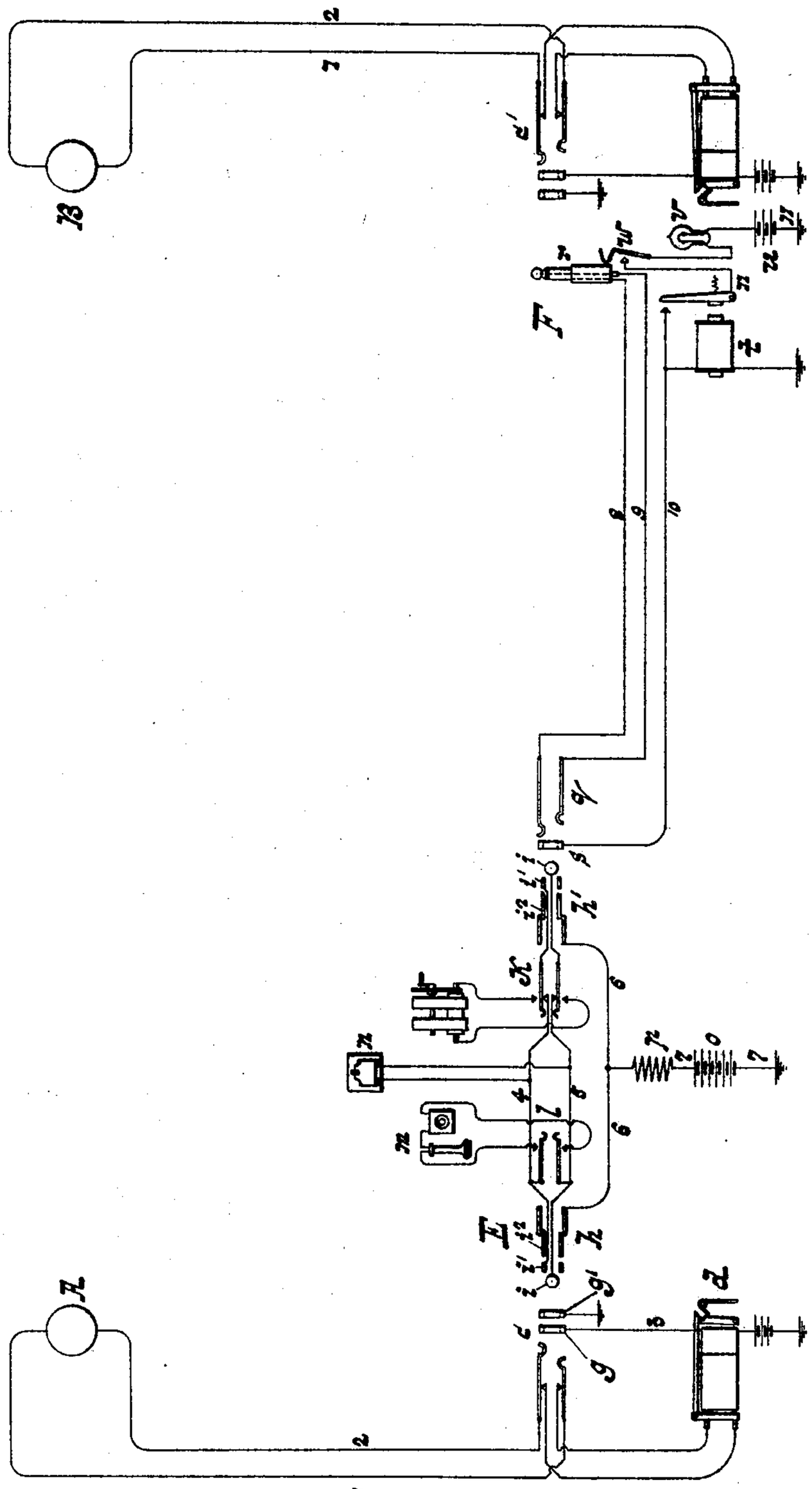
No. 636,276. Patented Nov. 7, 1899.

F. R. McBERTY.

SIGNAL FOR TELEPHONE TRUNK LINES.

(Application filed Sept. 25, 1896.)

(No Model.)



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UNITED STATES PATENT OFFICE.

