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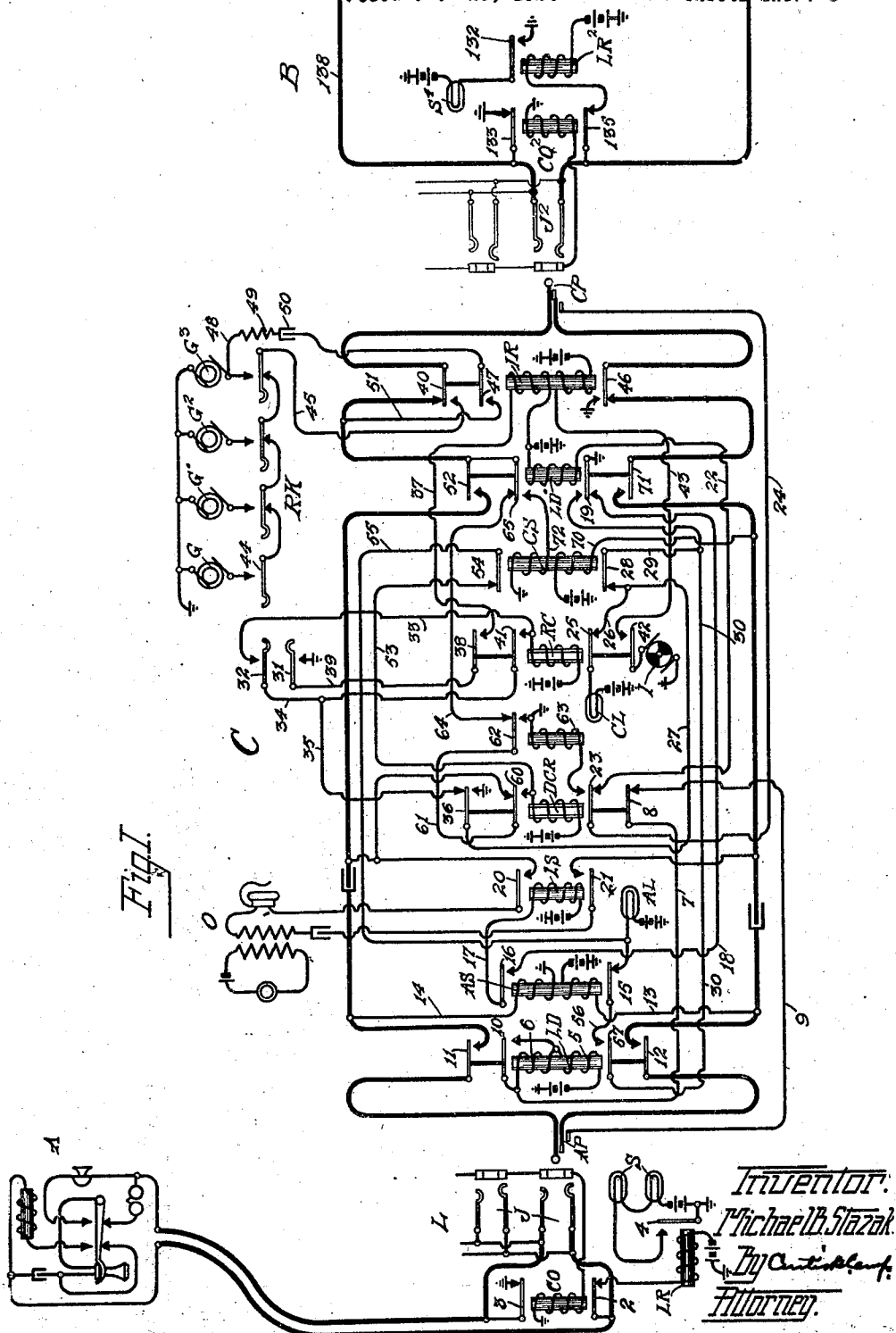
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M. B. STAZAK

