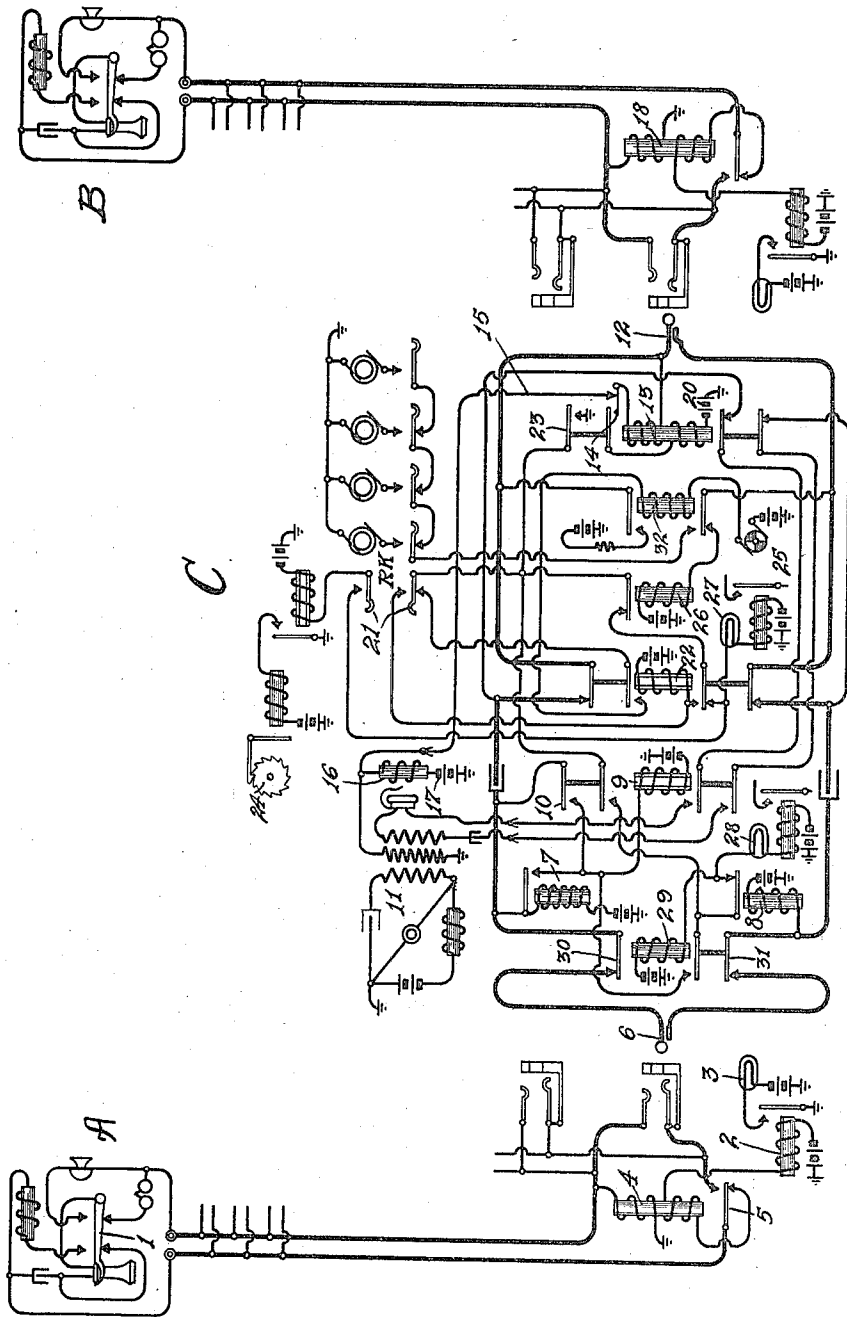


H. D. CURRIER.
 TELEPHONE SYSTEM HAVING INSTANTANEOUS DISCONNECT AND RECALL.
 APPLICATION FILED SEPT. 19, 1914.

1,306,804.

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Witnesses:

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UNITED STATES PATENT OFFICE.

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TELEPHONE SYSTEM HAVING INSTANTANEOUS DISCONNECT AND RECALL.

1,306,804.

Specification of Letters Patent. Patented June 17, 1919.

Application filed September 19, 1914. Serial No. 862,464.

To all whom it may concern:

Be it known that I, HIRAM D. CURRIER, a citizen of the United States of America, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Telephone Systems Having Instantaneous Disconnect and Recall, of which the following is a specification.

My invention relates to telephone systems and is more particularly designed to provide a system with instantaneous disconnect and recall features.