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SIGNAL FOR TELEPHONE TRUNK-LINES.

SPECIFICATION forming part of Letters Patent No. 636,276, dated November 7, 1899.

Application filed September 25, 1896. Serial No. 606,946. (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. 45,) 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 interoffice trunk-lines between telephone-exchanges and signaling-circuits pertaining to them. It provides a new mode of displaying before the receiving operator a signal for disconnection, the display of the signal being dependent upon the withdrawal of the answering-plug from the answering-jack of the calling subscriber.

As is well known to telephone engineers, it is common to provide trunk or transfer lines between different switchboards wherein subscribers' lines terminate, the lines being so arranged that an operator at one of the switchboards may make connection between any subscriber's line and the terminal of a suitable trunk-line, after which an operator at the other switchboard may make connection from the trunk-line to the required correspondent line in her switchboard. The first-mentioned operator is commonly furnished with appliances for signaling to the called line and for receiving and responding to the signal for disconnection. She is therefore designated the "supervising" operator. The work of the operator in charge of the other extremity of the trunk-line in making connection through the agency of the trunk-line between two subscribers consists solely in connecting the trunk-line with a subscriber's line in accordance with an order and in disconnecting the trunk-line therefrom. She is called the "receiving" operator. Since the receiving operator does not enter into direct communication with the subscriber, she relies for her instruction to disconnect the trunk-line from the subscriber's line upon a clearing-out signal automatically set or displayed before her in the act of the supervising operator in effecting disconnection at her switchboard. In a prior application, Serial No. 606,945, filed September 25, 1896, I have described and have claimed, broadly, a new mode of operating this disconnection-signal before the receiving operator, in which the excitation of the signal is dependent upon certain changes in the circuit connections of an extension of the trunk-line signaling-circuit formed through the agency of the terminal spring-jack of the trunk-line, the calling-plug of the operator's usual plug-circuit, and any suitable appliance of her keyboard whose position is changed during or contingent upon the removal of connection from the calling-subscriber's line. The present contrivance is a form of the invention therein claimed which possesses certain advantages of cheapness and security in operation. In the present invention the transmission of the clearing-out signal to the receiving operator is effected by the withdrawal of the answering-plug from the answering-jack of the calling-subscriber's line, the necessary changes of circuit connections for altering the electrical condition of the disconnection-signal being effected thereby.

A suitable embodiment of the present invention may be constructed as follows: In connection with the trunk-line terminating, as usual, in the spring-jack before the supervising operator and in a plug before the receiving operator and furnished with a signal-circuit connected with a contact-piece of the trunk-jack I provide at the receiving-operator's position any suitable annunciator adapted to respond to a momentary signaling-current and to remain displayed thereafter until replaced by suitable means. In connection with the usual pair of plugs and the plug-circuit a third or auxiliary conductor is furnished, uniting certain contact-pieces of the plugs, one of which contact-pieces is adapted to make connection with the contact-terminal of the signaling-circuit in the trunk-jack and the other of which is constructed to register with a grounded contact-piece in the subscriber's spring-jack. To this third conductor of the plug-circuit a grounded battery or

other source of current is connected, preferably with a resistance-coil interposed between the battery and the conductor of the plug-circuit.

When connection is made between a spring-jack of a subscriber's line and the trunk-line jack, the source of current becomes connected with the signaling-circuit of the trunk-line, and hence with the annunciator before the receiving operator, but current from the source is shunted or short-circuited from the latter instrument through the agency of the registering contact-pieces in the spring-jack of the subscriber's line. When, however, the answering-plug is withdrawn from this spring-jack in effecting disconnection in response to the subscriber's clearing-out signal, this short circuit is removed, the source of current is thrown upon the line, and the signal for disconnection is displayed before the receiving operator. The removal of the calling-plug from the trunk-line jack at any time does not effect any change in the electrical condition of the signaling-circuit.

This form of the invention is illustrated in the accompanying drawing.

Two subscribers' stations are shown connected by the lines with two different switchboards, between which a trunk-line extends, one of the switchboards being furnished with pairs of plugs and plug-circuits and the usual accessory apparatus.

