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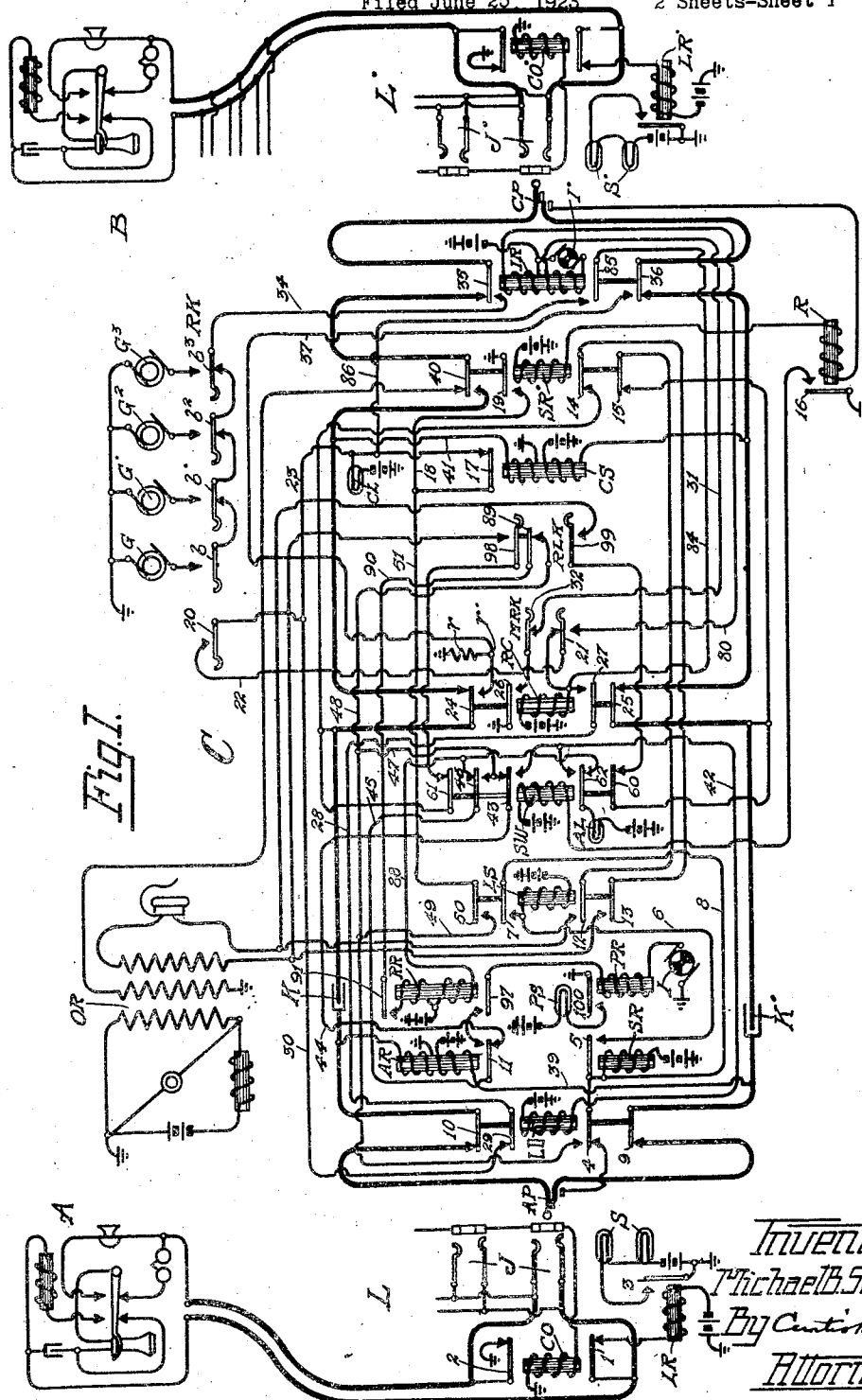
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M. B. STAZAK

TELEPHONE SYSTEM

Filed June 25, 1923

2 Sheets-Sheet 1



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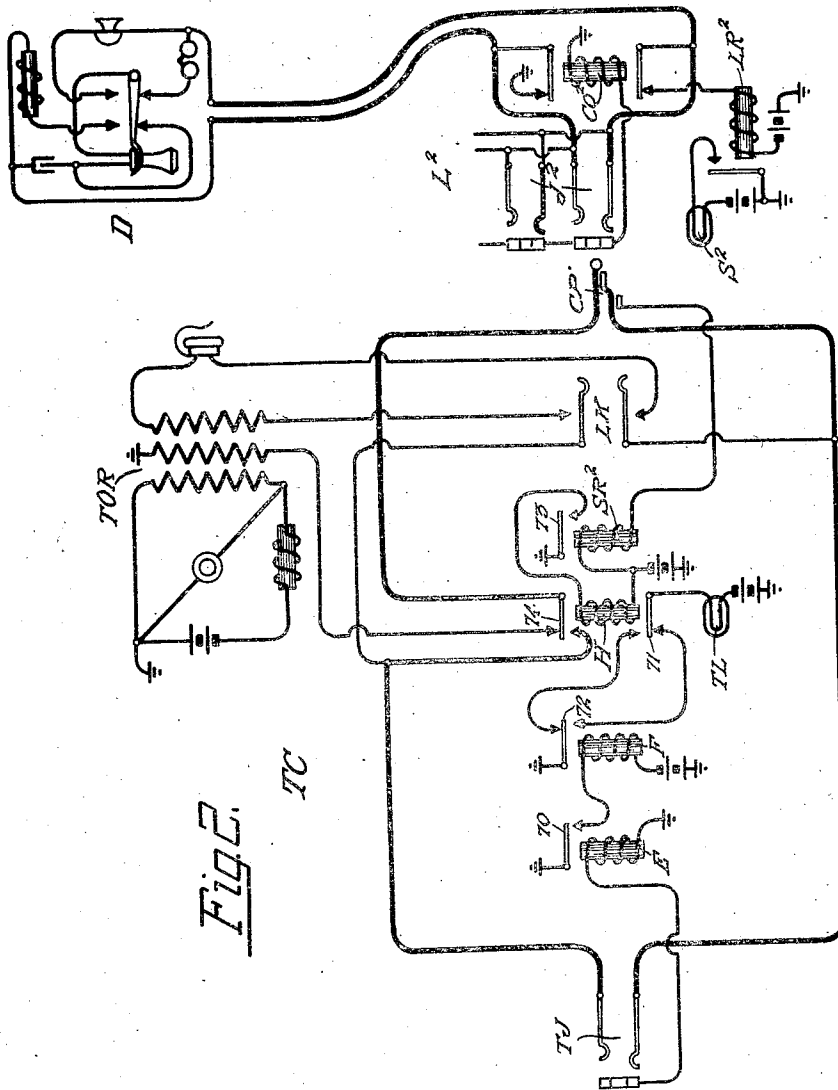
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

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TELEPHONE SYSTEM.

