

May 21, 1929.

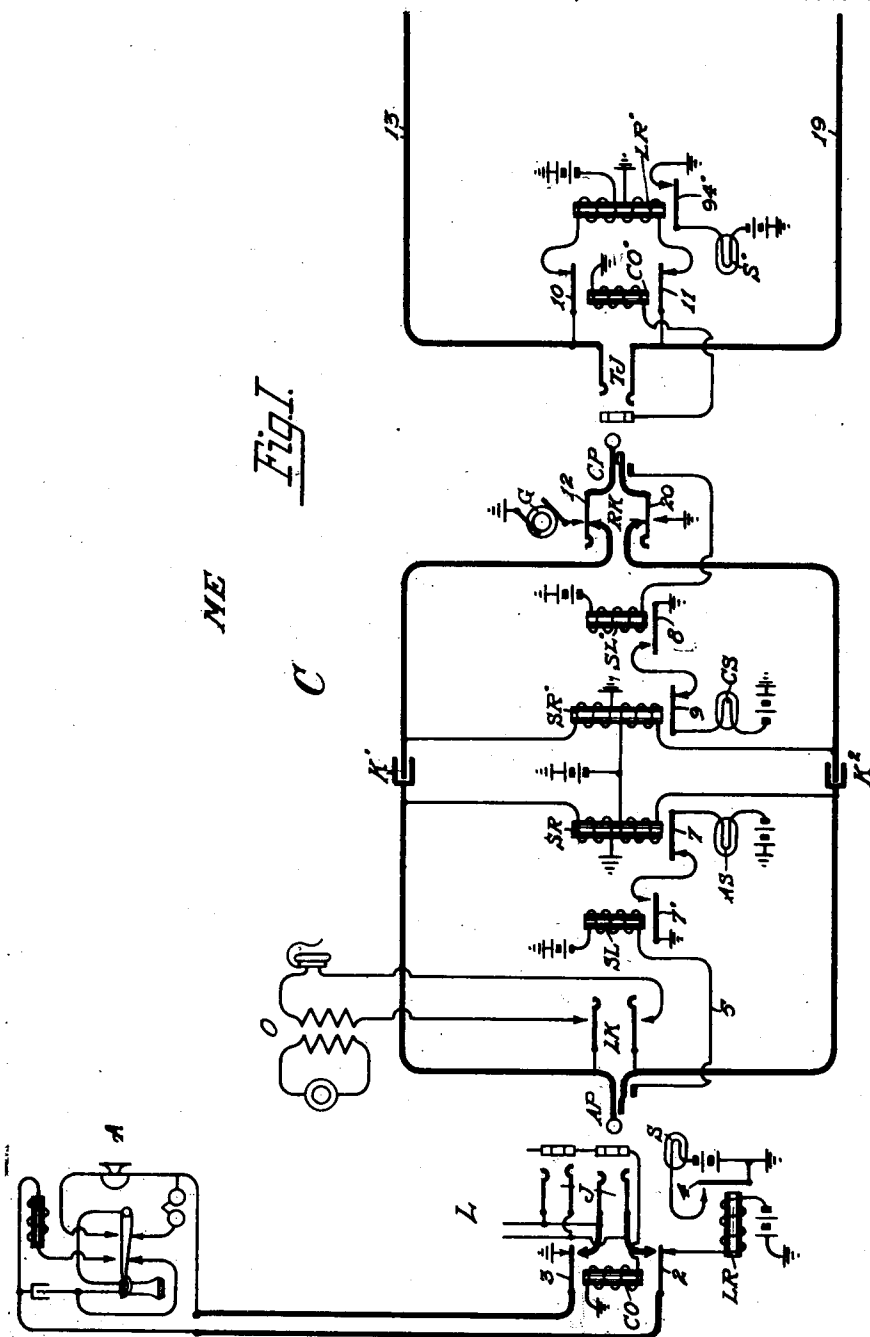
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1,713,564