The two stations are denoted A and B. The apparatus at each station is connected by line-circuit 1 2 with a spring-jack *c* and an annunciator *d* in one of the switchboards. These switchboards are designated E and F, respectively. The annunciator used is of the self-restoring type, having a restoring-magnet in a local circuit 3, which terminates in a pair of normally-separated contact-pieces *g* and *g'* in the corresponding spring-jack. To serve a certain purpose in the present invention, one of the contact-pieces *g'* is grounded directly.

The switchboard E is furnished with a pair of connecting-plugs *h* and *h'*, each having contact-pieces *i* and *i'*, constructed to register with the line-contacts of the subscriber's spring-jack, and a third contact portion i^2, designed to connect with and to unite electrically the contact-pieces *g* and *g'* of these spring-jacks. The line-contacts *i* and *i'* of the two plugs are united by the usual plug-circuit 4 5. In this plug-circuit a calling-key *k* is interposed, and with it are connected a listening-key *l* for bringing the operator's telephone *m* into communication with the plug-circuit and a clearing-out annunciator *n* for receiving the subscriber's signal for disconnection. The parts i^2 of the plugs are united by a third flexible conductor 6. This conductor is connected to earth through a branch 7, which includes a source *o* of current, together with a resistance-coil *p*.

A trunk-line circuit 8 9 extends between the two switchboards E and F, terminating in the suitable contact-pieces of a trunk-line jack *q* in the switchboard E and in corresponding portions of the plug *r* at the receiving-board F. The trunk-line signaling-circuit 10 associated with this line terminates in a normally open contact-ring *s* of the jack *q*. At the receiving-board it is grounded through the magnet-winding of a relay *t*. The switch-contacts of this relay control a ground branch 11, which includes a source *u* of current, together with a signal-lamp *v*, and whose continuity is also determined by a plug-seat switch *w* in the socket of terminal plug *r*, the branch 11 being closed only when the plug is raised from its socket.

For the purpose of examining the working of this apparatus assume a call to be received from station A for connection with station B. The operator at board E will answer the call by inserting plug *h* into spring-jack *c* in the usual way, and having learned the order will instruct the receiving operator through the agency of an order-wire or by any other suitable method to connect the trunk-line 8 9 with the spring-jack *c'* of line to station B. The supervising operator will then insert the plug *h'* into the trunk-line jack *q*, while the receiving operator will insert plug *r* into the spring-jack *c'*. By these acts a complete metallic circuit will be formed between substations A and B, made up of line conductor 1 2 of the calling-station, plug-circuit 4 5, trunk-line 8 9, and line-circuit 1 2 to station B. The supervising operator at board E will send a signaling-current to station B over a portion of this circuit by depressing her calling-key *k*. The insertion of plug *h* into the spring-jack *c* closes the local circuit 3, and thus effects the resetting of the line-annunciator of the calling-line. The same operation connects the free pole of battery *o* directly to earth through contact *g'* in this spring-jack, thus bringing conductor 6 to the potential of the earth. The insertion of plug *h'* into trunk-line jack *q* makes the conductor 6 an extension of the signaling-circuit 10. However, since battery *o*, in connection with the before-mentioned conductor, has been rendered ineffective the signal-relay *t* remains inert. Raising the plug *r* from its socket permits the plug-seat switch *m* to close the local branch 11, and thus places the subsidiary signal appliance in operative condition. When at the termination of the subscribers' conversation the clearing-out annunciator *n* at board E is operated as a call for disconnection, the operator at that board first withdraws the plug *h* from the spring-jack *c*. This act removes the short circuit of battery *o* and permits current from that source to flow through the conductors 6 and 10, causing the excitement of the relay *t*. This instrument draws its armature forward, closing its switch-contacts, and thus closes a local circuit made up of branch 11 and a por-

tion of wire 10, which local circuit includes the relay, the source q of current, and the signal-lamp v, and the lamp is thereby lighted. A moment later the operator at the board E withdraws plug h' from the trunk-line jack q, thus returning all of her appliances to their normal position. The withdrawal of this line-plug from the trunk-line jack produces no change in the condition of the signal v, however, since the relay t has now become excited by current from battery u. The signal remains lighted until, observing it, the receiving operator removes plug r from spring-jack c' and replaces it in its socket, thereby opening the local branch 11, extinguishing the lamp, and rendering the relay inert.