Application filed June 25, 1923. Serial No. 647,451.

My invention relates to telephone systems in which manually operated link circuits are employed for interconnecting subscribers' telephone lines as calling and called lines, and particularly to systems embodying automatic features.

A feature of my invention is the provision of a link circuit for interconnecting subscribers' lines of the same exchange in conversational circuit and also the provision of a trunk circuit to which my link circuit is adapted to be operatively connected to connect a subscriber's line at one exchange with a subscriber's line of another exchange. The link circuit of my invention is provided with automatic disconnect means for automatically freeing the calling subscriber's line from the link circuit after a connection has been established between a calling subscriber's line and another subscriber's line at the same exchange as a called line, immediately upon the replacement of the calling subscriber's receiver upon its switchhook. The calling subscriber's line is now ready to be called, or to initiate another call which may be seized by any one of the operators before whom the call is distributed.

Another feature of my invention is the provision of means for rendering the automatic disconnect means in my cord circuit ineffective when my link circuit is connected to my trunk circuit to extend a call to a distant exchange and the further provision of means in my link circuit for automatically flashing a supervisory signal after the calling subscriber replaces his receiver upon its switchhook and again removes it to initiate another call or recall, before the link circuit is disconnected from the calling subscriber's line, to attract the attention of the operator controlling this link circuit which will be the same operator that handled the preceding call initiated by the calling subscriber.

Another feature of my invention is the provision of means for providing secret service on the link circuit between a calling and called subscriber when a local connection is established, and the provision of means for permitting the operator controlling the link circuit to listen in on the conversation when a trunk connection is established.

Still a further feature of my invention is the provision of means for permitting ringing current to be applied from the exchange in which the calling subscriber's line termi-

nates to signal the called subscriber at the distant exchange.

Another feature of my invention is the provision of a pilot signal and means for automatically flashing the same when a call is made by the calling subscriber after the completion of a trunk connection.

The above mentioned features as well as other features not specifically pointed out above, will be more fully and particularly pointed out in the ensuing specification and claims, reference being had to the accompanying drawings in which:

Fig. 1 illustrates the cord circuit of my invention and also shows two common battery subscriber substations terminating in well known line circuits, and

Fig. 2 illustrates the trunk circuit of my invention which is adapted to work in connection with my cord circuit.

Referring now in general to my invention, as illustrated in Fig. 1, it comprises a well known common battery, calling substation A, terminating at the exchange in a well known line circuit L comprising multiple answering jacks J, multiple line lamps S, a line relay LR for controlling the operation of the line lamp signals S, and a cut off relay CO. To the right of the drawing, I show a common battery called subscriber's substation B, terminating at the exchange in a line circuit L', which comprises, multiple answering jacks J', multiple line lamps S', a line relay LR', and a cut off relay CO'. The line circuits L and L' shown are provided with the multiple answering jacks and multiple line lamps, so that a jack and a lamp appear in a plurality of operator's positions. When a call is initiated, the line signals S, which appear before a plurality of operators are lighted so that any one of the operators before whom the signals appear may answer the call to the exclusion of the other operators.

The cord circuit C of my invention, as illustrated in Fig. 1 of the drawing is arranged to interconnect the subscribers' substations A and B, and also to interconnect substation A and a substation D at a distant exchange via my trunk circuit TC shown in Fig. 2. The cord circuit C comprises an answering plug AP and a calling plug CP interconnected by the heavily marked conductors, having the condensers K and K' interposed. The answering end of the cord

circuit C comprises a sleeve relay SR which energizes in series with the cut off relay CO of the line circuit L upon the insertion of the plug AP into one of the jacks J, an answering supervisory lamp AL is also provided which is adapted to serve for several purposes which will be pointed out later. An answering supervisory relay AR is provided for controlling the operation of the supervisory signal AL and link disconnect relay LD and also the relay RR. A pilot signal PS, and a relay PR and interrupter I for interruptingly operating the same are provided. A listening relay LS is also provided and is operable upon the operation of relay SR, to automatically connect the operator's telephone set OR to the talking conductors of my cord circuit C. The relay SR is of such resistance, that it will not operate if another operator's cord circuit at another operator's position is already connected to one of the multiple jacks J and relay LS in this other cord circuit is energized, for in this case the relay LS, which is of low resistance will shunt the high resistance relay SR of cord circuit C, thereby preventing said relay SR from energizing, and the failure of relay SR of cord circuit C to energize, relay LS of cord circuit C will not energize to connect the operator's set OR to the cord circuit C. This feature will be pointed out more in detail in the ensuing specification.

The calling end of the cord circuit C comprises a sleeve relay SR' in series with relay R and is adapted to energize upon the insertion of the plug CP into the trunk jack TJ of my trunk circuit TC. The relay R, is adapted to energize when plug CP is connected to one of the jacks J' but will not energize when connected to the trunk jack TJ due to the high resistance of relay E of trunk circuit TC. A switching relay SW is provided and is controlled by relay R for purposes to be pointed out later. A calling supervisory lamp CL is provided as is also a calling supervisory relay for controlling said lamp CL. A ringing control relay RC and an interrupter relay and interrupter device I' are provided for intermittently applying ringing current to the called for subscriber's line from any one of the frequency generators G, G', G² and G³. A key MRK is provided for manually applying ringing current to the called for subscriber's line instead of automatically applying ringing current. A recall listening key RLK is provided for purposes to be presently described.

When the cord C is interconnecting two common battery lines such as A and B, relay R will be energized which in turn causes the operation of relay SW, relay SW when energized opens the energizing circuit of relay RR whereby said relay RR is prevented