TELEPHONE SYSTEM

Filed Oct. 29, 1924

2 Sheets-Sheet 1



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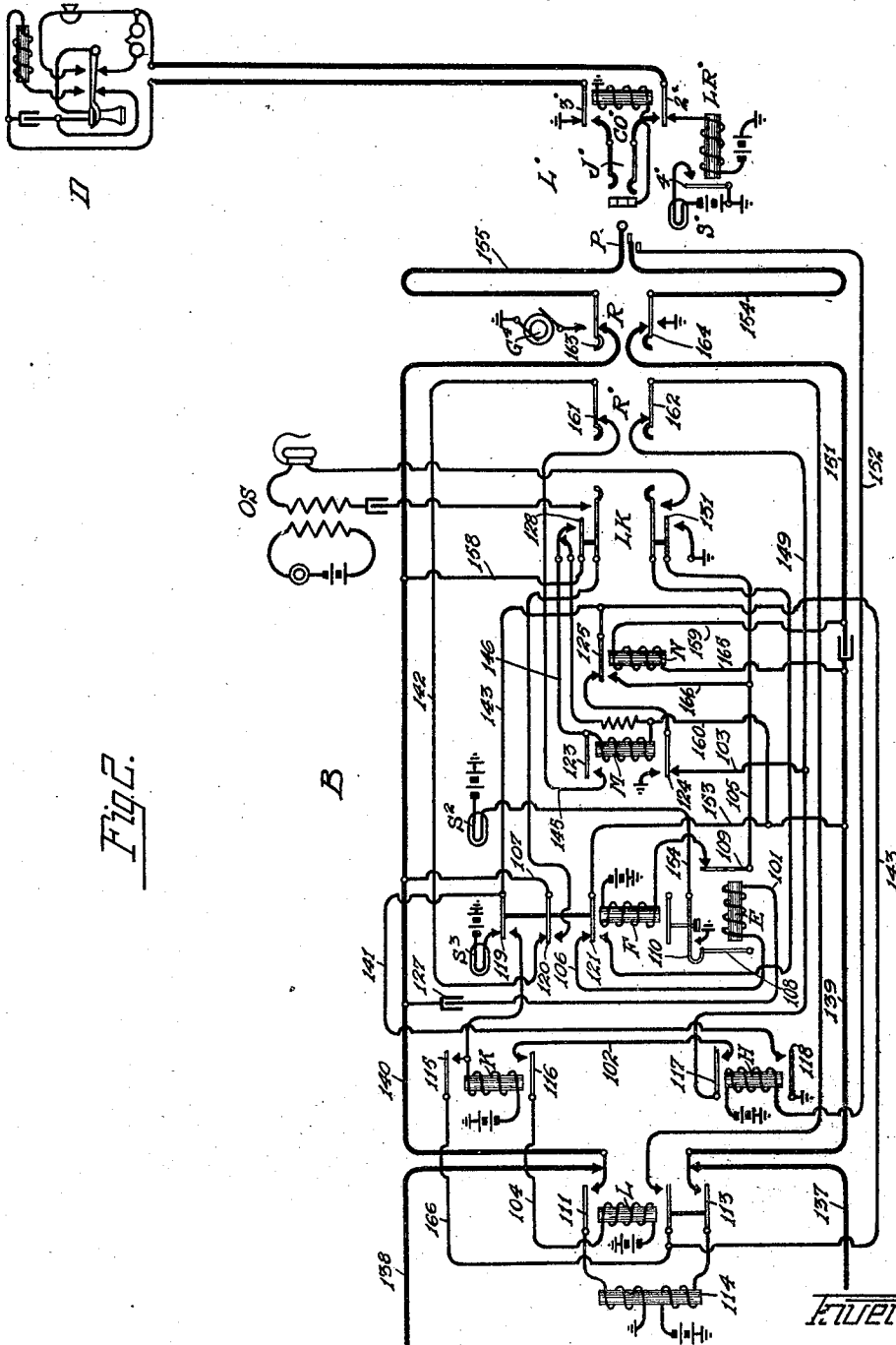


Fig. 2.

Inventor:
Michael B. Stazak.
By Curtis & Co.,
Attorney.

UNITED STATES PATENT OFFICE.

MICHAEL B. STAZAK, OF CHICAGO, ILLINOIS, ASSIGNOR TO KELLOGG SWITCHBOARD AND SUPPLY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

TELEPHONE SYSTEM.

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My invention relates to telephone systems, in which manual link or cord circuits are combined with a trunk circuit for the inter-connecting of two telephone lines, and has
5 to do more particularly with the so-called private branch exchange systems; such as are used in hotels, office buildings, etc.

With the usual trunk circuit, a subscriber may make a number of calls without the
10 knowledge of the P. B. X. operator.

A feature of my invention is the provision of means in the trunk circuit whereby the same is disassociated from the line circuit when the P. B. X. subscriber has replaced
15 his receiver on the switchhook.

Reference may now be had to the accompanying drawings in which I illustrate my invention operating in connection with a suitable telephone system.

20 Fig. 1 shows the calling subscriber and cord circuit at the P. B. X., and Fig. 2 shows the trunk circuit to the main exchange and the connections to the called subscriber.

In the drawings, I show a calling substation A and a called substation D, the said calling and called substations A and D connected, respectively, to line circuits L and L'. The line circuits L and L' comprise respectively the usual line relays LR and LR', cut-off relays CO and CO', jacks J and J', and the line signals S and S'. The jacks of the line circuit L are distributed among different operators' positions, and there is a line signal S for each jack so that when a call is
35 initiated over any line, the line signals at the various operator's positions are lighted, and any one of a plurality of operators may seize the call to the exclusion of all the other operators. The line circuit L' has only one
40 jack and is not multiplied into different operator's positions.