Of course the operator at switchboard E has before her terminal spring-jacks of a large number of lines, with all of which the plugs h and h' are intended to be used. Hence these plugs and their associated plug-circuits cannot be altered in any way which will render them inoperative when used between different subscribers' lines instead of between subscribers' lines and a trunk-line.

It will be understood that other signal-indicating appliances may be used in connection with the trunk-line and that the signal-circuit thereof may, if desired, be formed in part or in whole of conductors of the trunk-line itself in a well-known way. Further, other means than that herein specified may be adopted for changing the electrical condition of the signal when the answering-plug is withdrawn from the jack of the calling-line.

What I claim is—

1. The combination with subscribers' lines terminating in different switchboards, a trunk-line between the boards, a pair of connecting-plugs at one of the boards for making connection with the trunk-line, and the signaling-circuit of the trunk-line including a signal-indicating instrument before the receiving operator, and terminating in a contact-piece of the trunk-line, of a conductor uniting the contact-pieces of the connecting-plugs, adapted to form an extension of the signaling-circuit when one plug is inserted in the trunk-line jack, and a contact-piece in the subscriber's spring-jack adapted to coöperate with the terminal of the said extension of the signaling-circuit in the connecting-plug to alter the electrical condition of the signaling-circuit, and thereby to affect the same; as described.

2. The combination with telephone-lines terminating in spring-jacks in different switchboards, a trunk-line terminating in a spring-jack at one of the boards and in a suitable connecting appliance at the other board, and a pair of connecting-plugs and their plug-circuit at the originating board, of a signal-circuit for the trunk-line terminating in a contact-piece of a spring-jack, and containing a signal-indicating instrument at the distant terminal of the trunk-line, a conductor uniting contact-pieces of the two plugs and adapted to form an extension of the signaling-circuit when one plug is inserted in the trunk-line jack, a source of current connected with the conductor and a contact-piece in the spring-jack of the subscriber's line with circuit connections and adapted to coöperate with the other plug of the pair forming the free terminal of the extension of the signaling-circuit, to divert the current of the said source from the signal-receiving instrument; whereby the signal-receiving instrument is actuated when the plug is withdrawn from the subscriber's line by the supervising operator; as described.

3. The combination with telephone-lines terminating in spring-jacks in different switchboards, a trunk-line extending between the different switchboards and terminating in a spring-jack at the originating board, a pair of connecting-plugs with their plug-circuit at said originating board, and a clearing-out annunciator for the said plugs, of a signaling-circuit for the trunk-line terminating in a contact-piece of the spring-jack, a suitable annunciator at a distant terminal of the trunk-line, a grounded contact-piece in the subscriber's spring-jack at the originating board, a conductor uniting the plugs adapted to make connection between the said grounded contact-piece of the subscriber's line-jack and the said terminal contact-piece of the signaling-circuit in the trunk-line jack, and a source of current connected with the conductor uniting the plugs; substantially as described.

4. The combination with telephone-lines terminating in spring-jacks in different switchboards, a trunk-line extending between the different switchboards and terminating in a spring-jack at the originating board, a pair of connecting-plugs with their plug-circuit at said originating board, and a clearing-out annunciator for the said plugs, of a signaling-circuit for the trunk-line terminating in a contact-piece of the spring-jack, a suitable annunciator at a distant terminal of the trunk-line, a grounded contact-piece in the subscriber's spring-jack at the originating board, a conductor uniting the plugs adapted to make connection between the said grounded contact-piece and the signaling-circuit terminating in the trunk-line jack, a source of current connected with the conductor uniting the plugs, a plug-socket switch for the terminal plug of the trunk-line, and a device controlled thereby adapted to render the annunciator inert when the terminal plug is replaced in its socket; substantially as described.

5. The combination with a telephone trunk-line, of a signaling-circuit therefor including an indicator at one end and terminating in a contact-piece at the other end, a pair of connecting-plugs and their spring-jacks for extending the trunk-line to make connections

with other telephone-lines, a conductor forming an extension of said signaling-circuit and adapted to be connected therewith by the connection of one of the plugs of said pair with the trunk-line, and electrical means connected with said conductor and controlled by registering contacts of the other of said plugs and its spring-jack for influencing said signaling-circuit and the indicator included therein, substantially as set forth.

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.