from operating so long as plug CP is connected to a jack J', since relay SW will remain energized during the existence of such connection. The relay SW energizing closes a contact in the circuit of the link disconnect relay LD and places the said relay LD under the control of the answering supervisory relay AR, so that when the calling subscriber replaces his receiver upon its switchhook, relay AR will deenergize and close a circuit for relay LD whereupon relay LD will operate to free the calling subscriber's line A from the cord circuit C, so that the calling subscriber A may be free to be called or free to initiate a call, which may be seized by any one of the operators in whose position his line terminates even though the plug AP remains in the jack J. Now when my cord circuit C has its calling plug CP connected to the trunk jack TJ of my trunk circuit TC, relay R will not operate due to the high resistance of relay E in the trunk circuit TC, and relay R failing to operate, relay SW will not energize whereby the link disconnect relay LD will be rendered ineffective when the calling subscriber at A replaces his receiver upon its switchhook, but relay RR will operate and lock up, the lamp AL at this time lighting continuously to notify the operator at C that conversation has terminated, but now when the calling subscriber A removes his receiver to initiate a recall or another call, relay AR will again operate to connect the interrupter device I in circuit with the supervisory lamp AL whereupon said signal AL will light intermittently to indicate to the operator that another call has been initiated and that her services are desired whereupon she will operate her recall listening key RLK, which will open the locking circuit of relay RR and at the same time connect the operator's set OR to the cord circuit C to enable the operator to converse with the calling subscriber. Relay RR will de-energize when key RLK is operated to its alternate position whereupon the interrupter device I is disconnected out of circuit with lamp AL. When the device I is connected in circuit with the lamp AL, the pilot lamp PS is also caused to intermittently operate for supervisory purposes, due to the energization and de-energization of relay PR. When trunk connections are established, especially if the trunk connection is a toll connection, it is often desirable to have the calling subscriber be able to recommunicate with the operator that established the original connection, while when local connections are established, it is often desirable to obtain as quick an answer as possible upon recalls. Therefore, to expedite the service the recall is made available to a plurality of operators so that the idle one of a plurality of operators may answer the call.

Referring now to Fig. 2, it comprises a trunk jack TJ, which is located before the operator at cord circuit C, and with a calling plug CP' which is adapted to be connected to a called for subscriber's line to extend a call to said called subscriber's line. When a trunk connection is desired, the operator at the cord circuit C converses with the operator controlling the trunk circuit TC, over an order wire and the trunk operator will assign a trunk circuit to the operator at cord circuit C, whereupon the operator at cord C will insert her calling plug CP into the trunk jack TJ corresponding to the assigned trunk circuit and upon said insertion relay E of trunk TC will energize to close a circuit for relay F whereupon relay F energizes to close a circuit for the signal TL, which signal will light to notify the operator that the cord C at the calling operator's position has been connected to the proper trunk TC assigned. The operator at trunk TC will operate her listening key LK and test the called for subscriber's line to determine its idle or busy condition and if idle will insert plug CP' into the jack J² whereupon relay SR² will energize which will cause relay H to energize to open the circuit of the signal TL to cause the effacement of said signal TL and also to close a normally open contact in the trunk circuit TC. In case the operator of trunk TC inserts the plug CP' into jack J² before the plug CP cord circuit C is connected to jack J', the signal TL will light so that when plug CP' is connected to jack J' said signal TL will be effaced to notify the operator of such connection.

Ringling current will be applied from the operator's position where the cord circuit C is located. The signal TL will remain unlighted now until the plug CP of cord circuit C is withdrawn from the jack TJ whereupon relay E will de-energize, and relay E de-energizing relay F will de-energize, thereby causing the signal TL to light to notify the trunk operator that the connection is no longer desired whereupon she will withdraw the plug CP' from the jack of the called for subscriber's line and the trunk circuit TC will restore to normal.

Having described in general the apparatus employed in a preferred embodiment of my invention, I will now describe more in detail the operation of the system as illustrated in the accompanying drawings.

Assuming that the subscriber at substation A initiates a call, the removal of the receiver thereat, establishes an energizing circuit for the line relay LR of the line circuit L, traced from battery through the winding of said relay LR, normal contact 1 of the cut-off relay CO, through the now alternate closed switchhook contacts of substation A, normal contact 2 of cut-off relay

CO to ground, relay LR energizing over this circuit closes its alternate contact 3 whereby a circuit is closed for the line signals S which light at different operators' positions. The first operator to seize the call by the insertion of her answering plug AP into the jack J before which the signal S is lighted, and assuming that the operator to seize the call is the operator at cord circuit C, a circuit is closed for the sleeve relay SR traced from battery through the winding of said relay SR normal contact 4 of relay LD, sleeve contacts of plug AP and jack J, to ground through the winding of cut-off relay CO, relay SR and relay CO energizing in series over this circuit. Relay CO upon energizing opens its normal contacts 1 and 2 whereby the line relay LR restores to cause the effacement of the line signals S, and the sleeve relay SR of cord circuit C energizing closes an energizing circuit for the listening relay LS traced from battery through the winding of said relay LS, conductor 6, alternate contact 5 of relay SR, normal contact 4 of relay LD, sleeve contacts of plug AP and jack J to ground through the winding of cut-off relay CO. Relay LS upon energizing closes a locking circuit for itself traced from battery through the winding of said relay LS through its alternate contact 7, conductor 8, normal contact 4 of relay LD, sleeve contacts of plug AP and jack J to ground through the winding of cut-off relay CO. This circuit just traced also forms a shunting circuit about the sleeve relay SR, and the sleeve relay SR will de-energize due to the fact that its winding is of high resistance while the winding of relay LS is of low resistance. Upon the insertion of the plug AP into the jack J, a circuit is also closed for the answering supervisory relay AR traced from battery through the lower winding of said relay AR, normal contact 9 of relay LD, ring contacts of the plug AP and jack J, through the substation A, tip contact of jack J and plug AP, normal contact 10 of relay LD, to ground through the upper winding of said relay AR. Relay AR energizing over this circuit opens its normally closed contact 11 to prevent the premature lighting of the answering supervisory signal AL. Upon the energization of relay LS, the operator's telephone head set OR is connected to the talking conductors of the cord circuit C through alternate contacts 12 and 13 of said relay LS and normal contacts 14 and 15 of relay SR' whereupon the operator inquires the wants of the calling subscriber at substation A.

The feature whereby, all of the operators who attempt to seize the call, subsequently to the seizure of the call by the first operator are excluded, will now be explained.

When the first operator to seize the call inserted her answering plug AP into the

jack J, the sleeve relay SR in her cord circuit operated to close a circuit for the listening relay LS whereupon relay LS energized and closed a locking circuit for itself through its alternate contact 7. This locking circuit forming a shunting circuit for the said relay SR whereupon said relay SR, due to the high resistance of its winding and the low resistance winding of LS will de-energize, since sufficient battery will not flow through said relay SR to maintain the same energized. Now when an operator inserts her answering plug AP into another jack J subsequently to the insertion of the plug AP into the jack J by the first operator, the sleeve relay SR in the second operator's cord circuit will not operate due to the low resistance path of the circuit of relay LS of the first cord circuit, and therefore sufficient current will not flow through the high resistance winding of the sleeve relay SR in the second operator's cord circuit to operate the same. The failure of relay SR in the second cord circuit to operate, prevents the listening relay LS associated therewith to energize to connect the second operator's head set to her cord circuit to enable her to converse over the calling line. The operator receiving no reply to her inquiry will know that the call has been seized by another operator and will then withdraw her answering plug from the multiple jack J.

