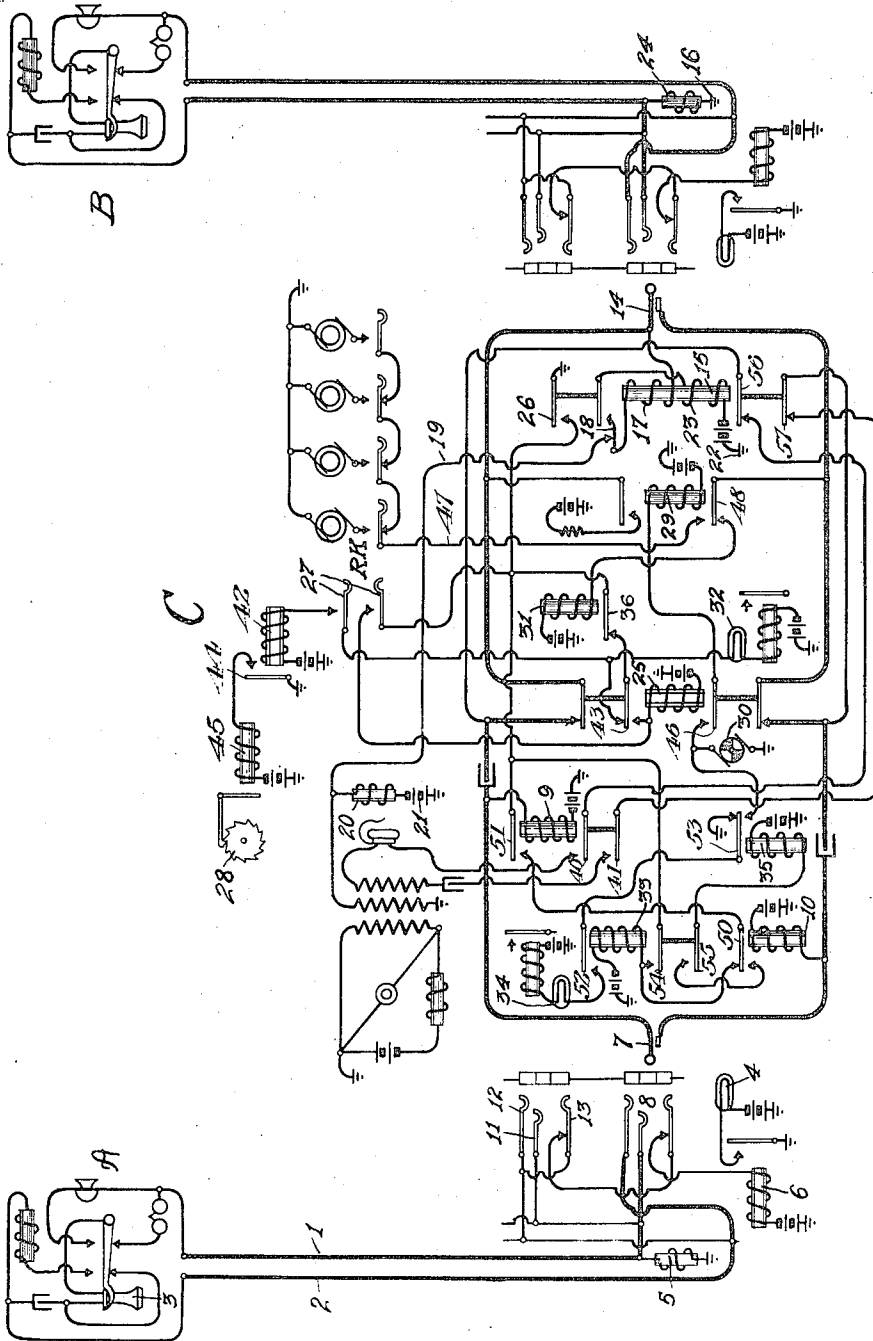


H. D. CURRIER.
 TELEPHONE SYSTEM WITH FLICKERING RECALL.
 APPLICATION FILED SEPT. 19, 1914.

1,438,170.

Patented Dec. 12, 1922.



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TELEPHONE SYSTEM WITH FLICKERING RECALL.

Application filed September 19, 1914. Serial No. 862,463.

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 with Flickering Recall, of which the following is a specification.

My invention relates to telephone systems and has for its object the provision of new and improved facilities for attracting the attention of the operator at an exchange should a subscriber desire the attention of the operator.

My invention in one embodiment for instance contemplates the provision of means whereby should a connected subscriber desire the attention of the operator, one movement of the switch hook under the control of said subscriber is sufficient to start in operation certain instrumentalities which convey to the operator an intermittent signal similar for instance to the signal which might be brought to the attention of the operator by the repeated flashing of the switch hook.

This particular form of the invention may be carried out by the use of an interrupter which after the switch hook of a connected line has been moved once, is placed in circuit to flash the clearing out lamp associated with the cord circuit so as to more readily attract the attention of the operator.

I will explain this particular form of carrying out my invention more in detail by referring to the accompanying drawing illustrating a telephone system diagrammatically to which my improved circuit arrangements have been applied. The circuit disclosed in this illustration while not one of the most used standard types of apparatus, yet however illustrates my invention and shows its availability for other circuits, I having chosen this particular system for illustration because of its being one of the first to which my improved arrangements have been applied.