The cord circuit C, in Figure 1, is provided with an answering plug AP and a calling plug CP, the said answering and calling
45 plugs AP and CP being connected by the heavily marked conductors. The answering end of the cord circuit C is provided with a combined sleeve and link disconnect relay LD which is energized when the answering plug
50 AP is inserted into the jack J of the calling line. The relay LD is provided with a high resistance winding and a low resistance winding, and upon the actuation of the said relay LD, the high resistance winding is
55 shunted and this prevents the relay LD in

another cord from being energized, should another operator attempt to answer the call after it has been seized by an operator, so that an operator at any other cord attempting to seize the call after the first operator has connected to the calling line, is prevented
60 from communicating with the subscriber. The shunt of the low winding of the relay LD of the first cord prevents the relay LD of the second cord from operating. As the
65 said second operator is not connected to the calling line, due to the relay LD of the second cord remaining at normal, she does not receive an answer from the calling subscriber, and withdraws the answering plug
70 of her cord pair from the connected jack. An answering supervisory relay AS is provided which is energized upon the action of LD, the said relay AS operating over the line. The relay AS upon actuation, prevents the premature lighting of the answering
75 supervisory lamp AL. A listening relay LS is provided and is actuated in response to the energization of the relay AS to connect the operator's set to the cord conductors.
80

The calling end of the cord circuit C is provided with a combined sleeve and link disconnect relay LD' actuated when the calling plug CP is inserted into the jack J² of the plug ended trunk circuit B. This relay, upon energization, opens the circuit of the listening relay LS, which relay deenergizing disconnects the operator's set O from the cord connectors. A party line ringing key RK is provided for connecting any one
85 of a plurality of generators G, G', G² and G³, depending upon the key plunger that is depressed, to signal the called for subscriber when connection is made directly to a called line. An interrupter relay IR is energized
90 upon the actuation of the ringing key RK, the said relay remaining energized as long as the party line ringing key RK is held in its fully depressed position to assure giving the called subscriber an instantaneous first
100 ring. The depression of the ringing key RK and the operation of the relay LD' closes a circuit for the ringing control relay RC, which relay RC controls the connection of ringing currents to the called line, and also
105 connects the interrupter I to the interrupter relay IR to intermittently energize and deenergize the said relay IR. A calling supervisory relay CS is also provided, which is actuated upon the response of the called sub-
110

scriber to interrupt the circuit of the relay RC to disconnect ringing current from the line of the answering called subscriber. A calling supervisory lamp CL is provided and is for the usual supervisory purposes. A disconnect relay DCR is provided, said relay being energized only after both subscribers have replaced their receivers upon their respective switchhooks to condition the line circuits of the respective calling and called line for a recall, as will be more fully explained hereinafter.

I also provide a plug-ended trunk circuit B, in Figs. 1 and 2, for the purpose of interconnecting the double disconnect cord circuit C with the subscriber's station D. This trunk circuit is composed of a jack J², a plug P, a ringing key R, a release key R', a listening key LK, an operator's set OS, a ringing generator G⁴, a cut-off relay CO² and a line relay LR², also lamp signals S², S³ and S⁴, and a number of relays, namely E, F, H, K, M and N, for purposes as will be explained.

I will now give a detailed account of the action of my invention in conjunction with the double disconnect cord circuit C. The following is a detailed account of the operation of the apparatus in extending a call from the subscriber at the substation A to the subscriber at the substation D.

Assuming now that the subscriber at the calling substation A initiates a call, the removal of the receiver from the switchhook, at substation A, closes an energizing circuit for the line relay LR of the line circuit L from battery through the winding of the relay LR, normal contact 2 of the cut-off relay CO, through the substation A and back to ground at normal contact 3 of relay CO. The line relay LR upon energization closes its alternate contact 4 to light the line lamps S at a plurality of operator's positions. Assuming that it is the operator associated with the cord circuit C that answers the call, the insertion of the answering plug AP into the jack J of the calling line establishes a series energizing circuit for the cut-off relay CO of the line circuit L, and the combined sleeve and link disconnect relay LD of the cord circuit C, traced from battery through the windings 5 and 6 of the relay LD, conductor 7, normal contact 8, of the disconnect relay DCR, conductor 9, sleeve contacts of the connected plug AP and jack J to ground through the winding of the cut-off relay CO. The high resistance winding 6 of the relay LD is shunted, this arrangement being provided for secret service, as a relay LD of a second cord circuit will not operate in series with the cut-off relay CO as the shunt of the low resistance winding 5 of the relay LD of the first cord circuit renders the relay LD of the second cord circuit that attempted to answer the call inoperative.

The closure of alternate contacts 11 and 12 of relay LD establishes an energizing circuit for the answering supervisory relay AS, traced from battery through the lower winding of the relay AS, conductor 13, alternate contact 12 of relay LD, ring contacts of the connected plug AP and jack J, through the closed contacts at the substation switchhook, back through the tip contacts of the connected jack J and plug AP, alternate contact 11 of the relay LD, conductor 14, and through the upper winding of the supervisory relay AS to ground, and the opening of normal contact 15 of the supervisory relay AS prevents the premature lighting of the answering supervisory lamp AL. The energization of the cut-off relay CO of the line circuit L opens the energizing circuit of the line relay LR which relay restores and the interruption of its contact 4 effaces the line signals S. The closing of alternate contact 16 of relay AS establishes an energizing circuit for the listening relay LS traced from battery through the winding of listening relay LS, conductor 17, alternate contact 16 of relay AS, conductor 18 to ground at normal contact 19 of the combined sleeve and link disconnect relay LD'. The listening relay LS upon energization closes its alternate contacts 20 and 21 to connect the operator's set O to the cord conductors. Should another operator attempt to seize the call after the operator associated with the cord circuit C is connected thereto, the low resistance path of the winding 5 of the relay LD prevents the relay LD of the second cord from operating, and the relay LD of the second cord failing to operate does not connect the operator's set O of the second cord across the cord conductors. The second operator failing to receive a response when she answers, knows that the call has been answered by another operator, and withdraws the plug of her cord circuit from the multiple jack of the calling line.

