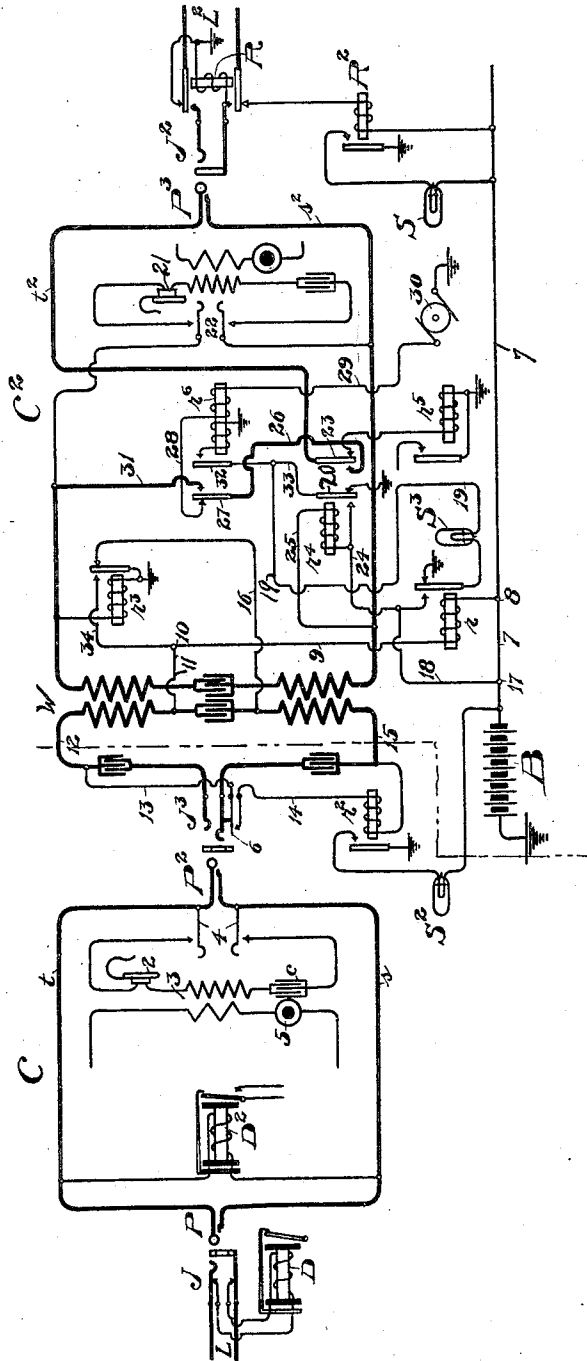


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TELEPHONE TRUNK CIRCUIT.
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Patented Aug. 2, 1910.



Witnesses.

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UNITED STATES PATENT OFFICE.

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TELEPHONE TRUNK-CIRCUIT.

965,973.

Specification of Letters Patent.

Patented Aug. 2, 1910.

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To all whom it may concern:

Be it known that I, CHARLES S. WINSTON, a citizen of the United States, residing in Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Telephone Trunk-Circuits, of which the following is a specification.

My invention relates to improvements in signaling devices and apparatus for telephone trunk circuits whereby connections between magneto telephone exchanges and common battery exchanges may be readily carried out.

In magneto exchanges, particularly of small size, it is desired to employ the same cord circuits in the connections between the subscribers' lines and the trunk circuits as are employed in connection with the subscribers' lines. Inasmuch as such cord circuits are provided with bridged clearing-out drops which are operated by current from the subscribers' hand generators, the connections completed thereby are liable to be tied up by the failure of the subscriber to operate his hand generator when through conversation or by his failure to operate it sufficiently to give the signal at the central office. When such cord circuits are used with trunk lines it is obvious that there is still more danger of the lines being tied up by reason of the fact that there is but one subscriber to operate the clearing-out drop and the chances for the operation of the same are reduced by one-half. In addition, if the trunk circuit extends to a common battery office, which is usually a larger, busier and more important office than a magneto office, and such delays in disconnection occur, the loss at the latter exchange by reason of such impairment of service is correspondingly greater. It is desirable, therefore, that some other means for indicating the fact that the conversation has terminated from that ordinarily used in connection with trunks, be employed so that the delays that are liable to occur at the magneto office will not be felt at the common battery office.

In my present invention I seek to avoid the difficulties mentioned and to provide a new and improved method of signaling in connection with such trunk circuits whereby the operator at the magneto office is immediately informed when the common battery subscriber is through talking and in which, as soon as she takes down the connection the

disconnect signal is transmitted to the common battery operator.

A further object of the invention is to provide such disconnecting signals for the trunk circuits at the magneto office in connection with their springjacks whereby the disconnect signal is independent of the clearing-out drop employed in the magneto cord circuit.