Referring back to when the operator inquired the wants of the calling subscriber A and assuming that the calling subscriber A desires to converse with the subscriber at substation B the operator will test the jack J' to determine its idle or busy condition in the usual and well known manner. Assuming the called line is idle the operator will insert the calling plug CP into the jack J'. The insertion of the plug CP into the jack J' establishes a circuit for the sleeve relay SR' which will energize in series with cut-off relay CO' of the line circuit L', this circuit being traced from battery through the winding of relay SR', through the winding of relay R, sleeve contacts of the plug CP and jack J', to ground through the winding of cut-off relay CO of the line circuit L'. Relay CO' energizes to open its normally closed contacts whereby the line relay LR' is removed from the control of the subscriber B so that when subscriber B removes his receiver the line signal S' will not light. Relay SR' upon energizing opens its normally closed contacts 14 and 15 whereby the operator's head set OR is disconnected from the cord circuit C. The winding of relay CO' is of low resistance which permits relay R to energize in series with relay SR' and said relay CO', said relay R energizing closes its alternate contact 16 whereby a circuit is closed for the

switching relay SW, traced from battery through the winding of said relay SW to ground through the alternate contact 16 of said relay R. Relay SW upon energizing opens its normally closed contacts and closes its alternate contacts, to prevent the operation of the relay RR and to place the relay LD under the control of the calling subscriber A. Relay SR' having energized, a circuit is closed for the calling supervisory lamp CL, traced from battery through said lamp CL, normal contact 17 of relay CS, conductor 18 to ground through alternate contact 19 of relay SR', lamp CL lighting over this circuit remains lighted until the called for subscriber removes his receiver from its switchhook whereupon relay CS will energize to open the circuit of said lamp CL as will be described later.

The plug CP having been inserted into the jack J' and relays SW, SR' and R having operated, the operator will depress one of the ringing key plungers of the ringing key RK to connect ringing current of the proper frequency to the called line and assuming generator G³ to be of the proper frequency required to operate the call bell at substation B, ringing key plunger b³ will be fully depressed momentarily to close the end spring contact 20 of the ringing key RK thereby closing an energizing circuit for the ringing control relay RC, traced from battery through the winding of said relay RC, normal contact 21 of key MRK, conductor 22, the now closed contact 20 of the end spring of ringing key RK, conductor 23, normal contact 17 of relay CS, conductor 18, to ground through alternate contact 19 of relay SR'. Ringing control relay RC energizing over this circuit opens the normally closed contacts 24 and 25 and closes its alternate contacts 24, 26, and 27. The closure of alternate contact 27 establishes a locking circuit for said relay RC which may be traced from battery through the winding of said relay RC, alternate contact 27 of relay RC, conductor 28, normal contact 29 of relay LD, conductor 30, conductor 23, normal contact 17 of relay CS, conductor 18 to ground through alternate contact 19 of relay SR'. This circuit just traced places the ringing control relay RC under the control of the calling subscriber A and also under the control of the called subscriber B, so that should the calling subscriber A replace his receiver upon its switchhook before the called subscriber B responds ringing current will be automatically disconnected from the called subscriber's line or in case the calling subscriber does not replace his receiver before the called subscriber responds ringing current will be disconnected automatically upon the removal of the receiver from its switchhook at the called subscriber's substation B. When the ring-

ing control relay RC is energized, an energizing circuit is established for the ringing interrupter relay IR traced from battery through the live segments of the continuously rotating interrupter device I', through the lower winding of said interrupter relay IR, conductor 31, normal contact 32 of key MRK, to ground through alternate contact 26 of relay RC. The interrupter relay IR will energize and de-energize over this circuit due to the interrupter device I' opening and closing the circuit through the lower winding of said relay IR whereby ringing current will be intermittently applied to the called for subscriber's line.

Assuming that the generator G^3 is of the proper frequency for operating the call bell at the called subscriber's substation B the circuit for the ringing current will be as follows: Ground, through the rotating frequency generator G^3 , alternate contact of plunger b^3 of the ringing key RK, conductor 34, alternate contacts 35 of the interrupter relay IR, tip contacts of the plug CP and jack J' through the call bell at substation B, ring contacts of the jack J' and plug CP, alternate contact 36 of relay IR, conductor 37, resistance r to ground. During each time ringing current is applied to the called line, the calling subscriber A will receive a reverte ring tone which will notify him that the called subscriber B is being signalled. This reverte tone is given over a circuit which is the same as the ringing circuit just described up to point r' from whence it may be traced through alternate contact 24 of relay RC, condenser K, normal contact 10 of relay LD, tip contacts of plug AP and jack J, through the receiver at the calling substation A, ring contacts of jack J and plug AP, normal contact 9 of relay LD, conductor 39, through the lower winding of relay AR to battery. The call bell at substation B will be intermittently actuated until the subscriber thereat removes his receiver from the switchhook whereupon ringing current will be automatically disconnected from the called line, provided the called subscriber answers during a silent or non-ringing period, the ringing current being disconnected from the called subscriber line in the following manner: when the subscriber at substation B removes his receiver from the switchhook while the interrupter relay IR is in its de-energized position which will be during a non-ringing or silent period, a circuit will be established for the calling supervisory relay CS, said circuit being traced from battery through the lower winding of said relay CS, normal contact 36 of relay IR, ring contacts of plug CP and jack J', through the now alternate closed switchhook contacts at substation B, tip contacts of jack J' and plug CP, normal contact 35 of relay IR, alternate contact 46 of relay SR', conductor 41, through the upper winding of relay CS to ground. Relay CS energizing over this circuit opens its normally closed contact 17 thereby opening the circuit of the calling supervisory signal CL whereupon said signal is effaced to notify the operator that the called for subscriber has responded.

Another result due to the opening of normally closed contact 17 of relay CS is the opening of the locking circuit of the ringing controlled relay RC whereupon relay RC de-energizes and opens its alternate contact 26 thereby opening the circuit of the interrupter relay IR whereby relay IR is prevented from further operating to connect ringing current to the called for subscriber line. The ringing controlled relay RC de-energizing closes its normal contacts 24 and 25 whereby the conversational circuit is closed through the talking conductors of the cord circuit C. The calling subscriber A and called for subscriber B are now in conversational circuit.