TELEPHONE SYSTEM

Filed June 3, 1926

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

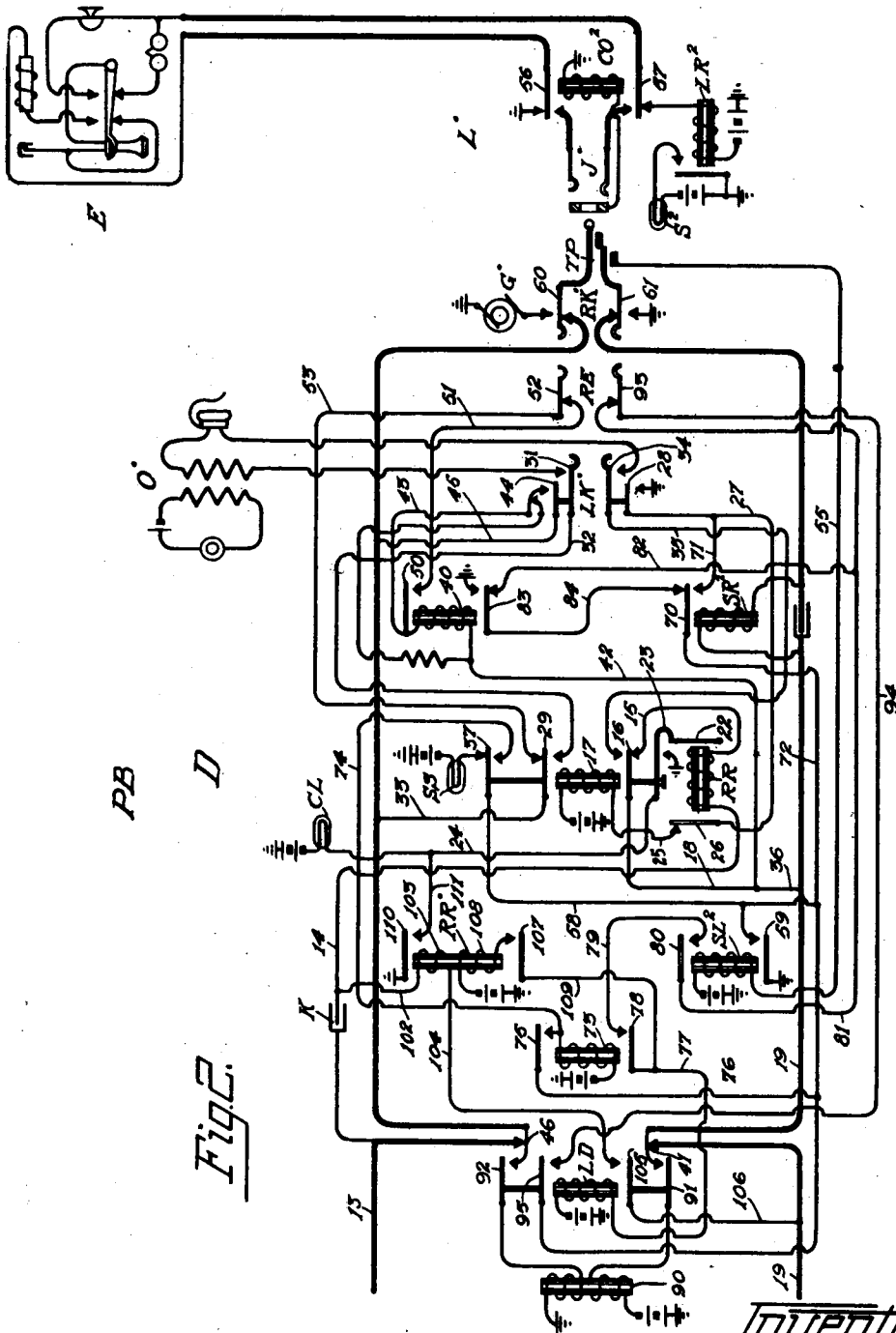


Fig. 2.

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UNITED STATES PATENT OFFICE.

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TELEPHONE SYSTEM.

Application filed June 3, 1926. Serial No. 113,353.

My invention relates to telephone systems and has to do more particularly with a two way trunk circuit used in connection with a so called private branch exchange system in which a call may be extended from the main exchange to the private branch exchange and in turn extended to a substation terminating thereat by means of said trunk circuit.

A feature of my invention is the provision of means in the trunk circuit which actuates to disconnect the portion of the trunk terminating at the main exchange from the trunk at the branch exchange so as to prevent the subscriber at said branch exchange from extending a recall to the main exchange before the branch exchange operator has disconnected the trunk from the line of the branch substation.

Another feature of my invention is the provision of means in the trunk circuit which permits the main exchange operator to ring on the trunk and light the trunk line lamp after the disconnect signal has been given to the trunk operator and before she has removed the trunk plug from the jack of the called line.

For a more complete understanding of my invention, reference may be had to the accompanying drawings comprising Figs. 1 and 2 which illustrate my invention operating in connection with a suitable telephone system in which Fig. 2 when placed to the right of Fig. 1 illustrates a complete telephone system for establishing a connection from a calling substation at a main exchange to a called substation terminating at a private branch exchange.