The operator having been connected to the cord conductors, now inquires the want of the calling subscriber at substation A, and assuming that it is the subscriber at the substation D that is wanted, the operator plugs the calling plug CP into jack J², of the plug ended trunk circuit B, to close a series energizing circuit for the combined sleeve and link disconnect relay LD' of the cord circuit C, and the cut-off relay CO² of the trunk circuit B, the circuit being traced from battery through the winding of the relay LD', conductor 22, normal contact 23 of the disconnect relay DCR, conductor 24, sleeve contacts of the calling plug CP and the connecting jack J² and through the winding of the cut-off relay CO² to ground. The opening of the normal contact 19 of the relay LD' opens the energizing circuit of the listening

relay LS, and the said relay restoring opens its alternate contacts 20 and 21, to disconnect the operator's set O from the cord conductors. The energization of the cut-off relay CO² prevents the actuation of the relay LR², and the premature lighting of the lamp signal S⁴.

The closing of alternate contact 19 of the relay LD' establishes a circuit for the calling supervisory lamp CL traced from battery through the calling supervisory lamp CL, normal contact 25 of the ringing control relay RC, conductors 26 and 27, normal contact 28 of the calling supervisory relay CS, conductors 29 and 30 to ground at alternate contact 19 of the relay LD', and the said calling supervisory lamp CL is lighted over this circuit and remains lighted until the operator depresses the party line ringing key RK. The operator having inserted the plug CP now depresses a ringing key plunger of the party line ringing key RK to its fully depressed position to close the end spring contacts 31 and 32 and to connect one of the ringing generator G, G', G² or G³ to signal the operator controlling the trunk circuit B. If the cord circuit C was used to connect directly to a called line the operator would select the proper frequency generator to signal the desired called lines. The closing of alternate contact 32 of the end springs of the party line ringing key RK brings about the energization of the ringing control relay RC during the interval that the key RK is held down, over a circuit traced from battery through the winding of the ringing control relay RC, conductor 33, closed end spring contact 32, conductors 34 and 35, normal contact 36 of the disconnect control relay DCR, conductor 27, normal contact 28 of the calling supervisory relay CS, conductor 29 and 30 to ground at alternate contact 19 of relay LD'. The closing of end spring contact 31 brings about the energization of the interrupter relay IR during the interval that the ringing key RK is held down, over a circuit traced from battery through the upper winding of relay IR, conductor 37, alternate contact 38 of the relay RC, conductor 39 to ground at alternate contact 31 of the end spring of the ringing key RK. The interrupter relay IR is energized over this circuit and the closing of alternate contact 40 of the said relay IR connects ringing current from one of the generators to signal the operator controlling the trunk circuit B.

The ringing control relay RC having been energized, due to the closure of the end spring contact 32, as already described, closes its alternate contact 41 to establish a locking circuit for itself traced from battery through the winding of the ringing control relay RC, its alternate contact 41, conductors 34 and 35, normal contact 36 of relay DCR, conductor 27, normal contact 28 of relay CS, con-

ductors 29 and 30 to ground at alternate contact 19 of the relay LD'. The opening of normal contact 25 of the relay RC now effects the calling supervisory signal CL.

The closing of alternate contact 42 of relay RC connects interrupter I to the lower winding of the interrupter relay IR, the circuit being traced from ground through the constantly rotating interrupter I, alternate contact 42 of relay RC, conductor 43 to battery and ground through the lower winding of relay IR. The relay IR is intermittently energized and deenergized over this circuit to connect ringing current to the trunk circuit B over a path traced from the ungrounded pole of the generator G, alternate contact of the depressed ringing key plunger, conductor 45, alternate contact 40 of relay IR, tip contacts of the connected plug CP and jack J², conductor 138, condenser 127, conductor 101, winding of relay E, conductor 106, normal contact 121, conductors 153, 132 and 137, through the ring contacts of the connected jack J² and the plug CP to ground at the alternate contact 46 of the interrupter relay IR.

The closing of alternate contact 47 of the relay IR transmits a ringing tone to the calling subscriber at the substation A, the ringing tone being traced from the low frequency generator G³, which is of 16 cycles, over conductor 48, through resistance 49, condenser 50, alternate contact 47, of relay IR, conductor 51, alternate contact 52 of relay LD', alternate contact 11 of relay LD, tip contacts of the connected plug AP and jack J, through the receiver at the calling station A, back through ring contacts of the connected plug AP and jack J, alternate contact 12 of relay LD, conductor 13 and through the winding of the answering supervisory relay AS to battery and ground. This tone just traced gives the calling subscriber at the substation A an audible signal when connection is made directly to a called line notifying him that the called subscriber is being signaled.