Should the calling subscriber A replace his receiver upon its switchhook before the called for subscriber B responds ringing current will be automatically disconnected from the called for subscriber's line in the following manner: the answering supervisory relay AR will de-energize due to the opening of the circuit of relay AR at the alternate switchhook contacts of substation A and relay AR de-energizing closes a circuit for the link disconnected relay LD traced from battery through the winding of said relay LD, conductor 42, alternate contact 43 of relay SW, conductor 44, normally closed contact 11 of relay AR, conductor 45, alternate contact 46 of relay SW, conductors 47, 48 and 49, alternate contact 50 of relay LS, conductor 51 to ground through alternate contact 19 of relay SR'. Relay LD energizing over this circuit opens its normally closed contact 29 thereby opening the locking circuit of the ringing control relay RC whereupon said relay RC de-energizes to open the operating circuit of the interrupter relay IR whereby further application of ringing current to the called for subscriber's line is prevented. Relay LD upon energizing also closes its alternate contact 4 which is adapted to close before normally closed contact 4 opens whereby a holding circuit is maintained for relay LS traced from battery through the winding of relay LS, alternate contact 7 of said relay LS, conductor 8, alternate contact 4 of relay LD, conductor 53, conductor 49, alternate contact 50 of relay LS, conductor 51, to ground through alternate contact 19 of relay SR'. Another result due to the energization of relay LD is the opening of normally closed contacts 9 and 10 of said relay LD which frees the

calling subscriber's line A from the cord circuit C whereby the calling subscriber A may be called or initiate another call, as the case may be, even though the plug AP remains in the jack J.

Should the operator at cord circuit C attempt to listen in on the conversation by operating her listening key RLK she is prevented from listening in due to the fact that relay SW will be energized, and will have its normally closed contacts 60 and 61 open, thereby preventing the operator's set OR from being connected to the talking conductors of the cord circuit C when the listening key RLK is operated to its alternate position.

The subscribers A and B are now connected in conversational circuit and upon termination of conversation they will replace their receivers upon their respective switchhooks. When the subscribers at substation B replaces his receiver upon its switchhook the circuit for the calling supervisory relay CS of the cord circuit C is opened whereupon said relay CS restores closing its normally closed contact 17 whereby the calling supervisory lamp CL will light over a circuit traced from battery through the said signal CL, normal contact 17 of relay CS, conductor 18 to ground through alternate contact 19 of relay SR'. When the calling subscriber A replaces his receiver upon its switchhook, the circuit for the answering supervisory relay AR is opened whereupon relay AR de-energizes and closes its normally closed contact 11, whereby a circuit is closed for the link disconnect relay LD, said link disconnect relay LD upon energizing opens its normally closed contacts 9, 10 and 4 to free the calling subscriber's line A from the cord circuit C, and at the same time establishes a holding circuit for the listening relay LS through its alternate contact 4 as traced above. A repetition of the tracing of the circuit for relay LD and also of the circuit for the listening relay LS is not deemed necessary as the circuits for these relays are clearly traced above. where a description was given of the operation of same when the calling subscriber A replaced his receiver upon its switchhook before the called subscriber responded. Relay AR de-energizing, a circuit is closed for the answering supervisory lamp AL traced from battery through said lamp AL, alternate contact 62 of relay SW, alternate contact 43 of relay SW, conductor 44, normal contact 11 of relay AR, conductor 45, alternate contact 46 of relay SW, conductors 47 and 48, conductor 49, alternate contact 50 of relay LS, conductor 51, to ground through alternate contact 19 of relay SR', over which circuit said lamp AL is caused to light. The operator observing the

lighted signals AL and CL will know that conversation has terminated whereupon she will take down the connection by withdrawing the plugs AP and CP from jacks J and J' respectively, whereupon the cord circuit C restores to normal, as do also the cut-off relays CO and CO'.

Operation of Fig. 1 and Fig. 2.

Having described the operation of my cord circuit when used for interconnecting two subscribers' lines at the same exchange, I will now describe the operation of my cord circuit when employed for connecting the subscriber's substation A with the subscriber's substation B at a distant exchange via my trunk circuit TC.

Assuming that the subscriber at substation A has initiated a call and that the same has been answered by the operator at the cord circuit C by inserting the calling plug AP into the jack J leading to the calling subscriber's line, the operation of the cord circuit C in answering the call will be the same as described above. Assuming that it is the subscriber at substation D that is wanted by the calling subscriber A, the operator at cord circuit C upon learning this will converse over an order wire with the operator at the distant exchange to inform the distant exchange operator of the number of the called for subscriber D, whereupon the operator at the distant exchange will inform the operator at the cord circuit C which trunk to connect her cord circuit to, and assuming that the trunk indicated is the trunk TC, shown in Fig. 2, the operator will insert the calling plug CP into the trunk jack TJ, whereby relay SR' of cord circuit C will energize in series with the relay E of trunk circuit TC over a circuit traced from battery through the winding of relay SR', through the winding of relay R, sleeve contacts of plug CP and trunk jack TJ, through the winding of relay E to ground. Relay R will not operate when in series with the relay E of trunk circuit TC due to the high resistance of the winding of said relay E, and relay R failing to energize, no circuit will be established for the relay SW of cord circuit C, whereby said relay SW remains unoperated. When relay E of trunk circuit TC energizes the circuit is closed for the relay F traced from battery through the winding of said relay F, alternate contact 70 of relay E to ground, and relay F operating a circuit is established for supervisory signal TL provided plug CP' has not already been inserted into jack J², said circuit being traced from battery through said signal TL, normal contact 71 of relay H, alternate contact 72 of relay F to ground. The signal TL lighting over this circuit will indicate to the operator at TC that the operator at

cord circuit C has inserted the calling plug CP into the proper trunk jack of the trunk which has been assigned to the operator at the cord circuit. If the plug CP' of trunk circuit TC has been inserted into the jack J² before plug CP of cord C has been inserted into the jack TJ, relays SR² and H will be operated and the supervisory signal TL will light over a circuit traced from battery through said signal TL, alternate contact 71 of relay H to ground through normal contact 72 of relay F. Now when the plug CP of cord C is inserted into jack TJ relays E and H of trunk circuit TC will operate, and relay H operating the circuit for the lamp TL will be opened at normal contact 72 of said relay H whereupon said lamp TL is effaced which will at this time notify the operator that the cord circuit C has been connected to the proper trunk circuit assigned.