Referring now to Fig. 1; to the left of the drawing I illustrate a common battery substation A terminating into a line circuit L at a main exchange which comprises a line relay LR, a line signal S, a cut off relay CO and multiple jacks J.

A cord circuit C comprises an answering plug AP and a calling plug CP connected by the heavily marked conductors having the condensers K' and K² interposed. A sleeve relay SL is associated with the answering end as is also a supervisory relay SR which control the lighting of an answering supervisory lamp AS. The calling end of the cord circuit C comprises a sleeve relay SL' and a supervisory relay SR' which control the lighting of a calling supervisory lamp CS. A listening key LK is provided for con-

necting the operator's set O to the cord conductors of the cord circuit C. A ringing key RK is provided for the calling end of the cord circuit which when actuated connects the ringing generator G to apply ringing current to a called line terminating at the same exchange or to signal a trunk operator located at a private branch exchange. A trunk jack TJ located at the main exchange is connected by conductors 13 and 19 to the trunk circuit D illustrated in Fig. 2 which is located at the private branch exchange. A cut off relay CO' is associated with the trunk jack TJ as is also a line relay LR', said line relay LR' controlling the lighting of the line signal S'.

The trunk circuit D located at the private branch exchange is illustrated in Fig. 2 and comprises a ringing relay RR which is energized by ringing current from the main exchange to control the lighting of the trunk calling lamp signal CL. The trunk D terminates at the private branch exchange in a trunk plug TP for extending connections to subscribers' substations terminating at this branch exchange PB.

A listening key LK' is provided which when actuated connects the operator's set O' to the trunk circuit D through instrumentalities in the trunk D which will be more fully hereinafter described. A sleeve relay SL² in the trunk circuit D is operated when a trunk plug TP is connected to the jack of a called line at the branch exchange and a link disconnect relay LD, a ringing relay RR' and a release key RE are also associated with the trunk D for purposes as will hereinafter be described.

To the right of Fig. 2 I illustrate a private branch substation E terminating in a line circuit L' at the private branch exchange which comprises a line relay LR², a line signal S², a cut off relay CO² and a jack J'.

Having described in general the apparatus of Figs. 1 and 2 I will now described in detail the operation of the circuit illustrated in the drawings when a call is extended from the calling substation A at the main exchange to the called substation E terminating at the private branch exchange D.

Assuming now that the subscriber at substation A initiates a call, the removal of the receiver at the substation thereat establishes an energizing circuit for the line relay LR of the line circuit L traced from battery through the winding of the relay LR normal

contact 2 of the cut off relay CO through the closed contacts of the substation switchhook back to ground at normal contact 3 of cut off relay CO. The line relay LR upon energization closes its alternate contact 4 establishing a circuit for the line signal S, traced from battery through the lamp S to ground at alternate contact 4 of relay LR. The operator of the cord circuit C noting the lighted line signal S inserts the answering plug AP into the jack J of the calling line establishing a series energizing circuit for the cut off relay CO of the line circuit L and the sleeve relay SL of the cord circuit C, traced from battery through the winding of the sleeve relay SL, conductor 5, sleeve contacts of the connected plug AP and jack J to ground through the winding of the cut off relay CO. The relay CO upon energization opens its normal contacts 2 and 3 to allow relay LR to deenergize and the opening of its alternate contact 4 effaces the line signal S. The insertion of the answering plug AP into the jack J also establishes an energizing circuit for the supervisory relay SR of cord C traced from battery, through the lower winding of the relay SR, ring contacts of the connected plug AP and jack J, alternate contact 2 of the relay CO, the closed contacts of the switchhook at the substation A back through alternate contact 3 of relay CO, tip contacts of the jack J, plug AP to ground through the upper winding of the relay SR. The relay SR upon energization opens its normal contact 7 to prevent the premature lighting of the answering supervisory lamp. The operator now actuates the listening key LK which connects the operator's set O to the cord conductors and she may now inquire the wants of the calling subscriber at substation A. Assuming that it is the subscriber at substation E which terminates at the private branch exchange PB, the operator at the main exchange ME inserts the calling plug CP of the cord C into the trunk jack TJ of the trunk D which terminates at the main exchange ME, which operation closes a series energizing circuit for the sleeve relay SL' of the cord circuit C and the cut off relay CO' associated with the trunk jack TJ traced from battery through the winding of the relay SL', sleeve contacts of the connected plug CP and trunk jack TJ to ground through the winding of the cut off relay CO'. The sleeve relay SL' upon energization closes its alternate contact 8 which closes a circuit for the calling supervisory lamp CS traced from battery through the lamp CS, normal contact 9 of supervisory relay SR' to ground at alternate contact 8 of relay SL'. The cut off relay CO' of the trunk circuit D upon energization opens its normal contacts 10 and 11 which prevents the energization of the relay LR' of the trunk D and prevents lighting of the signal S' and the calling

supervisory lamp CS of the cord C remains lighted until the operator actuates the ringing key RK and returns the same to normal.