When the interrupter relay IR is energized, it attracts its alternate contacts and allows ringing current to be sent through the trunk circuit as already described. Thus relay E is energized when this ringing current passes through it as already described. When relay E is energized, it attracts its armature 108, which allows alternate contact 110 to drop down; this action causes the line lamp signals S² to be lighted over a circuit traced from battery through lamp signals S², conductor 154, to ground, through alternate contact 110. This lamp remains lighted after relay E is deenergized because of the locking device preventing the return of the armature to its normal position.

The operator notices the lighted lamp signal S² and presses the listening key LK thus

connecting the operator's set OS to the cord conductors. The operator inquires the wants of the calling subscriber, and assuming that the subscriber at substation D is the party
 5 wanted, she ascertains if the line is idle, and if it is, she inserts the plug P into the jack J' of the line circuit L'. She is not connected with the tip circuit however until relay F is operated. When the listening
 10 key LK was depressed, a circuit for the energization of relay F was established traced from battery through the winding of relay F, normal contact 109 of relay E which was de-energized when the interrupter
 15 relay IR was de-energized, (contact 109 follows the operation of relay E independent of its locking armature) conductor 105, and to ground through alternate contact 131 of the listening key LK. When relay F is
 20 energized it restores alternate contact 110 to its normal position, thus effacing the lamp signal S²; it also prevents the premature lighting of the lamp signal S³. Assuming that the listening key was depressed
 25 when the interrupter relay IR was de-energized, a circuit for the energization of relay M, in the trunk circuit B, and relay CS, in the cord circuit C, is established traced from battery through the lower winding
 30 of the relay CS, conductor 70, alternate contact 71, normal contact 46, ring contacts of the connected plug CP and jack J², conductors 137, 139, 153 and 160, through the winding of relay M, over conductor 146,
 35 alternate contact 128 of the listening key LK, conductor 158, 140 and 138, through tip contacts of the connected plug CP and jack J², normal contact 40 of relay IR, alternate contact 65 of relay LD', and con-
 40 ductor 72 to ground through the upper winding of the calling supervisory relay CS.

The operator having inserted the plug P into the jack J' as before described now restores her listening key LK. This restoration of the listening key LK opens the energizing for relay F at alternate contact 131 of the key LK. The opening of alternate contact 128 of the key LK opens the initial energizing circuit of relay M but
 50 relay M being slow to release due to the shunt about its winding is held momentarily energized until the normal contact 120 of relay F closes at which time relay M establishes a locking circuit for itself, through its alternate contact 123, by current flowing
 55 from battery to the winding of relay M, as previously described, through alternate contact 123, conductor 145, normal contact 161 of the release key R', conductor 142, normal contact 120 conductors 107, 140 and 138,
 60 through the connected plug CP and jack J² to ground at the CS relay, as previously described. The opening of normal contact 28 of relay CS opens the locking circuit of

the ringing control relay RC, which relay de- 65
 energizes to open its alternate contact 42, which disconnects the ringing interrupter I from the lower winding of the relay IR. The relay IR now remains at normal, and the opening of its alternate contact 40 pre- 70
 vents further application of ringing current to the trunk circuit.

When the operator inserts plug P into jack J', a circuit is established for the energization of relay H and relay CO' of the 75
 line circuit L', by current flowing from battery through the winding of relay H, conductor 152, connected plug P and jack J' to ground through the cut-off relay CO'. When relay CO' is energized, the alternate 80
 contacts 2' and 3' of said relay CO' are attracted, thus connecting the subscriber's set at D to the exchange. The operator now depresses the ringing key R, of the trunk circuit B, and a circuit is established for the 85
 ringing of the call bell at subscriber's station D over a path traced from the ungrounded side of the ringing generator G⁴ through alternate contact 163 of said ringing key R, over conductor 155, through the tip contacts of the connected plug P and jack J', alternate contacts 3' of the cut-off relay CO', through the condenser, switchhook, and call bell of the subscriber's station D, and back through alternate contact 2' of the re- 95
 lay CO', ring contacts of the connected plug P and jack J', to ground at alternate contact 164 of the ringing key R. The call bell at substation D rings, over the circuit just traced, and the subscriber at D removes his 100
 receiver from the switchhook.

Assuming that the subscriber at substation D removes his receiver from the switchhook when the ringing key R is in its normal position, a circuit for the energization 105
 of relay N will be established by current flowing from battery through the lower winding of relay CS, conductor 70, alternate contact 71, of relay LD', normal contact 46 of relay IR, through the ring contacts of the connected plug CP and jack J², con- 110
 ductors 137, 139 and 165, the winding of relay N, conductors 159 and 151, normal contact 164 of the ringing key R, through the ring contacts of connected plug P and jack J', 115
 through the subscriber's set and back through the tip contacts of the connected plug P and jack J', conductor 155, normal contact 163 of the ringing key R, conductors 140 and 138, ring contacts of connected plug CP 120
 and jack J², normal contact 40 of relay IR, alternate contact 65 of the relay LD' to ground through the upper winding of relay CS. The energization of relay N establishes a circuit for the actuation of re- 125
 lay F traced from battery through the winding of relay F, normal contact 109 of relay E, conductors 105 and 166, alternate

contact 125 of relay N, conductors 143 and 141, to ground at alternate contact 118 of relay H.