I believe that the best way to describe my invention will be by tracing a connection as it is being made. The drawing in general represents two substations A and B and the central station C at which a link or cord circuit is shown adapted for interconnecting entering subscribers lines. The substation A

extends by means of line conductors 1 and 2 to the central station.

Assuming that the subscriber at the calling substation A is to initiate a call and the receiver 3 at the substation A to have been removed, this actuates the line lamp 4 over a circuit immediately understood and readily traced, this circuit including the coil 5 and the line relay 6. The operator at the central station noting the lighted line lamp 4 thereupon inserts the plug 7 into the jack 8, thereby energizing link circuit relays 9 and 10, the circuit of relay 9 being traced from battery through winding of said relay 9, tip contacts of the connected plug and jack to ground through the winding of coil 5. The circuit of relay 10 may be traced from battery through the winding of said relay 10 sleeve contacts of the connected plug and jack, through the closed contacts at the substation switch-hook and to ground through the winding of coil 5. The insertion of plug 7 into jack 8 opens the contact 13 of the jack bringing about the de-energization of line relay 6 thus effacing the line signal 4. It may be here pointed out that the jack spring 11 is adapted for association with the tip of the plug 7, and the springs 12 and 13 are adapted for association with the sleeve of the plug 7. The closing of alternate contacts 40 and 41 of relay 9 connects the operator's set O to the cord conductors enabling the operator to enquire the wants of the calling subscriber. The operator thereupon tests the called line, which in this instance is, assumed to be the line connected with substation B, and upon finding it idle inserts the plug 14 into the jack of the called line. The insertion of the plug 14 operates the relay 15 whose circuit can be traced from the ground at 16 through winding of coil 24, tip contacts of the connected plug and jack, the winding 17 of the relay 15, spring 18, conductor 19, coil 20 and through battery 21 to ground. Thereupon the relay 15 is locked up, the locking circuit from said relay being traced from ground at 22, through battery, through the winding 23 of said relay, alternate contact springs 18, winding 17 of said relay, tip of the plug 14, through coil 24 and to ground at 16. The opening of normal contacts 56 and 57 of relay 15 upon its actuation disconnects the operator's set O from the cord conductors pre-

venting the operator from connecting with this cord C.

The operator thereupon actuates the ringing key RK which completes a circuit for the relay 25 traced from battery through the winding of relay 25, now closed contact 27 of end springs of the ringing key to the grounded spring 26 of relay 15. The end springs 27 of the ringing key are of course only momentarily closed. The operation of the ringing key also operates the meter 28 traced from battery through the meter relay 42 the closed contact 27 of the end springs, normal contact 43 of relay 25, normal contact 36 of relay 31 and to ground at alternate contact 26 of relay 15. Meter relay 42 closes its alternate contact 44 to energize meter magnet 45 to operate the meter 28 once. After the initial actuation of the relay 25, it is locked in its energized condition by way of its alternate contact 43, normal contact 36 of relay 31, to the grounded spring 26 of relay 15. The operation of the relay 25 closes its alternate contact 46 to establish an energizing circuit for interrupter relay 29 traced from battery through the winding of the said relay 29, alternate contact 46 of relay 25 to ground at interrupter 30. The relay 29 is thus intermittently energized and de-energized by the interrupter 30 to connect and disconnect ringing conductor 47 to alternate contact 48 of relay 29, thereby maintaining an interrupter ringing circuit for the called substation B. The response of the subscriber at the station B causes the actuation of relay 31, over a circuit traced from battery through the winding of the said relay 31, normal contact 48 of relay 29 (when said relay is in its de-energized position) sleeve contacts of the connected plug and jack, the now closed contacts of the switch-hook at the substation B to ground through the winding of coil 24. The opening of normal contact 36 of relay 31 opens the circuit of the relay 25. The relay 25, upon restoration, opens the circuit of the relay 29 at contact 46, the said relay 25 causing the relay 29 to restore, thus disconnecting the ringing lead 47 from the tip conductor of the cord circuit C.

After the completion of the conversation, the restoration of the receiver at the station B permits restoration of the relay 31, due to the opening of the switch-hook contacts. The restoration of relay 31 closes an energizing circuit for supervisory lamp 32 traced from battery through the pilot relay, lamp 32, normal contact 43 of relay 25, normal contact 36 of relay 31 to ground at alternate contact 26 of relay 15, thereby lighting the supervisory lamp 32. Upon the restoration of the receiver at the station A, relay 33 is actuated on account of the restoration of the relay 10 due to the opening of the switch-hook contacts at the substation, the

