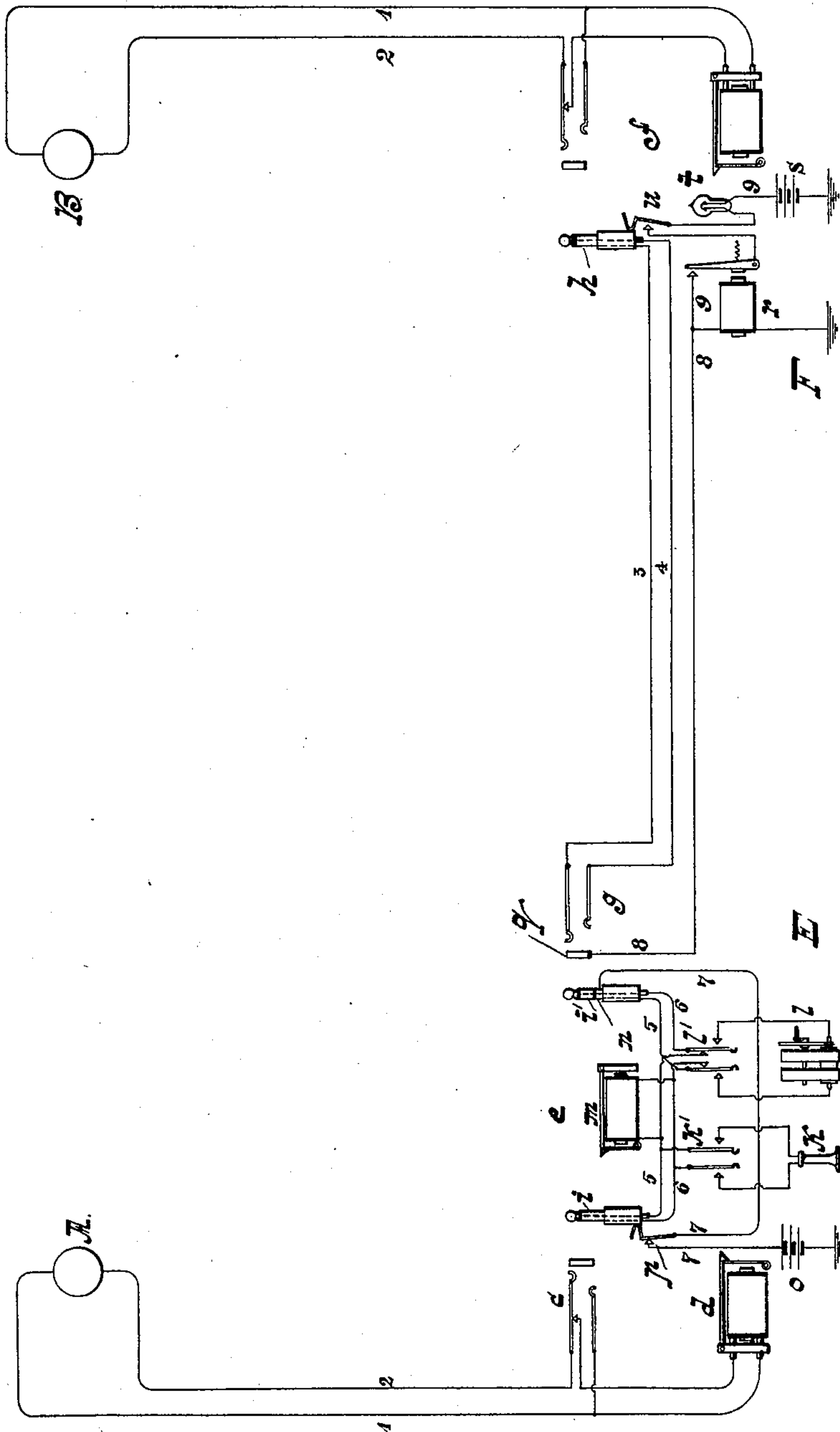
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F. R. McBERTY.

SIGNAL FOR TELEPHONE TRUNK LINES.

(Application filed Sept. 25, 1896.)

(No Model.)



Witnesses:

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UNITED STATES PATENT OFFICE.

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SIGNAL FOR TELEPHONE TRUNK-LINES.

SPECIFICATION forming part of Letters Patent No. 636,275, dated November 7, 1899.

Application filed September 25, 1896. Serial No. 606,945. (No model.)