My invention is more particularly an improvement over my application Serial No. 815,123, filed Jan. 29, 1914. In my said co-pending application I disclose a system in which a connected line may by the restoration of the switchhook cause an operative disconnection of the connected cord circuit so that an immediate reactivation of the switchhook actuates the line lamp irrespective of the presence of the plug of the connected cord circuit in the jack of that particular line.

My present invention concerns itself with the adaptation of a certain character of telephone line circuit and cord circuit to accomplish the same results, said line circuit being of an entirely different character from that disclosed in my said co-pending application.

My invention herein is adapted for use more particularly in connection with a line circuit where the tip side of the plug controls the effacement of the line signal and the operation of coöperating cord circuit instrumentalities. In my said co-pending application the line circuit is of such a character that the functions above enumerated are accomplished through the agency of the sleeve side of the cord circuit. In those line circuits in which the tip side of the cord circuit is called upon to perform the functions aforesaid, it has hitherto been necessary in order to obtain a busy test to actuate a manually controlled key in order to obtain this busy test.

My present invention contemplates the provision of a cord circuit which, while operating in connection with the particular line circuit referred to, obtains the busy test conditions without the use of a key and at the same time is of such a character as to permit of the instantaneous disconnect and

recall features mentioned in my said co-pending application.

I will explain my invention as applied to one particular form of a line circuit more in detail by referring to the accompanying drawing illustrating the same diagrammatically. I believe a correct understanding of my invention will be best obtained by describing the steps gone through in actually making a connection and the operations which follow as a result therefrom.

In the illustration I have shown two substations A and B as entering an exchange C at which my improved cord or link circuit is diagrammatically shown. Assuming that the subscriber at the substation A actuates his switchhook 1 by removing the receiver, then a circuit is completed for the line relay 2 to thereby actuate the line lamp 3. This circuit passes through the windings of the differential relay 4 which however does not actuate its armature 5 on account of the differential nature of these windings. The insertion of the plug 6 causes an actuation of the relay 7 by way of the grounded winding of the relay 4, thus destroying the balance and causing it to attract its armature 5, thereby extinguishing the lamp 3 and energizing the relay 8. Thereupon relay 9 is operated also over the grounded winding of the relay 4, thus establishing a shunt circuit about the relay 7 and permitting it to release its armature. The relay 9 locks itself in position by way of the contact spring 10 as is clear. The operation of the relay 9 connects the operator's set 11 to the strands of the cord circuit. The operator is now in a position to test the called line through the use of the plug 12 without actuating any key or other manual apparatus. This test circuit can be traced from the tip of the plug through the upper winding of relay 13, by way of the contact spring 14, conductor 15, to the connection between magnet 16 and high resistance tertiary winding which is of high enough resistance to prevent operating relay 13. The test circuit is thus completed by way of one winding of the relay 13, which relay 13 subsequently serves the purpose of disconnecting certain cord circuit instrumentalities when the calling plug is inserted. The relay thus serves a dual purpose as will appear from the further description.

If the line extending to the substation B

is idle, the operator inserts the plug 12, thus energizing the relay 13, the circuit of said relay being completed by way of the grounded winding of the differential relay 18 of the called line, including in this circuit also the magnet 16 and the battery 17. The relay 13 thereupon locks itself in position through the battery 20 and the spring 14 by way of the winding of the relay 18 as will be clear. The operation of the relay 13 disconnects the operator's set as will be apparent. Actuation of the ringing key on the part of the operator momentarily actuates the end springs 21 of said ringing key, thereby closing a circuit for the relay 22 over the grounded spring 23. The actuation of the springs 21 also operates the meter 24. Relay 22 locks in its energized condition by way of the grounded spring 23. The operation of the relay 22 causes an actuation of the relay 32 whereby intermittent ringing current is sent out over the called line by the interrupter 25. Upon the response of the called subscriber at the substation B, relay 26 is actuated by way of the grounded winding of the differential relay 18. The operation of the relay 26 causes a restoration of the relay 22, thereupon causing a restoration of the relay 32, thus disconnecting the ringing circuit from the called line. Upon completion of the conversation, the restoration of the subscriber's apparatus at substation B causes a restoration of the relay 26 to thereby actuate the supervisory lamp 27 over the grounded contact spring 23. When the calling subscriber at the station A restores, the supervisory signal 28 is actuated likewise over the grounded spring 23, due to the restoration of the relay 8. A restoration of the switch hook 1 at the substation A also causes an actuation of the relay 29 by way of the grounded contact spring 23 due to the restoration of the relay 8. The relay 29 upon energizing locks the relay 9 in position over this same grounded spring 23. These two relays thus remain energized until the plug 12 is finally withdrawn from the jack. The actuation of the relay 29 disconnects the plug 6 entirely from the cord circuit at the contact springs 30 and 31 so that the calling line A after the restoration of the switchhook 1 is entirely free upon a subsequent reactuation of said switchhook to actuate the line lamp 3 even though the plug 6 may remain within the jack of the said calling line A.