circuit for the relay 33 being traced from battery through the winding of said relay 33, normal contact 50 of relay 10, alternate contact 51 of relay 9 (relay 9 remaining energized as long as the plug 7 remains in the jack 8) to ground at alternate contact 26. Due to the energization of relay 33 its alternate contact 52 is closed thereby lighting the supervisory lamp 34 over a circuit traced from battery through the pilot relay, supervisory lamp 34, alternate contact 52 of relay 33 to ground at normal contact 53 of relay 35. The relay 33 thereupon is locked in its energized condition over a circuit traced from battery through the winding of said relay 33, its alternate contact 54 to the grounded spring 26 of relay 15. The operator noting the two lighted supervisory signals 32 and 34 knows that conversation has terminated and removes the plugs from the connected jacks opening the circuit of relays 9, 15 and 33. Relay 15 restoring opens the energizing locking circuit for relay 33 at contact 26 allowing the said relay 33 to restore. The apparatus of the cord circuit is now at normal and available for establishing other connections. Assuming now that the subscriber at the station A wishes to recall, before the operator has removed the answering and calling trunk circuit plugs from the jacks of the calling and called lines, no winking of the switch-hook is necessary, the only act necessary being the removal of the receiver 3 which again causes the energization of the relay 10, thereby actuating the relay 35 from battery through the winding of relay 35, alternate contact 50 of relay 10, alternate contact 51 to ground at alternate contact 26. The actuation of the relay 35 completes a circuit from the interrupter 30 through the clearing out lamp 34, traced from battery through the pilot relay, the lamp 34, alternate contact 52, of relay 33, alternate contact 53 of relay 35 to ground at interrupter 30, thus intermittently lighting and extinguishing this lamp 34 to convey a positive signal to the operator that the substation A is desirous of recalling. The operator in re-establishing another connection with another called line with the plug 14 removes the plug 14 from the previously connected jack and the withdrawal of the plug 14 then restores relay 15 opening the alternate contact 26 to break the ground connection at spring 26 to thereby restore relays 33 and 35. The withdrawal of the plug 14 to re-establish another connection with another line brings about circuit changes in the cord circuit C as previously described in connection with the called substation B, and further description is not necessary.

From this specific description of one form of the invention its nature will undoubtedly

be clear to those skilled in the art, and it will also be clear that changes and modifications herein can be readily made without departing from the spirit of my invention.

5 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. In a telephone system the combination
10 with a telephone line of a substation switch for controlling the circuit thereof, a supervisory lamp located at a central exchange, a plurality of circuits for said lamp, means responsive to an operation of said substation switch to close one of said circuits thereby causing said supervisory lamp to glow continuously, and means responsive to a single subsequent operation of said substation switch to close another of said circuits thereby causing said supervisory lamp to be intermittently operated.

2. In a telephone system the combination with a telephone line and a substation switch for controlling the circuit thereof, a supervisory lamp located at a central exchange, a plurality of circuits for said lamp, means responsive to an operation of said substation switch to close one of said circuits thereby causing said supervisory lamp to glow continuously, and means responsive to a subsequent operation of said substation switch to close another of said circuits thereby causing said supervisory lamp to be intermittently operated, said last circuit including an interrupter to cause said intermittent operation.

3. In a telephone system the combination with a telephone line and a substation switch for controlling its circuit, of a signal located
40 at a central exchange, means including a supervisory relay controlled by an operation of said substation switch to cause a continual actuation of said signal, and means controlled by a subsequent single actuation of said substation switch to cause an intermittent operation of said signal, said last means comprising an interrupter and a circuit changing relay for controlling its association with said signal, the circuit of the coil
50 of said circuit changing relay being completed thru normally open contacts of said supervisory relay.

4. A telephone system comprising a subscriber's telephone line, a substation switch
55 for bridging a transmitter across said telephone line, a signal located at the central exchange but under substation control, a relay adapted to be operated responsive to the opening of said bridged circuit to close a continuously operating circuit for said signal, and a second relay responsive to the closure of said bridged circuit to switch said signal to a periodically operating circuit.

5. A telephone system comprising a subscriber's line, a link circuit provided with a

terminal for connecting said line with said link circuit, a signal for said link circuit, a supervisory relay in the link circuit responsive to the replacement of the receiver at the subscriber's substation for causing a
70 continual operation of said signal, and a circuit changing relay responsive to a second energization of said supervisory relay to cause a periodic operation of said signal.

6. A telephone system comprising a subscriber's telephone line, a supervisory signal located at a central exchange, a substation switch for conductively uniting and disuniting the line limbs of said telephone line, a relay responsive to the opening of said
80 line by said switch to close a continuously operating circuit for said signal, and a second relay responsive to a subsequent closure of said line by said switch to switch said signal to an intermittently operating circuit.

7. In a telephone system the combination with a cord circuit, of a subscriber controlled supervisory relay, a locking relay, an operator's listening switch having auxiliary contacts, an operating circuit for said
90 locking relay extending thru said auxiliary contacts of said listening switch, a locking circuit for said relay independent of the auxiliary contacts of said listening switch, and a flashing recall signal controlled by
95 said locking relay and said supervisory relay, whereby the recall signal is displayed upon the second energization of said supervisory relay, and a disconnect signal is displayed upon the first de-energization of said
100 supervisory relay.

8. A telephone system including a subscriber's line, a cord circuit for connection thereto, a supervisory relay, a supervisory signal, a second relay adapted to follow the
105 operations of said supervisory relay after said supervisory relay has been once energized and de-energized, and circuit means for said supervisory signal controlled by said second relay to cause a continuous operation of said supervisory signal to denote a disconnect, and an intermittent operation of said supervisory signal to denote a recall.

9. In a recall indicating telephone system, a cord circuit, an operator's circuit, a listening switch, a pair of auxiliary contacts on
115 said listening switch, a supervisory signal, an automatic circuit interrupter, a locking relay having its initial operating circuit passing through said auxiliary contacts and
120 contacts of said locking relay in the circuit of said interrupter and said signal.

10. In a telephone system the combination with a telephone line, of a cord circuit for connection with said line, an operator's
125 circuit for connection with the cord circuit, a switch for connecting the operator's circuit with the cord circuit, a pair of auxiliary operator's switch contacts, an answering supervisory signal subject to two different
130

indications, a locking relay for establishing a circuit condition for one of said indications, and an operating circuit for said locking relay passing through said auxiliary contacts of said listening switch.