The invention is illustrated in the accompanying drawing in which the figure is a diagram of a telephone system embodying the improvements.

In the figure C designates the magneto office and C² the common battery office. At the former L designates the usual magneto telephone line terminating in a jack J and provided with a drop D. The cord circuits are each provided with an answering plug P and a calling plug P² having tip and sleeve contacts adapted to register with the corresponding contacts of the springjacks of the lines. The tip contacts of these two plugs are joined by the flexible strand *t* and the sleeve contacts similarly connected by the strand *s*. A clearing-out signal D² is bridged across the cord circuit in the usual manner and the operator's set, consisting of a receiver 2, the secondary of an induction coil 3 and a suitable condenser *c*, are adapted to be bridged across the cord circuit by the usual listening key 4, her transmitter 5 and the primary of her induction coil 3 being charged from any suitable source of current. The usual ringing generator is omitted for the sake of clearness.

At the office C² the common battery lines L² are terminated and are provided with the usual springjacks, such as J², cut-off and line relays R and R², and a line signal S which is controlled by the said line relay. The trunk circuit extending between these two offices is provided with a jack J³ at the magneto office and outgoing end and with a repeating coil W at the second office which inductively joins the outgoing end of the trunk with the incoming end, the latter being provided with a flexible cord comprising the strands *t*² and *s*² leading to the tip and sleeve contacts of the plug P³ which is adapted to be inserted in the jacks J² of the lines L². A disconnect signal S² is associated with the jacks J³ at the outgoing end of the trunk and a signal S³ is located at the incoming end, and is used both as a

ringing and as a disconnecting signal for this end of the trunk.

In the operation of the invention a call coming in at the magneto office is answered in the usual manner by the operator who upon learning that a connection is desired with a subscriber whose line terminates at the common battery office, inserts the plug P² of her cord circuit into the jack J³ of the trunk. This results in closing the auxiliary contacts 6 in the jack J³ thereby closing a circuit which may be traced from the live pole of the common battery B over battery lead 7 to point 8, thence through relay *r* and over conductor 9 to point 10, conductor 11, wire 12 of the trunk circuit, conductor 13, contacts 6, conductor 14, relay *r*², sleeve conductor 15 of the trunk, conductor 16 to the back contact and spring of the tip relay *r*³, and thence to ground. The current flowing in this path energizes said relays *r* and *r*², the latter closing the local circuit of the signal S² associated with the jack J³ and the former closing its spring upon its forward contact, thereby completing the circuit through the signal lamp S³ which may be traced from the live pole of battery B over conductor 7 to point 17, conductor 18, forward contact and spring of relay *r*, thence through the lamp S³ over conductor 19, and thence by way of spring 20 and back contact of the sleeve relay *r*⁴ to ground, thereby lighting the lamp S³. When the incoming operator observes this signal she connects her head telephone 21 with the trunk by means of the listening key 22 to receive the order.

Upon learning the line desired, it is tested in the usual manner by the trunk plug P³, the testing circuit being completed over the forward portion of the strand *t*² of the trunk cord, spring 23 of the relay *r*⁴ and its back contact, and through the high resistance and high impedance test relay *r*⁵, said relay controlling the local circuit connected with the operator's telephone set to enable her to receive the busy test signal. If the line is found idle the plug P³ is inserted in the jack J² of the telephone line, current being supplied from the live pole of battery B over conductor 7 to point 17, conductor 18, conductor 24, relay *r*⁴, conductor 25 and thence over the sleeve strand *s*² of the trunk cord through the cut-off relay of the line to ground, thereby operating the cut-off relay to render the line signal inoperative and to place the line in condition for conversation. The sleeve relay *r*⁴ is likewise operated to disconnect the said test relay *r*⁵ and to connect the forward portion *t*² of the trunk cord through spring 23 and forward contact of relay *r*⁴, conductor 26, spring 27 and normal contact of the automatic ringing relay *r*⁶, conductor 28 to the winding of said relay *r*⁶, and conductor 29, with the ground-