The operator at the distant exchange upon assigning the trunk to the operator at the branch exchange will operate her listening key LK to connect her telephone head set TOR to the trunk circuit assigned and will test to determine the idle or busy condition of the called for subscriber's line D and assuming that said line tests idle the operator will insert the plug CP' into the jack J². Upon the insertion of the plug CP' into the jack J² a circuit is closed for relay SR² which will energize in series with the cut-off relay CO² of line circuit L² said circuit being traced from battery through the winding of said relay SR², sleeve contacts of plugs CP' and jack J², to ground through the winding of the cut-off relay CO². Relay CO² operating will open its normally closed contacts thereby removing the line relay LR² and line signal S² from the control of the called subscriber D. Relay SR² energizing closes a circuit for relay H, traced from battery through the winding of relay H, alternate contact 73 of said relay SR² to ground. Relay H energizing over this circuit will close its alternate contact 74 to extend the talking conductor of the trunk circuit TC to the called subscriber's line D and will also open its normally closed contact 71 and close its alternate contact 71. The opening of normal contact 71 of relay H opens the circuit of the signal TL whereupon said signal TL will be effaced. The operator at the cord circuit C having inserted a calling plug CP into the trunk jack TJ will now throw her key MRK to its alternate position, and leave the same in this position until the called subscriber answers, whereby normally closed contacts 21 and 32 of said key are opened and alternate contact 21 will be closed. The operator will now operate the plunger key of the ringing key RK corresponding to the proper frequency adapted to operate the call bell at

the called substation D and assuming that the frequency generator G² is the proper frequency she will depress the plunger b² to its fully depressed position thereby closing a circuit for the ringing interrupter relay IR traced from battery through the upper winding of said interrupter relay IR, conductor 80, alternate contact 21 of key MRK, conductor 22, the now closed contact 20 of the end spring of ringing key RK, conductor 23, normal contact 17 of relay CS, conductor 18 to ground through alternate contact 19 of relay SR'. The interrupter relay IR will energize over this circuit to connect ringing current to the called subscriber's line so long as the plunger b² is in its fully depressed position. The circuit for the ringing current is as follows: ground through the rotating frequency generator G², alternate contact of b², normal contact of plunger b³, conductor 34, alternate contact 35 of relay IR, tip contacts of plugs CP and trunk jack TJ, alternate contact 74 of relay H, tip contacts of plug CP' and jack J² through the call bell at substation D, ring contacts of jack J² and plug CP', ring contacts of trunk jack TJ and plug CP, alternate contact 36 of relay IR, conductors 37, resistance r to ground. When the ringing key plunger b² is released by the operator the closed contact 20 of the end spring of the ringing key RK will open whereby the energizing circuit for the interrupter relay IR will be opened, and relay IR will restore to prevent further application of ringing current to the called subscriber's line. In case the called for subscriber does not respond the operator at the cord circuit C will again depress the ringing key plunger b² to its fully depressed position to apply ringing current to the called subscriber's line as just described above and will continue doing this at different intervals until the called subscriber answers. Another result due to the energization of the ringing interrupter relay IR is the closure of the circuit for the ringing control relay RC traced from battery through the winding of said relay RC, conductor 84, alternate contact 85 of relay IR, conductor 86, normal contact 17 of relay CS, conductor 18 to ground through the alternate contact 19 of relay SR'. Relay RC will energize over this circuit and remain energized so long as the interrupter IR is in its energized position, said relay RC closing its alternate contact 24 to close a circuit over which a reverte ring tone flows to the calling substation A to notify the calling subscriber at substation A that the called for subscriber at substation D is being signalled. The circuit for the reverte tone being the same as the ringing circuit just described above up to the point r' from which point r' a portion of the ringing

current will flow through alternate contact 24 of relay RC, over the tip side of cord circuit C, tip contacts of plug AP and jack J, through the receiver at substation A, ring contacts of jack J and plug AP, back over a portion of the ring conductor of cord circuit C and through the lower winding of relay AR to battery and ground. The calling supervisory lamp CL will remain light-
 10 ed until the called for subscriber at substation D removes his receiver from its switchhook whereby the operator by observing the lighted lamp CL will know that the called subscriber at substation D has not responded and will apply ringing current to the
 15 called line by fully depressing her plunger b^2 as pointed out above. When the called for subscriber answers when the relay IR is in its de-energized position a circuit will be closed for the calling supervisory relay CS traced from battery through the lower
 20 winding of said relay CS, normal contact 36 of relay IR, ring contacts of plug CP and jack TJ, ring conductor of trunk TC, ring contacts of plug CP' and jack J², through the now alternate closed switchhook contacts at the substation D, tip contacts of
 25 jack J² and plug CP' tip conductor of trunk TC, tip contacts of jack TJ and plug CP, normal contact 35 of relay IR, alternate contact 40 of relay SR', conductor 41 to ground through the upper winding of said relay CS. Relay CS energizing over this circuit
 30 opens its normally closed contact 17 thereby opening the lighting circuit of the signal CL whereby said signal CL will be effaced and the operator observing the unlighted signal CL will know that the called for subscriber at D has responded and will not de-
 35 press the ringing plunger b^2 again but will now restore the key MRK to normal, and the interrupter relay IR being in its de-energized position, ringing control relay RC will also be restored to normal position, and the calling and called subscribers at
 40 substations A and B, respectively, are connected in conversational circuit. Ringing current may also be connected to the called subscriber's line so that the ringing current will be automatically and intermittently
 45 connected to said called line if it is so desired, and in this case the key MRK will not be operated, but the operator at cord circuit C will depress the ringing plunger b^2 to its fully depressed position whereupon
 50 ringing current will be automatically and intermittently applied to the called subscriber's line until the subscriber responds or the calling subscriber replaces his receiver upon its switchhook. The operation of the
 55 cord circuit for automatically and intermittently connecting ringing current upon depressing the plunger b^2 is the same as that described when the cord circuit C is con-
 60 nected to the called subscriber's line B and

a repetition of this description is not deemed necessary for a clear understanding of this feature.

Assuming now that conversation has terminated and that the subscribers at substa-
 70 tions A and D have replaced their receivers upon their respective switchhooks, the replacement of the receiver upon its switchhook at substation A will open the circuit of the answering supervisory relay AR, whereby a circuit will be closed for the re-
 75 call relay RR traced as follows: battery through the lower winding of said relay RR, conductor 88, normal contact 46 of relay SW, conductor 45, normal contact 11 of relay AR, conductor 44, normal contact
 80 43 of relay SW, conductors 47, 48 and 49, alternate contact 50 of relay LS, conductor 51 to ground through alternate contact 19 of relay SR'. Relay RR energizes over this circuit and closes a locking circuit for itself
 85 traced from battery through its upper winding and its alternate contact 91, conductor 90, normally closed contact 89 of the recall listening key RLK, conductors 48 and 49, alternate contact 50 of relay LS, conductor
 90 51 to ground through alternate contact 19 of relay SR'. The link disconnect relay LD not being energized and relay AR upon de-energizing closes a lighting circuit for the answering supervisory lamp AL traced
 95 from battery through the lamp AL, normal contact 62 of relay SW, normal contact 46 of relay SW, conductor 45, normal contact 11 of relay AR, conductor 44, normal contact 43 of relay SW, conductors 47, 48 and
 100 49, alternate contact 50 of relay LS, to ground through alternate contact 19 of relay SR'. Upon the replacement of the receiver upon its switchhook at substation
 105 D the circuit for the calling supervisory relay CS of the cord circuit C is opened whereby said relay CS will de-energize and close its normal contact 17, thereby closing the lighting circuit of the supervisory signal CL. The operator observing the lighted
 110 signals AL and CL will know that the conversation has terminated and that the connection is no longer desired and will withdraw the plugs AP and CP from the jacks J and TJ respectively whereupon
 115 the cord circuit C restores to normal. The withdrawal of the plug CP from the jack TJ will open the energizing circuit of relay E of trunk circuit TC, whereupon said relay E will de-energize, and relay E de-energizing the circuit of relay F will be
 120 opened at alternate contact 70 of said relay E whereby said relay F restores and closes its alternate contact 72 thereby closing a circuit for the supervisory signal TL traced from battery through lamp TL, alternate
 125 contact 71 of relay H, normal contact 72 of relay F, over which circuit said lamp lights to notify the trunk operator that the plug
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CP of cord circuit C has been withdrawn from the jack TJ of the trunk circuit TC whereupon the trunk operator will withdraw the plug CP' from the jack J² whereby the trunk circuit TC is permitted to restore to normal and is ready to be used for extending another call.