11. In a telephone system the combination with a telephone line terminating in a jack at the central office, a cord circuit terminating in a plug, a supervisory signal, means to display said signal in two different ways to indicate either a disconnect or a recall, a relay controlling the different display conditions for said signal, a supervisory relay having its circuit extending through contacts of said plug and jack, controlling the operative condition of said first relay, the initial operating circuit for said first relay being local to the cord circuit.

12. In a telephone system the combination with a telephone line terminating in a jack at the central office, a cord circuit terminating in a plug, a supervisory signal, means to display said signal in two different ways to indicate either a disconnect or a recall, a relay controlling the different display conditions for said signal, a supervisory relay having its circuit extending through contacts of said plug and jack, controlling the operative condition of said first relay the initial operating circuit for said first relay being individual to the cord circuit.

13. In a telephone system the combination with a telephone line terminating in a jack at the central office, a cord circuit terminating in a plug, a supervisory signal, means to display said signal in two different ways to indicate either a disconnect or a recall, a relay controlling the different display conditions for said signal, a supervisory relay having its circuit extending through contacts of said plug and jack, controlling the operative condition of said first relay, the initial operating circuit for said first relay being independent of contacts of the plug and jack.

14. In a telephone system the combination with a telephone line and a link circuit connected thereto, of a signal for the link circuit having two display indications, one for a disconnect and the other for a recall, and a locking relay for use in controlling the character of the display of said signal, both the actuating and the holding circuits for said locking relay being independent of conductors individual to said telephone line.

15. In a telephone system the combination with a telephone line and an exchange, and a link circuit connected to said line, of a signal for the link circuit having two display indications, one for a disconnect and the other for a recall, a locking relay for use in controlling the character of the display of said signal, both the actuating and the holding circuit for said locking relay being

local to the exchange and a normally open listening switch contact in the circuit of said locking relay.

16. In a telephone system the combination with a telephone line and a link circuit connected thereto, of a signal for the link circuit having two display indications, one for a disconnect and the other for a recall, and a locking relay and an auxiliary relay for use in controlling the character of the display of said signal, both the actuating and the holding circuit for said locking relay being individual to said link circuit.

17. In a telephone system the combination with a telephone line and a link circuit connected thereto, of a signal for the link circuit having two display indications, one for a disconnect and the other for a recall, a locking relay for use in controlling the character of the display of said signal, the locking circuit for said locking relay being independent of the line conductors of the telephone line, and an auxiliary relay controlled by said locking relay.

18. In a telephone system including an exchange, the combination with a telephone line and a link circuit connected thereto, of a signal for the link circuit having two display indications, one for a disconnect and the other for a recall, a relay for controlling the character of the display of said signal, and a locking relay controlling said first relay, the locking circuit for said locking relay being individual to said telephone exchange.

19. In a central telephone exchange system the combination with a telephone line and a link circuit connected thereto, of a signal for the link circuit having two display indications, one for a disconnect and the other for a recall, a relay for controlling the character of the display of said signal, and a supervisory relay and a locking relay for controlling said first relay, the actuating circuit for said locking relay being local to the central exchange.

20. In a telephone system the combination with a cord circuit, of an interrupter mechanism, a locking relay, a subscriber controlled supervisory relay, an operator's listening switch, a pair of normally open auxiliary contacts for said listening switch, a supervisory signal, an interrupter mechanism, said locking relay controlling the effective connection of said interrupter mechanism with said signal, said supervisory relay serving upon its first deenergization to cause the locking circuit of said locking relay to be closed, which is independent of said listening switch contacts, said supervisory relay serving upon a reenergization to complete a circuit for operatively associating said interrupter with said signal.

21. In a telephone system the combination with a link circuit, a supervisory signal, two

circuits for said signal having means therein providing two different display indications, a switching relay having normal contacts for completing the circuit for said signal when one indication is desired, and abnormal contacts for completing the circuit of said signal when the other indication is desired, and a subscriber operated relay having a pair of normally open contacts which, when closed, complete an energizing circuit for said relay.

22. In a telephone system the combination with a link circuit, a supervisory signal, two circuits for said signal having means therein providing two different display indications, a switching relay having normal contacts for completing the circuit for said signal when one indication is desired, and abnormal contacts for completing the circuit of said signal when the other indication is desired, and a subscriber operated relay having a pair of contacts closed upon the energization of said relay, which, when opened, may interrupt an energizing circuit for said switching relay.

23. In a telephone system the combination with a telephone line, of a cord circuit for connection therewith, a relay for the cord circuit having its circuit completed by the connection of the cord with the line, a second relay for the cord circuit having its circuit completed thru the subscriber's instrument of said line, a supervisory signal placed under control of the subscriber by the actuation of the first of said relays and thereafter controlled by the subscriber thru the actuated or unactuated condition of the second of said relays, a pair of energizing circuits for said signal for producing different display indications in said signal means responsive to the first deenergization of said subscriber controlled relay for closing one of the display circuits for said signal, and means responsive to a subsequent energization of said subscriber controlled relay for closing the other display circuit for said signal.

24. In a telephone system the combination with a telephone line, of a cord circuit for connection therewith, a pair of relays for the cord circuit, one under the control of the operator and the other under the control of the subscriber on said telephone line, a supervisory signal jointly controlled by said relays, and a third relay jointly controlled by said first relays for determining the character of display of said signal.