The operator at cord circuit C now actuates the ringing key RK which connects ringing current to the trunk circuit D which may be traced from generator G, alternate contact 12 of the ringing key RK, tip contacts of the connected plug CP and trunk jack TJ, trunk conductor 13, condenser K and conductor 14, through the winding of the ringing relay RR of the trunk D, conductor 15, normal contact 16 of relay 17, conductor 18, trunk conductor 19, the ring contacts of the connected trunk jack TJ and plug CP to ground at alternate contact 20 of the ringing key RK. The ringing relay RR upon energization attracts its armature 22 which allows its alternate contact 23 to drop down which closes the circuit for the calling trunk lamp CL, traced from battery through the lamp, conductor 24 to ground at alternate contact 23 of the relay RR. The calling lamp CL remains lighted after the relay RR deenergizes because of the locking device which prevents the return of the armature 22 to its normal position. The operator at the private branch exchange PB noting the lighted calling lamp signal CL actuates her listening key LK' thus connecting the operator's set O' to the trunk conductors 13 and 19 which of course takes place after the relay 17 is energized as will now be described.

After ringing current has been applied from the cord C at the main exchange ME relay RR deenergizes and after the listening key LK' has been actuated an energizing circuit for the relay 17 is established, traced from battery, through the winding of the relay 17, conductor 25, normal contact 26 of relay RR, conductor 27 to ground at alternate contact 28 of the listening key LK'. The relay 17 upon energization closes its alternate contacts 29 and 16 which now connects the operator's set O' to the conductors 13 and 19 of the trunk D from alternate contacts 31 and 34 of the listening key LK' over the respective conductors 32 and 35, alternate contacts 29 and 16 of relay 17, to the trunk conductors 13 and 19. The operator's set O' is now connected and she inquires the wants of the calling subscriber at substation A. Assuming that it is the private branch exchange subscriber at E that is wanted, the trunk operator of D inserts the trunk plug TP into the jack J' of the wanted line. The relay 17 upon energization opens the alternate contact 23 of relay RR to efface the call lamp signal CL and the opening of its normal contact 37 prevents the premature lighting of the supervisory signal SS.

After the operator at cord circuit C has applied ringing current to the trunk circuit D from the generator G she releases the ringing key RK and the closing of the normal con-

5 facts of the ringing key RK establishes a series energizing circuit for the supervisory relay SR' of cord C and the relay 40 of the trunk circuit D traced from battery through the lower winding of the relay SR', normal contact 20 of the ringing key RK, ring contacts of the connected plug CP and trunk jack TJ, normal contact 41 of the relay LD of the trunk circuit D, conductors 36 and 42, through the winding of the relay 40, conductor 43, alternate contact 44 of the listening key LK', conductor 45, normal contact 46 of relay LD, trunk conductor 13, tip contacts of the connected plug CP and trunk jack TJ, 10 normal contact 12 of ringing key RK to ground through the upper winding of the relay SR' of the cord circuit C.

The operator having inserted the trunk plug TP into the jack J' of the wanted private branch exchange subscriber at E as before described, now restores her listening key LK' and this restoration of the listening key LK' opens the energizing circuit of the relay 17 at alternate contact 28 of listening key LK'. The opening of alternate contact 44 of the key LK' opens the initial energizing circuit of the relay 40, but relay 40 being slow to release due to a shunt about its winding is held momentarily energized until the normal contact 29 of the relay 17 closes, at which 15 time relay 40 establishes a locking circuit for itself through its alternate contact 50 by current flowing from battery thru the winding of relay 40 as previously described, its alternate contact 50, conductor 51, normal contact 52 of the release key RE, conductor 53, normal contact 29 of relay 17, conductor 33, the trunk conductor 13, tip contacts of connected plug CP and jack TJ to ground through the upper winding of the relay SR'. The relay SR' of cord circuit C is held energized over this circuit and the opening of its normal contact 9 effaces the calling supervisory signal CS and notifies the operator at cord C that the private branch operator associated with the 20 trunk D has answered the call.