ed ringing generator 30, which sends out ringing current to the subscribers' station over the tip side of the telephone line, with return over the sleeve side and through sleeve relay *r*⁴ and the battery B to ground. The attraction of spring 20 of relay *r*⁴ at this same time severs the circuit of the signal S³ which is extinguished, and connects said spring 20 through its forward contact with the conductor 24 leading direct to the live pole of the battery B. When the subscriber takes up his telephone to answer the call a path of low resistance is provided for the ringing current through the substation instruments, which permits an increased flow of current through the winding of relay *r*⁶, which until now has remained unoperated, and operates said relay by reason of said increased flow of current thereby attracting its spring 27 to disconnect the ringing generator 30 and to complete the tip strand for conversation through its forward contact and conductor 31 forming part of said strand *t*². At the same time spring 32 of the said relay *r*⁶ engages its forward contact, thereby completing a path for current from the spring 20 of relay *r*⁴ over conductor 33, said spring 32, and the locking winding of said relay *r*⁶ to ground. It is preferable that the spring 32 should engage its contact before the spring 27 is separated from its normal contact in order that the said relay *r*⁶ may not operate as a vibrator. As soon as the tip strand is completed, as mentioned, current from the battery B flows over the telephone line L² and back to the central office over the tip side of line and thence over the strand *t*² and through tip relay *r*³ to ground, thus operating said relay *r*³. The operation of the latter relay separates its spring from its back contact to open the circuit through the relay *r*² at the outgoing end of the trunk to retire the signal S² associated with the jack J³, and completes a second path for current through the relay *r* from the point 10 over conductor 34, which maintains said relay *r* energized to prevent the operation of the lamp S³ during conversation. By the extinguishing of lamp S² the operator at the magneto office is informed that the subscriber has responded.

During conversation the voice currents are transmitted from one circuit to the other through the repeating coil W, the current for the operation of the common battery subscriber's transmitter being provided from the battery B while current for the operation of the magneto subscriber's transmitter is provided from his local battery.

At the end of the conversation, the subscriber upon the common battery line hangs up his receiver, thereby cutting off current from the tip relay *r*³ which permits the re-establishment of the circuit before traced through the relays *r* and *r*², the latter serv-

ing to operate the disconnect signal S^2 associated with the jack J^3 and the former maintaining its spring in its forward position. The operator at the magneto office seeing the display of the signal S^2 and preferably without waiting until the drop D^2 is operated, withdraws the cord circuit plugs and takes down the connection. The withdrawal of the plug P^2 permits the opening of the contacts 6 of the jack J^3 , thus deenergizing relays r^2 and r and retiring the signal S^2 , but closing the circuit for the signal S^3 associated with the trunk plug P^3 . This circuit may be traced from the live pole of battery B to point 17, over conductors 18 and 24, forward contact and spring 20 of relay r^4 , conductor 19, lamp S^3 , spring and back contact of relay r to ground, thus lighting said signal S^3 and indicating to said incoming operator that the conversation has terminated and the cord circuit has been disconnected at the magneto office. She therefore withdraws the plug P^3 and restores all parts to normal condition.

It is thus seen that the disconnect signal associated with the outgoing jack of the trunk is given at the magneto office immediately upon the return of the receiver of the common battery subscriber to its hook, and that the disconnection at this office does not depend upon the operation of the clearing-out drop in the cord circuit. A simple and expeditious manner of handling trunk service between two such offices is therefore provided.

I claim:

1. In a telephone system, the combination with a trunk circuit, of signals permanently associated, one with each end of said trunk, a signal associated with the outgoing end of said trunk being adapted to be displayed when a cord is connected with said end of the trunk, a signal associated with the incoming end of the trunk being adapted to be displayed when a connection is established with the outgoing end of the trunk and being adapted to be again effaced when the incoming end of the trunk is connected with a telephone line, the former signal being adapted to be effaced when a called subscriber answers his call, substantially as described.

2. In a telephone system, the combination with a trunk circuit, of a cord circuit adapted to connect with the outgoing end of said trunk, and a telephone line with which the incoming end is adapted to be connected, a pair of signals permanently associated, one with each end of said trunk circuit, both said signals being adapted to be displayed when said cord is connected with the trunk, the signal at the incoming end of the trunk being adapted to be effaced when said end of the trunk is connected with said telephone line and the former signal being

adapted to be effaced when said line is in use, substantially as described.

3. In a telephone system, the combination with a telephone trunk circuit extending between different switchboards and adapted to be connected with subscribers' lines at each end, a supervisory signal placed in condition to operate by current over the two limbs of the trunk in series individual to the trunk at the outgoing end to indicate the position of the subscriber's telephone of the line connected with the other end of the trunk, substantially as described.

4. In a telephone system, the combination with a trunk circuit extending between a magneto office and a common battery office, of a cord circuit at the magneto office to connect the subscribers' lines thereof with the trunk, telephone lines at the common battery office with which the said trunk is adapted to be connected, a source of current at the latter office to furnish current to the subscriber's line for conversation, a supervisory signal associated with the outgoing end of the trunk independent of the cord circuit and having its operation controlled by the flow of current over the common battery telephone line during conversation, whereby the operator at the magneto office is informed during the connection of the condition of the said subscriber's line, substantially as described.