25. In a telephone system the combination with a telephone line, of a cord circuit for connection therewith, a pair of relays, and a source of current associated with said cord circuit and adapted to be placed in bridge of said telephone line by the connection of the cord with the line, one of said relays being under the control of the opera-

tor and the other of said relays being under the control of the subscriber on said line, a supervisory signal, and a third relay under the joint control of said relays and controlling the circuit of said supervisory signal, so as to provide two different displays, one for indicating a disconnect and the other for indicating a recall.

26. In a telephone exchange system, a telephone line, a link circuit connected therewith, a supervisory relay for the link circuit, a signaling device, an operating circuit therefor established upon the de-energization of the supervisory relay, a normally ineffective intermittent operating circuit for the signaling device, a second relay energized upon the de-energization of the supervisory relay, and a third relay operating while the supervisory and second relays are energized to render the first operating circuit ineffective and the second effective.

27. In a telephone exchange system, a telephone line, a link circuit connected therewith, a supervisory relay for the link circuit, a signaling device, an operating circuit therefor established by the de-energization of the supervisory relay, a second operating circuit for the signaling device, interrupter mechanism in the second operating circuit, and a relay conditioned for operation upon the de-energization of the supervisory relay and operated upon the subsequent energization thereof to open the first and close the second operating circuit.

28. In a telephone exchange system, a telephone line, a link circuit connected therewith, a supervisory relay for the link circuit, a signaling device, an operating circuit therefor established upon the de-energization of the supervisory relay, interrupter mechanism, a relay conditioned for operation upon the de-energization of the supervisory relay and operated upon the subsequent energization thereof, and a second operating circuit for the signaling device established upon the operation of the second mentioned relay and including the interrupter mechanism.

29. In a telephone exchange system, a telephone line, a link circuit connected therewith, a supervisory relay for the link circuit, a signaling device, an operating circuit therefor established upon the de-energization of the supervisory relay, interrupter mechanism, and a relay conditioned for operation upon the de-energization of the supervisory relay and actuated upon the subsequent energization thereof to connect the interrupter mechanism in circuit with the signaling device to cause the intermittent operation thereof.

30. In a telephone exchange system, calling and called subscribers' lines, a link circuit connecting said lines, a circuit, a signaling device and interrupter mechanism

adapted to be serially included in said circuit, and means controlled by the restoration to and the subsequent removal from its hook of the receiver at the calling station
5 for completing the circuit through the interrupter mechanism and the signaling device.

31. In a telephone exchange system, calling and called subscribers' lines, a link circuit
10 connecting said lines, a supervisory relay, a signaling device, interrupter mechanism, and a relay conditioned for operation upon the de-energization of the supervisory relay and operated upon the subsequent energiza-
15 tion thereof to connect the interrupter mechanism in circuit with the signaling device.

32. In a telephone exchange system, subscribers' lines, a link circuit having one end
20 connected to a subscriber's line, a supervisory relay associated with the link circuit and controlled from a connected substation, a signaling device, interrupter mechanism, a primary relay conditioned for operation
25 upon the connection of the other end of the link circuit with another subscriber's line and operated upon the de-energization of the supervisory relay, and a secondary relay operated upon the subsequent energization
30 of the supervisory relay to include the interrupter mechanism in circuit with the signaling device.

33. In a telephone exchange system, calling and called subscribers' lines, a link circuit
35 connected with the calling line, a signaling device associated with the link circuit, interrupter mechanism, a relay conditioned for operation when the link circuit is connected with a called line and operated upon
40 the restoration of the receiver to the switchhook by the calling subscriber, and a second relay operated upon the subsequent removal of the receiver from the switch-hook by the calling subscriber for including the inter-
45 rupter mechanism in circuit with the signaling device.

34. In a telephone exchange system, calling and called subscribers' lines, a link circuit
50 for connecting the lines, a signaling device individual to and in the link circuit, interrupter mechanism serving when in circuit with the signaling device to cause intermittent operation thereof, and means jointly
55 controlled by the operator in connecting the link circuit with the called line and the restoration to and the subsequent removal from its hook of the receiver at the calling station for including the interrupter mechanism in circuit with the signaling device.

35. In a telephone exchange system, calling and called subscribers' lines, a link circuit
60 for interconnecting said lines, recall signaling means associated with the answering end of said link circuit, and two relays
35 adapted to co-operate to cause said recall

signaling means to operate to present a signal, one of said relays being actuated during connection of said link with a calling line over a circuit including a portion of a talking strand of said link, and the actuation
70 of said other relay being controlled from the calling substation, said recall signaling means being conditioned for operation by the restoration of the calling subscriber's receiver to the switchhook and operated by
75 a subsequent removal thereof.

36. In a telephone exchange system, calling and called subscribers' lines, a link circuit for interconnecting the lines, a signaling device, interrupter mechanism, an operating circuit for the signaling device and the interrupter mechanism, a primary relay energized upon the connection of the link circuit with one of the lines over a path including a portion of a talking strand of the
85 link circuit, a supervisory relay in the link circuit and controlled over the connected line, and a secondary relay energized when the primary relay is energized and the supervisory relay is de-energized to close a
90 break in the operating circuit, the subsequent energization of the supervisory relay causing the signaling device to operate intermittently.

37. In a telephone exchange system, calling and called subscribers' lines, a link circuit
95 for interconnecting said lines, flashing signaling means associated with the answering end of said link circuit, a central source of current, and two relays cooperating when energized to start and continue the operation of said flashing signaling means to present a signal, one of said relays being energized from said source upon the connection
100 of said link with said calling line over a path including a portion of a talking strand of said link circuit, the other of said relays being energized from said source over a path including a portion of said link and the
105 calling line.