From the above description it will be apparent that I am enabled to accomplish the instantaneous disconnect and recall features with a two conductor cord circuit, and also in connection with a line circuit in which the line apparatus is controlled by the tip of the plug instead of the sleeve, providing at the same time the necessary test conditions without the actuation of the manual switch ele-

ment other than the plug. The adaptability of my invention to other circuits will be clear.

Having however thus described one form which my invention may take, what I claim as new and desire to secure by Letters Patent is:

1. A telephone system comprising a telephone line having a line relay and a differentially wound cut-off relay, an operator controlled link circuit having a manual connection terminal for connecting with said line, said cut-off relay being controlled by said terminal, and means controlled at the substation of said line for operatively disconnecting said link circuit from said line.

2. A telephone system comprising a telephone line having a line relay and a differentially wound cut-off relay, an operator controlled link circuit having a manual connection terminal for connecting with said line, said cut-off relay being operated through only one of its windings and the tip contact of said terminal, and means controlled at the substation of said line for operatively disassociating said link circuit from said line, said means including a disconnect relay associated with said cord circuit controlled when said cord circuit is associated with said line by the restoration to normal of the substation apparatus of said line.

3. A telephone system comprising telephone lines having line and cut-off relays, jacks for said lines having tip and sleeve terminals, the cut-off relays having their initial operating circuits connected to the tip terminal of their respective jacks, an operator's cord circuit for connecting two said jacks, a source of energizing current for said cut-off relay connected to the tip conductor of the cord through a single wound relay, an operator's telephone, and means controlled by said single wound relay for connecting said operator's telephone to said cord circuit, a supervisory control relay connected to the sleeve conductor of the cord and controlled over a connected line, and a link disconnect relay for operatively disassociating said cord from the connected line operated by said sleeve supervisory relay when the line circuit is interrupted when disconnection is desired.

4. A telephone system comprising a two-conductor subscriber's line circuit, a cut-off relay for said subscriber's line normally connected to said conductors, subscriber controlled means for closing a circuit through the windings of said cut-off relay in series, an operator controlled link circuit for connecting with said line circuit, means responsive to the connection of said link circuit to said line circuit for opening the said circuit for said cut-off relay and for closing a substitute circuit for one winding

only of said relay, and means controlled at the substation of said line for operatively disassociating said link circuit from said line whereby said cut-off relay is deenergized.

5 5. A telephone system comprising a telephone line having a line relay and a double wound differential cut-off relay, a link circuit having a manual connection terminal for connecting with said line, subscriber controlled means for closing a circuit through said cut-off relay, means responsive to the connection of said manual terminal with said line for unbalancing the windings of the said cut-off relay thereby effectively energizing the same, and means controlled at the substation of said line for operatively disassociating said link circuit from said line.

20 6. A telephone system comprising a two-conductor subscriber's line circuit, a double wound cut-off relay for said line circuit having its windings normally connected to opposite ones of said conductors, an operator controlled link circuit provided with a manual connection terminal for connecting to said line circuit, means responsive to said connection for energizing said cut-off relay through the tip contact of said manual terminal, and a disconnect relay for said link circuit controllable by the subscriber at the substation of said line for operatively disassociating said link circuit from said line circuit.

35 7. A telephone system comprising a telephone line, a differentially wound cut-off relay for said telephone line, an operator controlled link circuit provided with a terminal for connecting with said telephone line, means responsive to such connection for operatively energizing said cut-off relay, and means controlled at the substation of said line for operatively disassociating said link circuit from said line whereby said line may recall before said terminal is disconnected from said line.

50 8. A telephone system including a subscriber's telephone line provided with a line relay and a double wound cut-off relay, a link circuit provided with a connection terminal for connecting with the said line, a pair of relays connected to contacts of said terminal, means responsive to the connection of said link circuit to said telephone line for energizing one winding of said cut-off relay and one of said last relays in a series circuit, means controlled by said relay for substituting another relay in said series circuit with said cut-off relays, and means controlled at the substation of said line for operatively disassociating said link circuit relays from said line whereby said cut-off relay operates to render said line relay operative to make recalls.