The insertion of the trunk plug TP into the jack J' of the wanted line establishes an energizing circuit for the sleeve relay SL² of the trunk circuit D traced from battery through the winding of the relay SL², conductor 55, sleeve contacts of the connected plug TP and jack J' to ground through the winding of the cut off relay CO² of the line circuit L' associated with the called private branch 25 substation E. Relay CO² upon energization opens its normal contacts 56 and 57 to connect the subscriber's set at substation E to trunk circuit D. The relay SL² upon energization establishes a circuit for the supervisory signal SS of the trunk D traced from battery through the lamp SS, normal contact 37 of relay 17, conductor 58 to ground at alternate contact 59 of the sleeve relay SL², and the supervisory signal SS is lighted over this 30

circuit and remains in this condition until the called subscriber at E answers. The operator now depresses the ringing key RK' of the trunk D and connects ringing current from the generator G' to the called line E traced 35 from the generator G', alternate contact 60 of the ringing key RK', tip contacts of the connected trunk plug TP and jack J', alternate contact 56 of the cut off relay CO² through the condenser and call bell at the substation E back through alternate contact 57 of the cut off relay CO², the ring contacts of the connected jack J' and trunk plug TP to ground at alternate contact 61 of the ringing key RK'. 40

The subscriber at the substation E, in response to the call signal removes his receiver from the switchhook thus establishing an energizing circuit for the supervisory relay SR² of trunk D traced from battery through the lower winding of the relay SR' of cord C, normal contact 20 of the ringing key RK, ring contacts of the connected plug CP and trunk jack TJ, conductor 19, normal contact 41 of relay LD through the winding of the supervisory relay SR² of the trunk D, normal contact 61 of the ringing key RK', ring contacts of plug TP and jack J', alternate contact 57 of relay CO², through the now closed contacts of the substation switchhook at E back through alternate contact 56 of relay CO², the tip contacts of the jack J' and plug TP, normal contact 60 of the key RK', conductor 13, tip contacts of the jack TJ and plug CP, normal contact 12 of the ringing key RK of the cord C to ground through the 45 upper winding of the relay SR'. The relay SR² energizes over this circuit and the closing of its alternate contact 70 establishes an energizing circuit for the relay 17 traced from battery, through the winding of the relay 17, conductor 25, normal contact 26 of relay RR, conductors 27 and 71, alternate contact 70 of relay SR², conductors 72 and 58 to ground at alternate contact 59 of sleeve relay SL². Relay 17 upon energization opens its normal contact 37 to efface the supervisory signal SS which notifies the operator of trunk D that the called subscriber has answered. 50

The supervisory relay SR' of the cord C is now held energized over the line of the called substation E and remains energized until the called subscriber again replaces his receiver. The closing of alternate contact 37 of the relay 17 also establishes an energizing circuit 55 for the relay 73 traced from battery through the winding of the relay 73, conductor 74, alternate contact 37 of relay 17, conductor 58 to ground at alternate contact 59 of the relay SL². Relay 73 upon energization closes its alternate contact 75 thereby establishing a locking circuit for itself traced from battery through the winding of relay 73, its alternate contact 75, conductors 76, 72 and 58 to ground at alternate contact 59 of sleeve 60

relay SL^2 . The opening of normal contact 29 of the relay 17 opens the energizing circuit of the relay 40 to permit the same to restore to normal. The calling subscriber at the substation A at the main exchange and the called subscriber at the called station E are now in conversational circuit the talking circuit being traced over the heavily marked conductors.

After the conversation has terminated, the subscribers at the respective substations A and E replace their receivers upon their respective switchhooks. The replacing of the receiver at the substation A opens the energizing circuit of the supervisory relay SR of the cord C and the closing of its normal contact 7 closes a circuit for the answering supervisory lamp AS traced from battery through the normal contact 7 of relay SR to ground at alternate contact 7' of sleeve relay SL. The replacing of the receiver at the private branch exchange substation E opens the energizing circuit of the supervisory relay SR', and the closing of its normal contact 9 closes a circuit for the calling supervisory signal CS to ground at alternate contact 8 of the sleeve relay SL' of the cord C. The operator of the cord C noting the two lighted supervisory signals AS and CS removes the answering plug AP and the calling plug CP from the respective jacks J and TJ thus restoring respective sleeve relays SL and SL' to efface the signals AS and CS and the withdrawal of the plug CP and trunk jack TJ also allows cut off relay CO' associated with trunk D to restore to normal.