38. In a telephone exchange system, calling and called subscribers' lines, a two wire link circuit connecting the lines, a supervisory signaling device, interrupter mechanism, a source of current, a supervisory relay controlled from a connected station and when de-energized connecting the source of current in circuit with the supervisory signaling device to cause continuous operation thereof to furnish a disconnect signal, and a
110 relay operated by the deenergization of the supervisory relay to partially associate the signaling device, the interrupter mechanism and the source of current, the subsequent energization of the supervisory relay causing
115 the completion of said association whereby the supervisory signaling device is caused to operate intermittently to furnish a recall signal.

39. In a telephone exchange system, call- 120

ing and called subscribers' lines, a link circuit for interconnecting said lines, flashing signaling means associated with the answering end of said link circuit, a central source of current, two relays co-operating when energized to start and continue the operation of said flashing signaling means to furnish a signal, one of said relays being energized from said source upon connection of said link with said calling line over a path including a portion of a talking strand of said link circuit, the other of said relays being energized from said source over a path including a portion of said link and the calling line, and operator controlled means for effacing said signal.

40. A telephone system including a subscriber's line, a link circuit for connection thereto, an electromagnetic device and a signal for said link circuit, and a relay for said link circuit controlled over said subscriber's line for controlling said device and signal, said signal being actuated continuously when disconnection is desired and said device actuated intermittently when a recall is desired.

41. A telephone system including a subscriber's telephone line, a link circuit for connection thereto, an electromagnetically operated device for said link circuit, a signal for said link circuit, a relay for said link circuit, subscriber controlled means for actuating said relay, means controlled by said relay to cause a continuous operation of said electromagnetically operated device when disconnection is signaled for and to cause an automatic intermittent operation of said signal when a recall is signaled for.

42. A telephone system including a subscriber's telephone line, an operator's cord circuit for connection thereto, a relay for said cord circuit controlled over the subscriber's line, a supervisory device for said cord circuit, an electromagnetically operated device, and means controlled by said relay when the subscriber signals for disconnection to cause said supervisory device to operate continuously to denote disconnection and for causing an intermittent operation of said electromagnetically operated device to denote a recall.

43. A telephone system including a calling subscriber's telephone line, an operator's link circuit for connection thereto to extend a connection therefrom, a supervisory relay for said link circuit controlled over said subscriber's line, an operator's circuit, a listening switch for connecting said operator's circuit to said subscriber's line, an auxiliary contact for said listening switch, a locking relay having a circuit extending through said auxiliary contact, an answering supervisory signal, an electromagnetically operated device, means controlled by said supervisory relay and said

locking relay for causing a continuous operation of said supervisory signal to denote a disconnection and to cause an intermittent actuation of said electromagnetically operated device to denote a recall.

44. A telephone system including a subscriber's telephone line provided with an answering terminal, a cord circuit provided with an answering terminal for connection to said line via said line answering terminal, a signal for said cord circuit, means controlled at the subscriber's substation for causing a continuous operation of said signal when disconnection is desired and an intermittent operation of said signal when a recall is desired, operator controlled means for seizing said recall prior to the disconnection of the cord circuit terminal from the subscriber's line terminal, a called subscriber's line, and a signal for indicating when the called subscriber is being signaled.

45. A telephone system including a subscriber's telephone line, a link circuit having a manual terminal for connection to said telephone line, a supervisory device, means associated with said link circuit for causing the supervisory device to operate continuously to furnish a disconnect signal and intermittently to furnish a recall signal, operator controlled means for seizing said recall prior to a disconnection of said link circuit terminal from said subscriber's line, a called line, means for signaling the called subscriber, and a signal for indicating when the called subscriber is being signaled.

46. A telephone system including a calling and a called subscriber's line, a link circuit connecting said lines, a supervisory signaling device, a plurality of relays associated with said link circuit for causing the supervisory device to operate continuously to furnish a disconnection signal and intermittently to furnish a recall signal, and operator controlled means for seizing said recall prior to disconnection of said link circuit from said calling subscriber's line.

47. A telephone system including a subscriber's telephone line, a link circuit for connection thereto, a supervisory signal for said link circuit, a relay having a self-locking contact, a supervisory relay controlling a contact in the circuit of said first relay, means controlled by said relays for causing the continuous operation of said supervisory signal to denote a disconnection and an intermittent operation of said signal to denote a recall, said means including an interrupter for causing said intermittent operation, and a third relay having a contact in the interrupter lead extending from the interrupter.

48. A telephone system including a subscriber's telephone line, a link circuit for connecting thereto, a supervisory signal for said link circuit, a self-locking relay having

a winding normally connected to a strand of said link circuit, a supervisory relay, a circuit for said supervisory relay controlled over the subscriber's line, and means controlled by said relays for causing a continuous operation of said supervisory signal to denote a disconnection and an intermittent operation of said supervisory signal to denote a recall.

49. A telephone system including a calling and a called subscriber's telephone line, a link circuit for connecting said lines in conversational circuit, recall signaling means associated with the answering end of said link circuit, and two relays adapted to co-operate to cause said recall signaling means to operate to present a signal, one of said relays being actuated during connection of said link with a calling line over a circuit including a strand of said link, said relay being normally connected to said strand, the actuation of the other relay being controlled from the calling substation, said recall signaling means being conditioned for operation by the restoration of the calling subscriber's receiver to the switch hook and operated by a subsequent removal thereof.