When relay F is actuated, the circuit for the lighting of lamp signal S^3 is broken at alternate contact 119 of said relay F, thus effacing said signal S^3 and informing the operator that the called subscriber at substation D has answered. Following said information, the operator will desist from depressing ringing key R and thus actuating said call bell at substation D. Also when relay F is actuated, a circuit for the energization of relay K is established by current flowing from battery, through the winding of said relay K, alternate contact 119 of relay F, and over conductor 141 to ground at alternate contact 118 of relay H. Relay K locks itself by a circuit through its alternate contact 115, traced from battery, through said relay K, alternate contact 115 and conductors 166, 143 and 141 to ground at alternate contact 118 of relay H. The actuation of relay F breaks the locking circuit of relay M, at its alternate contact 120, thereby causing the de-energization of relay M, which returns to normal. Relay CS of cord circuit C is now held up over the called line.

When the operator releases the ringing key R and the called subscriber at substation D removes the receiver from the switchhook, a talking circuit is established from substation A to substation D over the heavy conductors and the called and calling subscribers may carry on a conversation.

After the subscribers have finished their conversation, they replace their receivers on their respective switchhooks, causing the answering and calling supervisory relays AS and CS to restore, due to the opening of the switchhook contacts at the respective stations A and D. The closing of normal contacts 15 and 54 of the respective supervisory relays AS and CS closes an energizing circuit for the disconnect control relay DCR, traced from battery through the winding of relay DCR, conductor 53, normal contact 54 of the calling supervisory relay CS, conductor 55, normal contact 15 of the answering supervisory relay AS, conductor 56, alternate contact 57 of the relay LD, conductor 30, to ground at alternate contact 19 of the relay LD'. The relay DCR upon energization opens its normal contacts 8 and 23 and the opening of normal contact 8 interrupts the energizing circuit of the relay LD, and the opening of normal contact 23 opens the energizing circuit of relay LD', and the two relays LD and LD' now restore to normal. The relays LD and LD' open their respective contacts 57 and 19, opening the initial energizing circuit of the disconnect control relay DCR, but due to the slow-to-release construction of the relay DCR, it is

momentarily held energized until a locking circuit is established for it, which may now be traced from battery through the winding of relay DCR, its alternate contact 60, conductor 61, normal contact 62 of relay 63, conductor 64, normal contact 65 of relay LD', normal contact 40 of relay IR, tip contacts of the connected plug CP and jack J^2 , normal contact 133 of relay CO², said relay CO² having restored to normal when the series energizing circuit of the relays LD' and CO² was interrupted at contact 23 upon the energization of relay DCR to ground. The series energizing circuit of the relay LD and relay CO is interrupted at the contact 8 of the energized relay DCR, and relays LD and CO restore. The relay LD upon restoration opens its alternate contacts 11 and 12, disassociating the calling line from the strands of the link or cord circuit C, and the restoration of relay LD' opens its alternate contacts 52 and 71, disassociating the called line from the strands of the cord circuit C. The closing of alternate contact 36 of the relay DCR establishes a circuit for the calling supervisory lamp CL traced from battery through the lamp CL, normal contact 25 of relay RC, conductors 26 and 27 to ground at alternate contact 36 of relay DCR, and the lamp CL is thus lighted over this circuit. A circuit is also established for the lighting of the answering supervisory lamp AL, traced from battery through the lamps AL, conductor 55, normal contact 54 of relay CS, conductor 53, alternate contact 60 of relay DCR, conductor 61, normal contact 62 of relay 63, conductor 64, normal contact 65 of relay LD', normal contact 40 of relay IR, tip contacts of the connected plug CP and jack J^2 , normal contact 133 of relay CO² to ground, and the answering supervisory lamp AL is thus lighted over this circuit. The closing of alternate contact 23 of relay DCR connects relay 63 over conductor 24 to the sleeve of the connected jack J^2 , but relay 63 is not energized at this time, as ground from the sleeve of the connected jack J^2 extends over the sleeve contact of the plug CP over conductor 24 and through alternate contact 23 of relay DCR to one terminal of the winding of relay 63 which is also connected to ground. The ground potential upon the sleeve of the jacks J^2 prevents the sleeves of the jacks J from testing busy when the subscribers have replaced their receivers and the plugs AP and CP are still connected in the respective jacks J and J^2 so that should another operator test the line of substation D, as to its idle or busy condition, the operator in testing a multiple jack J will not receive a busy click even through the plug CP is still in the jack J^2 . Thus, should an operator be busy in handling other connections and permit the plugs AP and CP to remain in the jacks, the lines are im-

mediately available as called lines and will test idle.

The operator noting the two lighted supervisory signals AL and CL removes the answering plug AP and calling plug CP from their respective jacks J and J², and the removal of calling plug CP from jack J² of the called line opens the energizing circuit of the disconnect relay DCR at the tip contacts of the plug CP and jack J², and the relay DCR, upon de-energization, opens its alternate contacts 60 and 36, which opens the circuits of the answering and calling supervisory signals AL and CL, respectively, thus effacing the two signals. The removal of the plug AP from the jack J of the calling line disconnects the answering end of the cord circuit C from the calling line, and the apparatus used in establishing a connection between the calling subscriber at substation A and the called subscriber at substation D is now at normal and available for establishing other connections.