5. In a telephone system, the combination with a trunk circuit extending between magneto and common battery switchboards, of a cord circuit at the magneto office to connect the subscribers' lines with the spring-jack of the trunk circuit, said trunk having a connecting cord at the common battery office to connect the same with the subscribers' lines of the latter office, a signal associated with and individual to the spring-jack of the trunk at the magneto office, said signal being operated by current flowing over the two limbs of the trunk line in series during the connection of the trunk circuit with the common battery line when the subscriber's telephone is hung upon its hook and not operated at other times, whereby the magneto operator is informed when the common battery subscriber answers his call and when he hangs up his telephone, substantially as described.

6. In a telephone system, the combination with a trunk circuit extending between a magneto switchboard and a common battery switchboard and having a springjack at the magneto board and a connecting cord at the common battery board, the usual magneto cord circuit being employed to connect the subscribers' lines of that office with the trunk, of a disconnect signal associated with the springjack of the trunk and independent of the cord circuit and under the control of the common battery subscriber during con-

versation, whereby the magneto operator is informed upon the hanging up of the common battery subscriber's telephone, substantially as described.

5 7. In a telephone system, the combination with a trunk circuit having a connecting jack at one end, of subscribers' lines also terminating at said end, a cord circuit to connect said subscribers' lines or to connect said jack
10 to one of the subscriber's lines at said end, means for connecting the trunk with a subscriber's line at the opposite end, and a supervisory signal permanently associated with the said springjack, substantially as
15 described.

8. In a telephone system, the combination with a telephone trunk line adapted to connect between local and common battery switchboards, of a cord circuit at the local
20 battery switchboard adapted to connect local battery subscribers with one end of said trunk line, a signal receiving device bridged across the cord circuit, a condenser in each limb of said line at the local battery
25 end to interrupt the flow of direct current and means whereby when connection is established with the trunk at said end an inductive shunt also at said end is closed between the strands of the trunk line on the
30 common battery side of said condensers to permit the flow of direct current in the trunk, and apparatus at the incoming end affected by such current flow, substantially as described.

35 9. In a telephone system, the combination with a telephone trunk line adapted to connect between local and common battery switchboards of a cord circuit at the local battery switchboard adapted to connect
40 local battery subscribers with one end of said trunk line and a cord circuit permanently connected with the other end of said trunk line adapted to temporarily connect with the subscribers' lines of the common
45 battery system, a magnetic signaling device permanently associated with the local battery end of the trunk and adapted to have its coil bridged between the limbs thereof whenever connection is established with the
50 trunk at said end, and a relay associated with the common battery end adapted, only when unactuated, to maintain battery connected between the limbs of the trunk at the said common battery end, and means where-
55 by whenever said trunk cord is connected with a closed circuit subscriber's line said latter relay is actuated, substantially as described.

10. In a telephone system, the combination with a telephone trunk line adapted to connect between local and common battery

exchanges, of a cord circuit at the local battery exchange adapted to connect with the trunk at said exchange and a cord circuit at the common battery end of said trunk line
65 permanently connected thereto and adapted to be temporarily connected to any of the lines of the common battery system, a source of direct current at the common battery end normally bridged between the limbs of said
70 trunk line a relay included in the bridge, a signal associated with said relay and adapted under proper conditions to be displayed by the actuation thereof, and means associated with the local battery exchange end of
75 said trunk for closing the circuit through said relay whenever the cord circuit is connected to the trunk line at said local battery end, substantially as described.

11. In a telephone system, the combination with a telephone trunk line adapted to connect between local and common battery
80 exchanges, of a signal permanently associated with the trunk line at the local battery exchange and adapted to be displayed by
85 current flowing over the limbs of the trunk line in series, and a signal at the common battery exchange end of the trunk line permanently associated therewith, also adapted to be displayed under proper conditions by
90 current flowing over the two limbs of said trunk line in series, substantially as described.

12. In a telephone system, the combination with a telephone trunk line adapted to
95 connect between local and common battery exchanges, a magnetic signaling device associated with the outgoing end of the trunk and having its circuit normally broken by contacts of the trunk jack but adapted to be
100 closed by the insertion of a plug in the jack, and means to control said signal by current from the incoming end of the trunk when the plug is inserted in said jack, substantially as
105 described.

13. In a telephone system, the combination with a trunk line extending between different switchboards, of a signal permanently associated with the outgoing end of
110 said trunk, and normally in an inoperative condition, means to place the signal in operative condition by establishing a connection with the trunk at said end, and means thereafter to control the signal from the other
115 end of the trunk, substantially as described.

Signed by me at Chicago, county of Cook, State of Illinois, in the presence of two witnesses.

CHARLES S. WINSTON.

Witnesses:

ROBERT LEWIS AMES,
EDITH F. GRIER.