50. A telephone system including a calling subscriber's telephone line, a link circuit for connection with said line, flashing signaling means associated with said link circuit, a plural contact plug, two relays co-operating to start and continue the operation of said flashing signaling means to present said signal, one of said relays being normally connected to a contact of said plug and provided with a circuit including said contact, the other of said relays being energized over said subscriber's telephone line, and a third relay controlled by said second relay, said third relay following the operations of said second relay.

51. A telephone system including a subscriber's telephone line, a link circuit connected thereto, a supervisory relay for the link circuit, a signaling device, means controlled by the de-energization of said supervisory relay to cause an actuation of said signaling device, interrupter mechanism, a relay conditioned for operation upon the de-energization of the supervisory relay and operated upon the subsequent energization thereof, and means controlled by said second relay for associating said interrupter mechanism with said signaling device to cause an intermittent actuation thereof.

52. A telephone exchange system including a calling and a called subscriber's line, a link circuit connecting said lines, a supervisory relay, a signaling device, interrupter mechanism and a relay conditioned for operation upon the de-energization of the supervisory-relay and operated upon the subsequent energization thereof to associate the

interrupter mechanism with said signaling device.

53. In a telephone exchange system, a calling and a called subscriber's line, a link circuit for connecting said lines, a signaling device for said link circuit, interrupter mechanism serving when associated with the signaling device to cause an intermittent actuation thereof, and means jointly controlled by the operator and the restoration to and the subsequent removal of the receiver from its switch hook at the calling substation for associating the interrupter mechanism with the signaling device, said means including a relay conditioned for operation by the de-energization of said supervisory relay and actuated by the subsequent energization of said relay.

54. A telephone system including a telephone line terminating in a jack at the central office, a cord circuit terminating in a plug for connection to said line via said jack, a supervisory signal means to display said signal in two different ways to indicate either a disconnection or a recall, relay means controlling the different display conditions of said signal, a supervisory relay having its circuit extending through contacts of said plug and jack and controlled over the telephone line, said supervisory relay exercising a control over said relay means which includes a relay conditioned for operation by a de-energization of said supervisory relay, the circuits for said relay means being local to the central office.

55. In a telephone system including a central exchange, the combination of a cord circuit connected to a subscriber's line, a signal for the cord circuit, an electromagnetically controlled device, a locking relay for controlling the operation of said signal and device, both the actuating and locking circuits for said locking relay being local to the central exchange, and means controlled by said locking relay for actuating said supervisory signal to indicate a disconnection and to actuate said device to indicate a recall.

56. In a telephone system the combination with a telephone line and a link circuit connected thereto, of a signal for the link circuit having two display indications, one for a disconnect and the other for a recall, a locking relay and a second relay for controlling the character of the display of said signal, an actuating and a holding circuit for said locking relay local to the exchange, and a circuit for said second relay conditioned for operation by said locking relay.

57. In a telephone system the combination with a telephone line and a link circuit connected thereto, of a signal for the link circuit having a recall display indication, a locking relay and a second relay for controlling the recall display of said signal,

the locking circuit for said locking relay being independent of the line conductors of the telephone line, and a circuit for said second relay conditioned for operation by said locking relay.

58. In a telephone system the combination with a telephone line and a link circuit connected thereto, of a signal for the cord circuit having a recall display indication, a locking relay and a second relay for controlling the recall display of said signal, a supervisory relay controlling a contact in the circuit of said locking relay, said locking relay operating said second relay upon a second energization of said supervisory relay.

59. In a telephone system the combination with a telephone line, of a cord circuit for connection therewith, a pair of relays, a source of current associated with said cord circuit and placed in bridge of said telephone line by the connection of the cord with the line, one of said relays being under the control, of the operator and the other of said relays being under the control of the subscriber on said line, a supervisory signal under the joint control of said relays and operating to provide two different displays, one for indicating a disconnect and the other for indicating a recall, and means controlled by the operator for restoring the supervisory signal to normal when it displays a recall.

60. A telephone system including subscribers' telephone lines, a cord circuit for interconnecting said lines, a signal for said cord circuit, a supervisory relay controlled over a connected subscriber's line, a locking relay having a circuit controlled by said supervisory relay, a third relay conditioned for operation by said locking relay, and means controlled by said third relay for causing an intermittent operation of said signal, said third relay following the operations of said supervisory relay.

61. A telephone system including subscribers' telephone lines, a cord circuit for interconnecting said lines, a signal for said cord circuit, a supervisory relay controlled over a connected subscriber's line, a locking relay having a circuit controlled by said supervisory relay, a third relay conditioned for operation by said locking relay and actuated by a subsequent energization of said supervisory relay, and means set in operation by said third relay for intermittently operating said signal.

62. In a telephone system, the combination of a subscriber's line circuit connected with a central office link circuit, a signal for said link circuit, a substitution switch for said line circuit, relay means responsive to an actuation of said substitution switch to cause said signal to glow continuously, said relay means being responsive to a subsequent operation

of said substitution switch to cause an automatic intermittent operation of said signal, and responsive to a further actuation of said substitution switch to again cause a continuous operation of said signal.