When the called subscriber at the branch exchange substation E replaces his receiver the energizing circuit of the supervisory relay SR^2 is opened at the switchhook contacts and the relay SR^2 restores, closing its normal contact 70 to establish an energizing circuit for the link disconnect relay LD of the trunk D traced from battery through the winding of the relay LD, conductor 77, alternate contact 78 of the relay 73, conductor 79, alternate contact 80 of the sleeve relay SL^2 , conductors 81, 82, normal contact 83 of the relay 40 (which was deenergized as before described) conductor 84, normal contact 70 of the relay SR^2 , conductors 72 and 58 to ground at alternate contact 59 of the sleeve relay SL^2 . The deenergization of the relay SR^2 also opens the energizing circuit of the relay 17 at alternate contact 70 and the relay 17 restoring again closes a circuit for the supervisory signal SS of the trunk D traced from battery, through the lamp SS, normal contact 37 of relay 17, conductor 58 to ground at alternate contact 59 of the sleeve relay SL^2 . The operator at trunk D noting the lighted signal SS knows the conversation between subscribers has terminated and she therefore withdraws the trunk plug TP from the jack J' of the called substation E. The with-

drawal of the trunk plug TP from the jack J' opens the series energizing circuit of the cut off relay CO² of the line circuit L' and the sleeve relay SL^2 . The relay SL^2 upon de-energization restores to normal to open its alternate contacts 59 and 80 to open the energizing circuit of the link disconnect relay LD and the opening of alternate contact 59 of relay SL^2 also opens the locking circuit of relay 73 and also opens the circuit of the supervisory signal SS. The apparatus used in establishing a connection from the calling substation A at the main exchange ME and the called substation E at the private branch exchange PB is now at normal and available for establishing other connections.

Assuming that the substation E is connected to a private branch board located at a hotel or in an office and that the local subscribers connected thereto are not permitted to make outgoing calls without the operator's supervision, means are provided in the trunk circuit D associated with the private branch switchboard to prevent this unauthorized initiation of calls. This means in the trunk circuit D is so arranged that should the operator at the trunk D be busy handling other calls when receiving a disconnect signal from a called substation at the branch exchange and allow the plug TP of the trunk D to remain in the jack J' after receiving the disconnect signal the means in the trunk operates to prevent the subscriber at the substation E from initiating a call and extending the same to the main exchange.

Assuming that the subscriber at the substation E has finished conversation and replaces his receiver upon the switchhook and then decides to make a call and assuming that the operator is occupied with other business and has not withdrawn the plug TP from the jack J', thus when the calling subscriber at E removes his receiver from the switchhook the supervisory relay SR^2 is immediately energized. The circuit of the supervisory relay SR^2 is now traced from battery, through the lower winding of the coil 90, alternate contact 91 of the relay LD, conductor 19 through the winding of relay SR^2 , normal contact 61 of the ringing key RK', ring contacts of the connected plug TP and jack J', alternate contact 57 of the cut off relay CO², the closed contacts of the substation switchhook back through alternate contact 56 of the cut off relay CO², tip contacts of the connected jack J' and plug TP, normal contact 60 of ringing key RK', conductor 13, alternate contact 92 of relay LD to ground through the upper winding of the coil 90. The relay SR^2 again closes its alternate contact 70 to establish an energizing circuit for the relay 17 and the relay upon energization opens its normal contact 37 to efface supervisory signal SS. The relay LD as before described energizes when the called sub-

scriber replaces his receiver to open its normal contacts 41 and 46 interrupting the trunk conductors 13 and 19 to prevent the recalling subscriber at E from extending a connection to the main exchange. The opening of normal contact 70 of the relay SR^2 opens the initial energizing circuit of the link disconnect relay LD but the same is held energized over a circuit which may be traced from battery, through the winding of relay LD, conductor 77, alternate contact 78 of relay 73, conductor 79, alternate contact 80 of relay SL^2 , conductor 81, normal contact 93 of the release key RE, conductor 94, alternate contact 95 of the relay LD, conductors 72 and 58 to ground at alternate contact 59 of the sleeve relay SL^2 .