Assuming now that the calling subscriber after replacing his receiver upon its switchhook on the termination of conversation removes his receiver from its switchhook to initiate another call before the plug AP has been withdrawn from the jack J, the circuit for relay AR will again be established to cause said relay AR to energize, and relay AR energizing closes its alternate contact 11 whereupon the interrupter device I and relay PR are connected in circuit in series with the answering supervisory lamp AL, said circuit being traced from battery through the said signal AL, normal contact 62 of relay SW, normal contact 46 of relay SW, conductor 45, alternate contact 11 of relay AR, alternate contact 97 of relay RR, through the winding of relay PR and to ground through the live segments of the rotating interrupter device I. The supervisory lamp AL will be caused to flash over this circuit due to the continuously rotating interrupter device I which opens and closes the circuit through said lamp AL. The operator observing the flashing of signal AL will know that the subscriber at substation A has initiated another call and will operate her recall listening key RLK to its alternate position thereby opening the locking circuit of relay RR at the normally closed contact 89 of said key RLK, and at the same time closes the alternate contacts 98 and 99 of said key RLK to connect the operator's head set OR to the talking conductors of the cord circuit C. Relay RR de-energizes due to the opening of its locking circuit and restores to normal thereby opening its alternate contact 97 to disconnect the interrupter device I out of circuit with the answering supervisory lamp AL whereby the signal AL will be effaced and the operator will inquire the wants of the calling subscriber at substation A, and after learning the same, will restore her recall listening key RLK and take care of the call in the same manner as described in the foregoing specification.

When the interrupter device I is connected in series with the supervisory lamp AL and relay PR also being in series with the device I said relay will be intermittently operated to open and close its alternate contact 100 whereby a circuit is closed for the pilot supervisory lamp PS which lamp PS will operate intermittently for supervisory purposes.

While I have described and illustrated a preferred embodiment of my invention it

is to be understood that I do not wish to be limited to the exact structure as shown and described but that I intend to cover all that, which may 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. In a telephone system, a calling subscriber's line, a called subscriber's line, a trunk circuit for extending said calling subscriber's line to a distant exchange, an operator's cord circuit for interconnecting said calling and called subscriber lines and also for connecting said calling line with said trunk circuit, an operator's set, relay means for connecting and disconnecting said operator's set and said cord circuit, automatic means for freeing the calling subscriber's line from said cord circuit if said cord circuit is directly connected to a subscriber's line, and means for rendering said automatic means inoperable if said cord circuit is connected to said trunk circuit.

2. In a telephone system, common battery telephone lines, a trunk circuit, a cord circuit for interconnecting two of said telephone lines in conversational circuit as a calling and a called line, said cord circuit also adapted to interconnect one of said telephone lines with said trunk circuit as a calling line, link disconnect means for freeing said calling line from said cord circuit if said cord circuit is used to directly connect common battery lines, means for preventing the operation of said link disconnect means if said cord circuit is connected to said trunk circuit, and automatic signaling means in the said cord circuit for signalling the called subscriber if said cord circuit and said trunk circuit are used to connect to a called subscriber.

3. In a telephone system, common battery telephone lines terminating in an exchange, a trunk circuit for extending any one of said lines as a calling line to a distant exchange, a link circuit at said first exchange for interconnecting said telephone lines as calling and called lines, an operator's set, relay means for connecting and disconnecting said operator's set and said link circuit, automatic means for freeing the calling line from said link circuit if connection is established between common battery lines, means for preventing the operation of said automatic means if said link circuit is connected to said trunk circuit.

4. A telephone system including a calling telephone line terminating in different operators' positions in a telephone exchange, a called line terminating in the same exchange, a trunk circuit for extending a call from said exchange to a distant exchange, a link circuit at each of said operator's positions for seizing a call initiated over said

calling line, an operator's set, relay means for connecting and disconnecting said operator's set and said link circuit, link disconnect means for each of said link circuits
 5 for freeing said calling line from the link circuit which seized the call to permit another call to be distributed among said operators' positions and seized by any one of said operators while said link circuit is connected
 10 to said called line, a supervisory lamp for said link circuit, means for causing the same to light intermittently to denote a recall if said link circuit is connected to said trunk circuit, and means for rendering said
 15 link disconnect means operable on a local connection and said last means inoperable on a trunk connection so that a call initiated over said calling line can only be answered by the operator that establishes the trunk
 20 connection.

5. A telephone system including a calling subscriber's line, a called subscriber's line, a trunk circuit, a link circuit for connecting said calling line to said called line or to said
 25 trunk circuit, link disconnect means for said link circuit for freeing said calling line from said link circuit, a supervisory signal for said link circuit, means for causing said signal to operate continuously to denote a
 30 disconnection, means for causing said signal to operate intermittently to denote a recall, automatic means operable upon the connection of said link circuit to said called line to render said link disconnect means oper-
 35 able and said third means inoperable, said automatic means being operable upon the connection of said link circuit to said trunk circuit for rendering said link disconnect means inoperable and said third means op-
 40 erable.

6. A telephone system including a calling line, a called line, a trunk circuit, a link circuit for connecting said calling line to said called line or to said trunk circuit, link
 45 disconnect means for said link circuit for freeing said calling line from said link circuit, a supervisory lamp for said link circuit, means for causing said lamp to light continuously to signal for a disconnection,
 50 means for causing said lamp to light intermittently to denote a recall, electromagnetic means for said link circuit operable when said link circuit is connected to said called line to render said link disconnect means op-
 55 erable and said third means inoperable, said electromagnetic means operable if said link circuit is connected to said trunk circuit to render said link disconnect means inoperable and said third means operable.