63. A telephone system including a subscriber's line circuit having a substitution switch, a link circuit for connection with said line circuit, a signal for said link circuit, relay means for said link circuit responsive to one actuation of said substitution switch to cause a continuous actuation of said signal, responsive to a subsequent actuation of said switch, to cause an automatic intermittent operation of said signal, and responsive to a further actuation of said substitution switch to cause a continuous actuation of said signal.

64. A telephone system including a subscriber's line circuit having a substitution switch, a central office link circuit for connection with said line circuit, a signal for said link circuit, relay means for said link circuit including a relay controlling different displays of said signal, said relay means also including a relay responsive to the actuation of said substitution switch to cause different actuations of said first relay, thereby causing different displays of said signal, means rendering said first relay unresponsive to a first energization of said second relay, and a manually actuated operator's switch to render said first relay operable responsive to the second.

65. A telephone system including a subscriber's telephone line, a link circuit for connection thereto, a supervisory signal, a relay for causing different displays of said supervisory signal, a relay controlled over the subscriber's line circuit for causing different actuations of said first relay, thereby causing the different display indications of said signal and operator's listening means to place said first relay under control of the second.

66. A telephone system including a subscriber's line circuit, a link circuit for connection thereto, a signal for said link circuit, a relay for causing a continuous operation of said signal, also for causing a subsequent automatic intermittent operation of said signal, and for causing a subsequent continuous operation of said signal, and a relay controlled over the subscriber's line circuit for controlling said first relay.

67. A telephone system including a subscriber's line circuit connected with a central office link circuit, a signal for said link circuit, a supervisory relay controlled over the subscriber's line circuit, a second relay unaffected by the first actuation of the said supervisory relay but adapted to follow the subsequent operations of said supervisory relay to cause either a continuous actuation or an automatic intermittent actuation of said signal at the will of the subscriber.

68. A telephone system including a subscriber's line circuit connected with a central office link circuit, a signal for said link circuit, a relay controlled over said subscriber's line circuit, a locking relay controlled by said first relay, and a third relay controlled by said two relays for causing the continuous operation of said signal to denote a disconnect and an intermittent operation of said signal to denote a recall.

69. A telephone system including a subscriber's line circuit connected with a central office link circuit, a signal for said link circuit, a relay controlled over said subscriber's line circuit, a locking relay controlled by said first relay, and a third relay controlled by said two relays for causing the continuous operation of said signal to denote a disconnect and an intermittent operation of said signal to denote a recall, said third relay responsive to the actuation of said first relay when said locking relay is in its energized condition.

70. A telephone system including a calling subscriber's telephone line, a link circuit for connection thereto, a supervisory relay controlled over said subscriber's line circuit, a signal for said link circuit, a locking relay controlled by the supervisory relay, and a third relay adapted to follow the operation of said supervisory relay after the actuation of said locking relay, said third relay being operable to cause a continuous operation of said signal to denote a disconnect and an automatic intermittent operation of said signal to denote a recall.

71. In a telephone exchange system, a telephone line, a link circuit connected therewith, a supervisory relay for the link circuit, a signaling device, an operating circuit therefor established by the de-energization of the supervisory relay, another circuit for controlling the device, interrupter mechanism in the other circuit, and a relay conditioned for operation upon the de-energization of the supervisory relay and operated on the subsequent energization thereof to render the second circuit effective.

72. In a telephone system, a telephone line, a link circuit connected therewith, a supervisory relay for the link circuit, a signaling device, an operating circuit therefor, established upon the de-energization of the supervisory relay, interrupter mechanism, a relay conditioned for operation upon the de-energization of the supervisory relay and actuated upon the subsequent energization thereof, to connect the interrupter mechanism to cause the intermittent operation of said signaling device.

73. In a telephone exchange system, calling and called subscribers' lines, a link circuit connecting said lines, a supervisory relay, a signaling device, interrupter mechanism, and a relay conditioned for operation

upon the de-energization of the supervisory relay and operated upon the subsequent energization thereof to operatively associate the interrupter mechanism with said signaling device.

74. In a telephone system, the combination of a line circuit connected with a central office link circuit, of a switch for said line circuit, signaling means associated with said link circuit, relay means responsive to an actuation of said switch to cause a steady signal, said relay means being responsive to a subsequent operation of said switch to cause an automatically intermittent signal and responsive to a further actuation of said switch to cause a steady signal.

75. A telephone system including a subscriber's line circuit connected with a central office link circuit, a signal responding to circuit conditions of said link circuit, a relay controlled over said subscriber's line circuit, a second relay, a listening switch, said second relay initially energized over a circuit including a contact of said switch, a locking circuit for said second relay, and a switch contact of said first relay whereby the locked or unlocked condition of said second relay is controlled by said first relay, and means jointly controlled by said two relays for causing automatically repeated operations of said signal to denote a recall.

76. A telephone system including a telephone line circuit connected with a central office link circuit, a relay controlled over said line circuit, a second relay having its operative condition changed responsive to de-energization of said first relay, its condition remaining unchanged on re-operation of said relay, contacts for said first two relays, a third relay and a circuit therefor including said contacts, said third relay responsive to the re-operation of said first relay, and an automatically intermittent recall signal controlled by said third relay.

77. A telephone system including a telephone line and a station thereon connected with a central office link circuit, a relay controlled over said line circuit, a second relay unaffected by the first operation of said first relay but adapted to follow the subsequent operations of said first relay, signaling means responsive to said second relay including automatic apparatus for intermittently actuating said means, said automatic apparatus effective on a second energization of said first relay.

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.