To all whom it may concern:

Be it known that I, FRANK R. MCBERTY, a citizen of the United States, residing at Downer's Grove, in the county of Du Page and State of Illinois, have invented a certain new and useful Improvement in Signals for Telephone Trunk-Lines, (Case No. 43,) 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 transmission of signals between different switchboards of telephone-exchange systems. It involves a novel arrangement of circuits and appliances for giving the receiving operator who completes a trunk-line connection certain necessary information as to the movements of the operator who originates the trunk connection. Hitherto in operating signals for the same purpose in trunk-lines the spring-jack ordinarily constituted the terminal of the trunk-line before the originating operator had been furnished with auxiliary switch-contacts controlling local circuits, including suitable signal-indicating appliances at the other terminal of the trunk-line, before the receiving operator. In switchboards wherein a large number of trunk-lines terminate in such spring-jacks, however, and especially in switchboard systems wherein each trunk-line appears in a spring-jack in a number of different switchboards, the additional switch-contacts on the jacks become a matter of considerable expense.

It is the object of the present invention to dispense with these switch-contacts on trunk-line jacks and to make use of the connecting plugs and cords employed with the spring-jacks to effect the changes of circuits required for operating the signals. Since there are ordinarily a much smaller number of pairs of plugs and cords in use at a switchboard than there are trunk-line spring-jacks in the same switchboard, it is possible to effect a very considerable saving in the cost of the plant by means of my improvement.

The invention may be described generally as consisting in the combination, with the trunk-line, its spring-jack, and the signaling-circuit, including signals at the distant ter-

minal of the trunk-line and connected with the spring-jack, of a pair of plugs and their plug-circuit for making connection between the trunk-line jack and another spring-jack, a conductor connected with the plug, adapted to form an extension of the signaling-circuit, and an appliance in association or connection with the plug-circuit, which is moved or whose relations are changed simultaneously with or in the act of removing the connection with the call-initiating line for changing the connections of the signaling-circuit to operate the signals.

A specific form of this invention applies to those switching-signals in which lines terminate in a switchboard before an operator who is furnished with pairs of plugs and with the usual appliances in association with the plugs for supervising connections which she originates and before whom terminate trunk-lines extending to a different switchboard. In such switching systems the operator, in response to a call-signal of a line under her care, makes connection with the line by means of one plug of the pair, learns the subscriber's order, makes connection with the spring-jack of a trunk-line with the other plug of the pair, communicates the subscriber's order to the receiving operator having charge of the distant terminal of the trunk-line, who completes the connection between the trunk-line and the line called for. The first-mentioned or originating operator may transmit the call-signal to the substation called and take all necessary steps to bring the subscribers into communication. At the termination of the conversation she observes the signal for disconnection given by the clearing-out annunciator in connection with her pair of plugs and removes the plugs of the pair from the line spring-jack and the trunk-line spring-jack, respectively. This last act of disconnecting the trunk-line from the line should automatically display a signal for disconnection before the receiving operator.

In the specific form of my invention referred to I provide a signal-circuit including the signal-indicating instrument before the receiving operator and terminating in an open contact-piece in the trunk-line spring-jack, a conductor in connection with the plug

of the originating operator, adapted for insertion into the trunk-line jack, arranged to form an extension of the signaling-circuit, a plug-seat switch for the other or answering plug of the pair, and circuit connections controlled by this plug-seat switch adapted to cause the display of a signal-indicating instrument when the plug is replaced in its seat or socket. In the use of this apparatus the originating operator must withdraw the answering-plug from the subscriber's-line jack and must replace it in its normal resting-socket before she withdraws the calling-plug from the trunk-line spring-jack. During the moment between the replacement of the answering-plug in its socket and the withdrawal of the calling-plug from the trunk-line jack current flows to line or other change is effected in the electrical condition of the line which causes the display of a signal. The latter may preferably be a relay controlling a subsidiary indicator and constructed to remain in a fixed position after having been thrown into that position by a temporary excitement.

I preferably employ a signaling-circuit separate from the line conductors, although, of course, these latter conductors may be made to serve for the transmission of signals in any of the well-known ways.

This form of the invention is represented in the accompanying drawing. Two subscribers' lines are shown, terminating in spring-jacks and annunciators in different switchboards. Between the switchboards extends a trunk-line provided with signaling appliances, and at one of the switchboards are represented the pairs of connecting-plugs, with their supervisory apparatus, for making connection between different lines in the switchboard or between a line and the trunk-line to the distant switchboard. These switchboards may of course be within a single office or may be widely-separated portions of the same exchange system.