60 9. A telephone system comprising a tele-

phone line having a line relay and a double wound cut-off relay, a link circuit provided with a manual connection terminal for connecting with said line, means responsive to such connection for operatively energizing said double wound cut-off relay by energizing only one of its windings thereby deenergizing said line relay, contacts controlled by the energization of said cut-off relay to open the circuit of its other winding, and means controlled at the substation of said line for operatively disassociating said link circuit from said line.

10. A telephone system comprising a subscriber's line, a line relay and a cut-off relay each normally connected to a conductor of said subscriber's line, means for including said line relay in series circuit with said cut-off relay to signal for connection, a link circuit provided with a manual connection terminal for connecting to said line, means responsive to such connection for operatively energizing said cut-off relay thereby disconnecting said line relay from said line, and subscriber controlled means for deenergizing said cut-off relay thereby again connecting said line relay to said subscriber's line.

11. A telephone system comprising a subscriber's line provided with a line relay and a differentially wound cut-off relay, a link circuit provided with a connection terminal for connecting with said line, subscriber controlled means for energizing said line relay, means responsive to the connection of said terminal to said line for operating said cut-off relay, and subscriber controlled means for deenergizing said cut-off relay.

12. A telephone system comprising a subscriber's line provided with a differentially wound cut-off relay normally connected to a talking-conductor of said line, a line relay, a circuit including said cut-off relay and line relay in series, operator controlled means for operatively energizing said cut-off relay to disconnect said line relay, and subscriber controlled means for deenergizing said cut-off relay.

13. A telephone system including a subscriber's line, a cut-off relay and a line relay for said line, a circuit for said line relay including said cut-off relay and, with the substation set of said line, a link circuit provided with a connection terminal for connecting to said line, a local energizing circuit for said cut-off relay controlled by said connection of the terminal to the line, and subscriber controlled means for operatively disassociating said line and link circuit by opening said last circuit.

14. A telephone system including a subscriber's line terminating in multiple jacks at the exchange, a differentially wound cut-off relay normally connected to a conductor of said line and to a spring of said jacks, a

link circuit provided with a terminal for connection to said line, means for closing a circuit through the windings of said cut-off relay, means responsive to such connection
5 for unbalancing the windings of said cut-off relay to thereby cause an operative energization of the same, and substation controlled means for deenergizing said relay.

15 15. A telephone system including a subscriber's line having one of its conductors normally connected directly to a contact of a spring jack, a cut-off relay connected to said conductor, a line relay, a circuit including said cut-off relay and line relay in series,
15 operator controlled means for energizing said cut-off relay to disconnect said line relay, and subscriber controlled means for deenergizing said cut-off relay.

20 16. A telephone system including a subscriber's telephone line, a differential cut-off relay and a line relay for said line, a circuit for said line relay controllable over said telephone line and including the windings of said cut-off relay, an operator's link circuit provided with a manual connection terminal for connecting to said line, an energizing circuit for said cut-off relay including one of its windings and a contact of said manual connection terminal, and a relay for said

link circuit under substation control for
30 breaking said last circuit.

17. A telephone system including a subscriber's line, a double wound cut-off relay and a line relay for said line, subscriber controlled means for closing a series circuit
35 through the said cut-off relay, operator controlled means for opening the circuit of one of the windings of said cut-off relay to thereby operatively energize the same, and subscriber controlled means for afterward de-
40 energizing said cut-off relay.

18. A telephone system including a subscriber's line provided with a cut-off relay and a line relay, subscriber controlled means for closing a circuit through said cut-off
45 relay, operator controlled means for closing a substitute circuit for said cut-off relay whereby the same is operatively energized, and subscriber controlled means for thereafter deenergizing said cut-off relay.
50

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

HIRAM D. CURRIER.

Witnesses:

GEORGE E. MUELLER,
M. R. ROCHFORD.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

It is hereby certified that in Letters Patent No. 1,306,804, granted June 17, 1919, upon the application of Hiram D. Currier, of Chicago, Illinois, for an improvement in "Telephone Systems Having Instantaneous Disconnect and Recall," errors appear in the printed specification requiring correction as follows: Page 2, line 104, claim 3, for the word "two" read *to*; page 3, line 117, claim 13, strike out the word "with"; page 4, line 27, claim 16, for the word "includuing" read *including*; same page, line 40, claim 17, for the word "afterward" read *afterwards*; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 30th day of September, A. D., 1919.

[SEAL.]

M. H. COULSTON,

Acting Commissioner of Patents.