When the subscriber at D finishes his conversation, and replaces his receiver on the switchhook, the circuit for the energization of relay N is interrupted at the switchhook of substation D. The relay N being de-energized, it opens its alternate contact 125 and this interrupts the circuit for the energization of relay F, allowing it to become normal and thus open its alternate contacts. This action establishes a circuit for the energization of relay L by current flowing from battery through the winding of relay L, conductor 104, alternate contact 116 of relay K, conductor 102, alternate contact 117, conductors 149 and 103, normal contact 124 of relay M, normal contact 125, of relay N, and through conductors 143 and 141 to ground at alternate contact 118 of relay H. The lamp signal S³ is lighted when normal contact 119 of relay F is returned to its normal position establishing a circuit from battery through the lamp signal S³, normal contact 119, conductor 141 to ground at alternate contact 118 of relay H.

When the operator sees the lamp burning she knows that the subscribers have finished their conversation, and accordingly, she withdraws plug P from jack J', thus cutting off the called subscriber from the interconnecting trunk and cord circuits. When the plug P is withdrawn, the circuit for the energization of cut-off relay CO' and relay H is interrupted. This restores the alternate contacts 2' and 3' of the said cut-off relay CO' to their normal positions. The de-energization of relay H causes the restoration of alternate contacts 117 and 118 of said relay H to their normal positions, thus breaking the energizing circuits for relay K and relay L, which restore to their normal positions. The lamp signal S³ was ef-

faced by the interruption of its energizing circuit at normal contact 118 of relay H.

When the subscribers place their respective receivers on the switchhooks, the cord circuit C is immediately ready for use by new subscribers, or a new call initiated by one of the parties of the former conversation. If the cord circuit C was used for direct connection to a called subscriber's line and the parties had replaced their receivers, if the called party was to make a recall and the call answered by a different operator, when she plugs into a multiple jack of the called line she would operate relay 63 and transfer the ground supply for lamp AL from relay CO² to alternate contact 62 of relays 63.

Assuming that subscriber D is in a hotel that charges him a certain amount for each outgoing call he makes, before the operator who might be busy handling other calls, could withdraw the plug P from jack J', the subscriber at D could make a number of calls, and thereby make the hotel lose a certain amount of revenue. In order to prevent this from happening, I have provided means in the trunk circuit to disconnect the trunk circuit from the cord circuit immediately upon the replacing of the receiver on the switchhook.

Assuming that the subscriber D has just finished a conversation, and replaced the receiver on the switchhook, and then decides to make another call, and assuming that the operator has been occupied with other business and has not withdrawn plug P from jack J', thus when the calling subscriber at D removes his receiver from the switchhook the relay N is energized over a circuit traced from battery through the lower winding of coil 114, alternate contact 113 of relay L, conductors 139 and 165, through the winding of relay N, conductors 159 and 151, normal contact 164, ringing key R, ring contacts of connected plug P and jack J', alternate contact 2' of relay CO', through the subscriber's set and back through alternate contact 3' of cut-off relay CO', tip contacts of connected plug P and jack J', normal contact 163 of ringing key R, conductor 140, alternate contact 111, to ground, through winding of coil 114. The energization of relay N establishes a circuit for the actuation of relay F which in turn opens the circuit of lamp signal S³ to efface the same as has been previously described. The relay L being energized holds the circuit open and prevents the calling subscriber at D from getting a connection with the cord circuit C. The operator controlling the trunk circuit B seeing the lamp signal S³ effaced depresses the release key R' which interrupts the circuit for the energization of relay L at alternate contacts 161 and 162; said relay L de-energizing closes the talking circuit

shown as heavy conductors and energizes relay LR² over a circuit traced from battery through the winding of relay LR², alternate contact 135, conductors 137, 139 and 165, winding of relay N, conductors 159 and 151, normal contact 164 of ringing key R, conductor 154, ring contacts of connected plug P and jack J', alternate contact 2' of relay CO', subscriber's set at D, alternate contact 3 of cut-off relay CO', connected plug P and jack J', conductor 155, normal contact 163 of ringing key R, conductors 140 and 138 alternate contact 133 of relay CO² to ground. This establishes a circuit for the lighting of lamp signal S⁴ by a circuit traced from battery through the lamps S⁴ and alternate contact 132, of relay LR², to ground. The operator controlling the cord circuit C notices the lighted lamp S⁴ and plugs an answering plug AP into jack J², and the call is taken care of in the usual way.

Having described my invention operating with a certain circuit arrangement, 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 is:

1. A telephone system including a calling subscriber's line and a called subscriber's line, a cord circuit and a two-way trunk circuit for connecting said lines, disconnect means for automatically disconnecting said cord circuit from the trunk circuit, recall means in said trunk circuit controlled by the called subscriber, and trunk operator controlled means for releasing said recall means permitting the operation of a signal associated with said trunk circuit to signal the operator associated with said cord circuit.