It is not necessary to describe the apparatus at the substations. The lines 1 2 from the different stations A and B each extend to a spring-jack *c* and an annunciator *d* in a switchboard, station A being connected with switchboard *e* in office E and the line from station B being connected with a switchboard *f* in office F. The trunk-line circuit 3 4, which extends between these switchboards, terminates at board *e* in a spring-jack *g* and in board *f* in a plug *h*. The switchboard *e* is furnished with a pair of plugs *i' i'*, which are united by conductors 5 6, which constitute the plug-circuit. The plug-circuit is equipped with the usual signaling and telephonic apparatus, consisting of the telephone *k* and a key *k'* for connecting the other with the plug-circuit, a calling-generator *l* and key *l'* for connecting it in circuit with plug *i'*, and a clearing-out annunciator *m* in a permanent bridge of the plug-circuit. The apparatus thus far described is of usual and well-known character.

In the present invention the plug *i'* has upon it a contact-piece *n* in addition to the line-contacts, which forms the terminal of the conductor 7, connected to earth through a battery or other source of current. The continuity of conductor 7 is controlled by a plug-seat switch *p* in the resting-socket of plug *i*, which serves ordinarily to open the battery-circuit, but which closes it when the plug is thrust into the socket. The contact-piece *n* of the plug should be so arranged with relation to the line-jack *c* that the plug may be inserted in the line-jack without bringing the part *n* into electrical connection with any part of the line-jack.

In the trunk-line jack *g* I provide a contact-piece *q* in position to register with the part *n* of a plug inserted in the jack. This contact-thimble forms the normally open terminal of a wire 8, extending to the switchboard *f* and including there the magnet of a relay *r*, being grounded after traversing the relay. The switch-contacts of the relay, which are arranged to close when the relay is excited, control a branch 9 from the wire 8, which includes a source *s* of current and a signal-lamp *t*, together with the switch-contacts of a plug-seat switch *u* for the plug *h*. This switch is arranged to interrupt the conductor, which it controls when the plug is replaced in its socket. Thus there exists at office F a local circuit made up of the conductor 9 and the grounded portion of the wire 8, which includes a source of current *s*, the relay *r*, and the signal-lamp *t* and which is opened when the plug *h* is in its socket.

The operation of this system is as follows: In response to an initial call from station A the operator at office E inserts the plug *i* into the spring-jack *c* and learns the subscriber's order for connection with station B. She transmits this order to the operator at office F through an order-wire or by any preferred means, instructing the operator, if desired, to make connection between trunk-line 3 4 and line to station B. The trunk-line to be used having been designated in any suitable way, the operator at board E inserts the plug *i'* of the pair into the jack *g* of that trunk-line, after which the operator at office F makes the connection in accordance with her instruction. The originating operator at board *e* then signals to station B by means of calling-key *l'* and ascertains in the usual way that the subscribers have been brought into communication. At the termination of conversation thus instituted either or both of the subscribers transmit a signal for disconnection, which operates clearing-out annunciator *m* in the switchboard *e*. Observing this signal, the operator proceeds to disconnect the subscriber's line from the trunk-line, first removing the plug *i* from the line-jack *c* and replacing it in its socket and then removing plug *i'* from the trunk-line jack *g*. When the plug-seat switch *p* is operated by the replacement of the plug in the socket, a

current is permitted to flow from battery *o*, through wire 7, contacts *n* and *q*, wire 8, and relay *r*, to earth at the distant office. The relay is thus excited and closes the local branch 9, whereby the lamp *t* is lighted for a signal to the operator there to disconnect the trunk-line from the subscriber's line. An instant after the removal of the plug *i* from the line-jack *c* the plug *i'* is removed from line-jack *g*, breaking the signaling-circuit; but there now exists a circuit of battery *s* through the relay *r*, which maintains the excited condition of the relay and prevents its contacts from separating. The lamp-signal *t* thus remains illuminated after the removal of the connection at the board *e*. When the receiving operator at board *f*, complying with this signal, removes the plug *h* from the line-jack *c* and replaces it in its socket, the local branch 9 is broken, the signal *t* is extinguished, and the relay is caused to become again inert.

As I have before pointed out, the generic invention which it has been my aim to describe in this application may be carried out in various other ways through the medium of other appliances in connection with the plug-circuits of the originating operator, whose condition or position is altered in the process of disconnecting the trunk-line from the subscriber's line, the essential mode of procedure being that the change referred to shall take place previous to the withdrawing of the plug *i'* from the trunk-line jack.