The operator of the trunk D seeing the supervisory signal SS effaced knows that the subscriber at the substation E is calling and depresses the release key RE which opens the energizing circuit of the relay LD at contact 93 of the release key RE and relay LD deenergizes to again complete its normal contacts 41 and 46 to close the continuity of the trunk conductors 13 and 19 which brings about the energization of the line relay LR' at the main exchange which may be traced from battery through the upper winding of the relay LR' , normal contact 10 of the cut off relay CO' , trunk conductor 13, normal contact 46 of the relay LD, normal contact 60 of the ringing key RK' , tip contacts of the trunk plug TP and jack J' , alternate contact 56 of the cut off relay CO^2 through the closed contacts at the substation switchhook at E back through alternate contact 57 of the cut off relay CO^2 , ring contacts of the jack J' and trunk plug TP, normal contact 61 of the ringing key RK' , conductor 19, normal contact 41 of the relay LD, normal contact 11 of the cut off relay CO' to ground through the lower winding LR' . The relay LR' upon energization closes its alternate contact 94' and thereby completes a circuit for the line signal S' traced from battery through the lamp S' to ground at alternate contact 94' of the line relay LR' . The operator associated with the cord C noting the lighted signal S' inserts an answering plug AP of the cord C into the trunk jack TJ and the call from the substation E is taken care of in the usual way.

Assuming that the calling plug CP has been withdrawn from the trunk jack TJ associated with the trunk D and that the trunk operator at D has not withdrawn the trunk plug TP from the jack J' of a called line, means are provided whereby an operator at the main exchange may insert a calling plug CP into the trunk jack TJ associated with the trunk D and rering the trunk operator without waiting for disconnection of the trunk plug TP from the jack J' . A plug CP having been inserted into the trunk jack TJ

the operator associated with the connected cord C now actuates the ringing key RK to connect the ringing generator G. The ringing current from the generator G may be traced from the ungrounded pole of the generator G, alternate contact 12 of the ringing key RK, the tip contacts of the connected plug CP and trunk jack TJ, trunk conductor 13, conductor 14, condenser K, conductor 102 through the upper winding 103 of the ringing relay RR' , conductor 104, alternate contact 105 of the relay LD (which relay was energized when the called subscriber at the substation E replaced his receiver upon his switchhook as previously described), conductor 106, trunk conductor 19, ring contacts of the jack TJ and plug CP, to ground at alternate contact 20 of the ringing key RK. The relay RR' is energized and the closing of its alternate contact 107 establishes a locking circuit for itself traced from battery through the lower winding 108 of the relay RR' , alternate contact 107 of relay RR' , conductor 109, alternate contact 78 of relay 73, conductor 79, alternate contact 80, relay SL^2 , conductors 81 and 82, normal contact 83 of relay 40, conductor 84, normal contact 70 of relay SR^2 , conductors 72 and 58 to ground at alternate contact 59 of the sleeve relay SL^2 . The closing of alternate contact 110 of relay RR' establishes a circuit for the calling lamp signal CL, traced from battery through the lamp CL, conductors 24 and 111 to ground at alternate contact 110 of relay RR' . The lamp is lighted over this circuit and notifies the operator at the trunk D that a call from the main exchange is waiting for attention. The operator now withdraws the trunk plug TP from the connected jack J' which withdrawal opens the series energizing circuit of the sleeve relay SL^2 of the trunk D and the cut off relay CO^2 of line circuit L' . The relay SL^2 upon deenergization opens its alternate contact 80 which brings about the deenergization of the disconnect relay LD. The opening of alternate contact 59 of relay SL^2 brings about the deenergization of the relay 73 and the opening of alternate contact 80 also opens the locking circuit for the ringing relay RR' . The relay RR' deenergizing its alternate contact 110 is opened to efface the calling lamp CL, the supervisory signal SS is also effaced when the sleeve relay SL^2 deenergizes due to the opening of alternate contact 59. The operator actuates her listening key LK to connect her operator's set O' which places her in communication with the calling subscriber at the main exchange and the operation of the circuit from this point on is the same as previously described.

I have illustrated and described a certain circuit arrangement but I do not wish to be limited to the same as changes and modifications may readily suggest themselves to those skilled in the art and I therefore aim to cover

all such changes and modifications as come within the spirit and scope of the appended claims.

Having described my invention what I claim as new and desire to secure by Letters Patent of the United States is:—

1. A telephone system including a calling subscriber's line and a called subscriber's line, a cord circuit and a trunk circuit for interconnecting said lines, disconnect means in said trunk circuit controlled by said called subscriber for disconnecting one end of said trunk circuit from the other end thereof, said disconnecting means preventing the extension of a recall from said called line to said cord circuit prior to said disconnection, and means in said trunk to permit the re-ringing of said trunk prior to the disconnection of said trunk from said called subscriber's line.