2. A telephone system including a calling subscriber's line and a called subscriber's line, a cord circuit and a trunk circuit for effecting connection between said lines, link disconnect means in said cord circuit and controlled by said calling subscriber for automatically disconnecting said cord circuit from said trunk circuit, and disconnect means in said trunk for preventing an extension of a recall from said called line over the trunk circuit to the operator associated with said cord circuit and means in said trunk circuit under the control of the trunk operator associated with said trunk circuit for releasing said disconnect means to permit said recall to be extended to the operator of said cord circuit.

3. A telephone system including a calling subscriber's line and a called subscriber's line, a cord circuit and a trunk circuit for effecting connection between said lines, dis-

connect means for automatically disconnecting said cord circuit from said trunk circuit, disconnect means in said trunk circuit for preventing an extension of a call over the trunk circuit to the operator associated with said cord circuit, and trunk operator control means for rendering ineffective said last means to permit the extension of a call to the cord operator.

4. The combination of a cord circuit and a two-way trunk circuit connecting a pair of lines in conversational circuit as calling and called lines, subscriber controlled means for disconnecting the cord circuit from the trunk circuit, and called subscriber controlled means for disconnecting one end of the trunk circuit from the other end thereof, and a pair of signals for said trunk circuit, one directly controlled by said called subscriber and said other signal adapted to be placed under the control of said called subscriber by operator controlled switching means in said trunk circuit.

5. The combination of a cord circuit and a two-way trunk circuit connecting a pair of subscriber's lines, disconnect means for disconnecting the cord circuit from one of said lines and from the trunk circuit and for disconnecting one end of the trunk circuit from the other end thereof, and a pair of signals associated with said trunk circuit, one being directly controlled by one of said subscribers and the other of said pair of signals being placed under the control of said one of said subscribers by operator controlled switching means in said trunk circuit.

6. The combination of a pair of subscriber's lines connected by means of a cord circuit and a two-way trunk circuit, disconnect means for disconnecting the cord circuit from the trunk circuit and for disconnecting the outgoing end of the trunk circuit from the incoming end thereof, a signal associated with said trunk directly controlled by said one of said subscribers, and a second signal at the incoming end of said trunk circuit placed under the control of the said one of said subscribers by operator controlled switching means in said trunk circuit.

7. A telephone system including a two-way trunk circuit for connecting subscriber's lines, and disconnect means for disconnecting one end of said trunk circuit from the other end thereof while a subscriber's line remains connected to the trunk circuit, and a signal for said trunk circuit adapted to be placed under the control of said subscriber's line, by operator's switching means in said trunk circuit.

8. A telephone system including a two-way trunk circuit for connecting subscriber's lines, disconnect means for disconnecting one end of said trunk circuit from the other end thereof while a subscriber's line remains connected to the trunk circuit, and operator

controlled means for restoring the said disconnect means to permit the trunk circuit to be used for other calls while said trunk circuit is connected to said subscriber's line,

5 and a signal for said trunk circuit adapted to be placed under the control of said connected subscriber's line by said operator controlled means in said trunk circuit.

9. A telephone system including a two-way
10 trunk circuit connected to a subscriber's line, a signal associated with one end of said trunk circuit, subscriber controlled means for preventing said subscriber from operating said signal, and operator controlled restoring
15 means in said trunk for replacing the control of said signal under said subscriber prior to the disconnection of said trunk from said subscriber's line.

10. A telephone system including a trunk
20 circuit for use in establishing connections between subscriber's lines, a signal associated with each end of said trunk circuit, subscriber controlled means for operating one of said signals, and operator controlled means
25 for rendering ineffective the control of said signal by said subscriber and switching said control to the other of said signals prior to the disconnection of said trunk from said subscriber's line.

30 11. A telephone system including a calling subscriber's line and a called subscriber's line, a cord circuit and a trunk circuit for connecting said lines, a battery supply relay in said cord circuit for supplying said called
35 subscriber's line with the talking current, a battery supply relay in said trunk circuit, and subscriber controlled means for switching the supply of talking current from said relay in said cord circuit to said relay in
40 said trunk circuit, and operator controlled

means for releasing said battery supply relay in said trunk circuit prior to the disconnection of said trunk from said called line.

12. A telephone system including a calling
45 subscriber's line and a called subscriber's line, a cord circuit and a trunk circuit for connecting said lines, a disconnect relay for said trunk circuit for disconnecting one end of the trunk circuit from the other end
50 thereof, and trunk operator controlled means for restoring said disconnect relay prior to the disconnection of said trunk circuit from said called subscriber's line.

13. A telephone system including a cord
55 circuit and a trunk circuit for connecting a pair of lines, a signal for said trunk circuit controllable by the cord circuit operator, a signal for said trunk circuit controllable by one of said subscribers, and a third
60 signal for said trunk circuit to which the trunk operators can switch said subscriber's control.

14. A telephone system including a calling
65 subscriber's line, and a called subscriber's line, a cord circuit and a trunk circuit for connecting said lines, link disconnect means in said cord circuit controlled by said calling subscriber for automatically disassociating said cord circuit from the trunk circuit, and recall means associated only with
70 said trunk circuit and controlled by the called subscriber for signalling the operator associated with the incoming end of the trunk circuit.

Signed by me at Chicago, in the county of Cook and State of Illinois, this 27th day of October, 1924.

MICHAEL B. STAZAK.