My invention is defined in the following claims:

1. The combination with a telephone trunk-line extending from one switchboard to another and terminating in suitable terminal connection at one of said boards and in a spring-jack at the other board, of a signaling-circuit for the trunk-line including an indicator at one switchboard and terminating in a contact-piece associated with said spring-jack at the other board, a pair of plugs and their cord-circuit at the latter board, a conductor connected with a contact-piece on one of the plugs and adapted to form an extension of the signaling-circuit when the plug is inserted in the spring-jack, and a switch adapted to be actuated upon manipulation of the other plug in connecting and disconnecting lines, whereby the electrical condition of the signaling-circuit may be changed and a signal displayed at said indicator, substantially as described.

2. The combination with two telephone-lines terminating in different switchboards, a trunk-line extended between the boards and terminating in a spring-jack at one of them and in a suitable connecting appliance at the other switchboard, of a pair of plugs and their plug-circuits at said first-mentioned board, with their supervisory apparatus, a signaling-circuit for the trunk-line having a signal-indicating instrument at the other board, a conductor terminating in one of the connecting-

plugs adapted to form an extension of the signaling-circuit when said plug is inserted in the trunk-line jack, and a switch or switch-contacts controlled by the other plug of the pair and adapted to alter the circuit connections of the extended portion of the signaling-circuit in or in consequence of the act of disconnecting the plug from the subscriber's spring-jack, to cause the display of the signal; as described.

3. The combination with two telephone-lines terminating in different switchboards, a trunk-line extending from a spring-jack in one of the boards to a suitable connecting appliance at the other board, a pair of plugs, their plug-circuit, and their supervisory apparatus, at said first-mentioned board, for making connection between the subscriber's line jack and the trunk-line jack and supervising connections, of a signal-circuit terminating in a contact-piece of the trunk-line jack and including a signal-indicating instrument at the distant terminal of the trunk-line, a conductor terminating in one of the connecting-plugs adapted to form an extension of the signal-circuit when the plug is inserted in the spring-jack, and a plug-seat switch for the other plug of the pair controlling the circuit connections of said extension of the signal circuit, whereby the signal may be displayed when the plug is replaced in its socket before the other plug is withdrawn from the trunk-line jack; as described.

4. The combination with the terminal spring-jacks of telephone-lines in different switchboards, a trunk-line extending between the two boards and terminating in a spring-jack of one of them and in a suitable connecting appliance at the other, and a pair of connecting-plugs at the board wherein the trunk-line spring-jack is, of a signal-circuit for the trunk-line terminating in a contact-piece of the spring-jack and including a signal-controlling relay at the distant terminal of the trunk-line, a conductor terminating in one of the plugs of said pair adapted to form an extension of the signal-circuit, when the plug is in the trunk-line jack, an appliance associated with the pair of plugs whose position is changed in or consequent upon the act of disconnecting the other set of plugs from the subscriber's spring-jack, and a switch controlled thereby, adapted to cause the excitement of the relay in the signal-circuit, a local circuit including a magnet-winding of a relay, together with switch-contacts closed by the relay when excited, and means for interrupting the current through the said magnet; whereby when the plug-circuit is disconnected from the subscriber's line prior to the disconnection of the other plug from the trunk-line it causes the persistent display of the clearing-out signal at the distant terminal of the trunk-line; as described.

5. The combination with subscriber's-line terminal spring-jacks in different switchboards, a trunk-line between the boards end-

ing in a spring-jack at one of them and in a terminal plug at the other, and a pair of connecting-plugs with their supervisory appliances at the switchboard wherein the trunk-line spring-jack is located, of a signal-circuit for the trunk-line terminating in the spring-jack including the magnet of a signal-controlling relay, a conductor terminating in one of the connecting-plugs adapted to form an extension of the signal-circuit when the plug is inserted in the trunk-line jack, a plug-socket switch for the other plug of the pair adapted to connect a source of current with the said extension of the signal-circuit when the plug is replaced in its socket, a local circuit controlled by the relay including a source of current and the magnet-winding of the relay, and

a plug-socket switch of the terminal plug of the trunk-line adapted to open the local circuit when the terminal plug is replaced in its socket; whereby, when the subscriber's line is disconnected from the trunk-line prior to the withdrawal of the connecting-plug from the trunk-line jack a clearing-out signal is displayed at the distant end of the trunk-line, and the replacement of the terminal plug thereof in its resting-socket causes the effacement of the signal; substantially as described.

In witness whereof I hereunto subscribe my name this 13th day of August, A. D. 1896.

FRANK R. McBERTY.

Witnesses:

ELLA EDLER,

MYRTA F. GREEN.