2. A telephone system including a calling subscriber's line and a called subscriber's line, a cord circuit and a trunk circuit for interconnecting said lines, disconnect means in said trunk controlled by said called subscriber for disconnecting one end of said trunk from the other end thereof, said disconnecting means preventing the extension of a recall from said called line to said cord circuit prior to said disconnection, and means in said trunk controlled by said disconnect means to permit the re-ringing of said trunk prior to the disconnection of said trunk from the said called subscriber's line.

3. A telephone system including a calling subscriber's line and a called subscriber's line, a cord circuit and a trunk circuit for interconnecting said lines, disconnect means in said trunk controlled by said called subscriber for disconnecting one end of said trunk from the other end thereof, said disconnecting means preventing the extension of a recall from said called line to said cord circuit prior to said disconnection, a calling signal in said trunk, and means in said trunk controlled by said disconnect means to permit the operation of the said calling signal in said trunk prior to the disconnection of said trunk from said called subscriber's line.

4. A telephone system including a calling subscriber's line and a called subscriber's line, a cord circuit and a trunk circuit for interconnecting said lines, disconnect means in said trunk circuit controlled by said called subscriber for disconnecting one end of said trunk circuit from the other end thereof, and means in said trunk circuit to re-signal the operator of said trunk prior to the disconnection of said trunk from said called subscriber's line, said disconnect means preventing the extension of a recall from said called line to said cord circuit prior to said disconnection.

5. A telephone system including a calling

subscriber's line and a called subscriber's line, a cord circuit and a trunk circuit for interconnecting said lines, disconnect means in said trunk circuit controlled by said called subscriber and operated upon the termination of conversation to disconnect one end of said trunk from the other end thereof, and means in said trunk circuit for re-signaling the operator of said trunk prior to the disconnection of said trunk from said called subscriber's line, said disconnect means preventing the extension of a recall from said called line to said cord circuit prior to said disconnection.

6. A telephone system including a calling subscriber's line and a called subscriber's line, a cord circuit and trunk circuit for interconnecting said lines, a link disconnect relay in said trunk circuit controlled by said called subscriber and operated upon the termination of conversation to disconnect one end of said trunk from the other end thereof, and means in said trunk controlled by switching contacts of said link disconnect relay to permit the cord circuit operator to re-ring the trunk operator prior to the disconnection of said trunk from said called subscriber's line, said link disconnect relay preventing the extension of a recall from said called line to said cord circuit prior to said disconnection.

7. A telephone system including a calling subscriber's line and a called subscriber's line, a cord circuit and a trunk circuit for interconnecting said lines, a link disconnect relay in said trunk for disconnecting one end of said trunk from the other end thereof, a calling signal in said trunk, and means in said trunk controlled by said link disconnect relay to permit the cord circuit operator to re-ring the trunk operator and light said calling signal prior to the disconnection of said trunk from said called subscriber's line, said link disconnect relay preventing the extension of a recall from said called line to said cord circuit prior to said disconnection.

8. A telephone system including a calling subscriber's line and a called subscriber's line, a cord circuit and a trunk circuit for interconnecting said lines, a link disconnect relay in said trunk for disconnecting one end of said trunk from the other end thereof controllable by said called subscriber upon the termination of conversation, a ringing relay for said trunk operated by ringing current applied by the cord circuit operator through contacts of said link disconnect relay prior to the disconnection of said trunk from the called subscriber's line, said link disconnect relay preventing the extension of a recall from said called line to said cord circuit prior to said disconnection.

9. A telephone system including a calling subscriber's line and a called subscriber's line, a cord circuit and a trunk circuit for interconnecting said lines, a link disconnect relay

in said trunk for disconnecting one end of said trunk from the other end thereof and controllable by said called subscriber upon the termination of conversation, a calling signal for said trunk circuit, and a ringing relay for said trunk operated by ringing current applied by the cord circuit operator through contacts of said link disconnect relay to light said calling signal to re-signal said trunk operator prior to the disconnection of said trunk from the called subscriber's line, said link disconnect relay preventing the extension of a recall from said called line to said cord circuit prior to said disconnection.

10. A telephone system including a cord circuit and a trunk circuit for connecting a calling subscriber's line to a called subscriber's line, disconnect means controlled by the called subscriber for disconnecting his line from the said cord circuit, said disconnecting means preventing the extension of a recall from said called line to said cord circuit prior to the disconnection of said trunk circuit from said called line, and trunk signalling means operable for the first exchange subsequent to an operation of said disconnect means.

Signed at Chicago in the county of Cook and State of Illinois, this 27th day of May, 1926.

MICHAEL B. STAZAK.