7. In a telephone system a calling telephone line terminating in multiple jacks and line lamps before a plurality of operators' positions, a link circuit for each of said operators' positions for seizing a call initiated
 60 over said calling line, means for permitting

only one operator's link circuit to be operatively connected to said calling line at the same time, calling jacks of different classes, link disconnect means operable, when the link circuit is operatively connected to said
 70 calling line and to a calling jack of one of said classes to automatically free the calling subscriber's line from said link circuit to permit another call to be initiated and answered by any one of said operators, means
 75 for preventing the actuation of said link disconnect means when said link circuit is connected to a jack of the other of said classes so that a call over said calling line can only be answered by the operator at said link
 80 circuit so long as said link circuit remains connected to said calling line, a supervisory lamp for said link circuit, means for causing said lamp to burn continuously to signal for disconnection and to light intermit-
 85 tently to denote a recall.

8. In a telephone system, a calling line terminating in multiple answering jacks and line lamps distributed among different operators' positions, a called line, a trunk circuit, a link circuit at each of said operators' positions for connecting said calling line or to said trunk circuit, means for permitting only one operator's link circuit to be operatively connected to said calling line at the same time to seize the call initiated over said calling line, a supervisory lamp for said link circuit, link disconnect means for freeing the calling line from said link circuit to permit another call to be initiated over said calling line and seized by any one of said operators when said link circuit is connected to said called line, means for preventing the actuation of said link disconnect means when said link circuit is connected to said trunk circuit so that a call initiated over said calling line prior to the disconnection of said link circuit from said calling line can only be answered by the operator controlling the link circuit, means
 110 for causing said supervisory lamp to light continuously to signal for a disconnection on either a local or trunk connection, and means for causing said lamp to light intermittently to denote a recall over said calling line on a trunk connection.

9. In a telephone system a calling subscriber's telephone line terminating in a plurality of answering jacks at different operators' positions of a telephone exchange, a called subscriber's telephone line terminating in calling jacks at said exchange, a trunk circuit terminating in said exchange, a link circuit for each of said operators' positions for seizing a call initiated over said calling line and for extending the same to said called line via one of said calling jacks or for extending the same to said trunk circuit, means for freeing the calling line from the link circuit operatively connected to said
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calling line when said link circuit is connected to a calling jack so that a call may be initiated over said calling lines and seized by any one of said operators, means for preventing the operation of said first means when said link circuit is connected to said trunk circuit so that a call or recall over said calling line can only be answered by the operator at said link circuit so long as said link circuit is connected to said calling line and trunk circuit.

10. In a telephone system, a calling line terminating in an exchange at a plurality of operators' positions, a called line terminating in said exchange, a trunk circuit at each of said operators' positions for seizing a call initiated over said calling line and for extending the same to said called line or said trunk circuit, means individual to said link circuits for permitting only one operator's link circuit to be operatively connected to said calling line at the same time, automatic means for freeing said calling line from the link circuit operatively connected to said calling line so that another call may be initiated over said line and seized by any one of said operators, means for preventing the operation of said link disconnect means when the link circuit is operatively connected to said calling line and to said trunk circuit so that when a call is initiated over said calling line while said link circuit remains connected to said calling line said call will be seized by the same operator that seized the preceding call initiated over said calling line.

11. In a telephone system a calling and a called subscriber's telephone line terminating in a branch exchange, a link circuit for interconnecting said telephone lines, automatic disconnect means for said link circuit and controlled over the calling subscriber's line, a supervisory lamp for said link circuit, a trunk circuit extending between said branch exchange and a distant exchange, said link circuit adapted to connect either of said lines to said trunk circuit as a calling line, means for preventing the operation of said automatic disconnect means when said link circuit is connected to said trunk circuit, and means for causing said supervisory lamp to light continuously on either a local or trunk connection to signal for a disconnection, and to light intermittently to denote a recall only when a trunk connection is established.

12. A telephone system including a calling telephone line and a called telephone line terminating in an exchange, a trunk circuit extending from said exchange to a distant exchange, a link circuit for said first exchange for interconnecting said calling and called lines, and also for connecting said calling line with said trunk circuit,

a supervisory lamp for said link circuit, link disconnect means controlled by the calling subscriber for disconnecting said link circuit from said calling line when said link circuit is connected to a telephone line, means for preventing the operation of said link disconnect means when said link circuit is connected to said trunk circuit, means for causing said supervisory lamp to light continuously to signal for a disconnection, and means for causing said lamp to light intermittently to denote a recall only when said link circuit is connected to said trunk circuit.

13. A telephone system including a calling line terminating in multiple answering jacks and line lamps distributed among different operators' positions, link circuits at each of said operators' positions and adapted to permit only one link circuit to be operatively connected to said calling line at the same time to seize a call, said link circuits operable to establish a local connection or a trunk connection, a supervisory signal for each of said link circuits, means for causing said signal to operate continuously to signal for a disconnection, a pilot supervisory signal for each of said positions and operatively associated with said link circuits at its associated position, means for causing said signal and said pilot signal to operate intermittently to denote a recall initiated over said calling line, electromagnetic means for each of said link circuits operable when a local connection is effected to render said link disconnect means operable to permit a recall to be effected via said multiple line lamps even though the link circuit operatively connected to said calling line remains physically connected to said line, said electromagnetic means operable to render said link disconnect means inoperable, when a trunk connection is established, to cause said second means to operate so that a recall over said calling line will be indicated only at the operator's position where the trunk connection is established.

14. A telephone system including a calling line, a called line, a trunk circuit, a link circuit for connecting said calling line to said called line or to said trunk circuit, link disconnect means for said link circuit for freeing said calling line from said link circuit, a supervisory lamp for said link circuit, means for flashing said lamp for denoting a recall, electromagnetic means operable for rendering said link disconnect means operable and said second means inoperable when said link circuit is connected to said called line, said electromagnetic means also operable to render said link disconnect means inoperable and said second means operable when said link circuit is connected to said trunk circuit.

15. A telephone system including a calling line terminating in multiple jacks and line lamps, a called line, a trunk circuit, a supervisory signal for said link circuit, 5 link disconnect means for said link circuit operable to free said calling line from said link circuit so that a recall over said calling line will be signaled on said multiple line lamps, means for causing said signal 10 to operate intermittently, electromagnetic means for said link circuit for rendering said disconnect means inoperable and to render said second means operable to cause a recall to be signaled by said supervisory 15 signal.

16. A telephone system including a calling line terminating in one exchange, a called line terminating in another exchange, a trunk circuit terminating in said first 20 exchange in a terminal jack and at said second exchange in a terminal plug adapted to be connected to said called line, a link circuit at said first exchange for connecting said calling line to said trunk circuit 25 via said terminal jack to extend said calling line to said called line, ringing current means at said first exchange for ringing the subscriber on said called line, and manual means and automatic means for applying 30 ringing current to said called line.

17. A telephone system including a calling line terminating in a telephone exchange, a called line terminating in a distant exchange, a trunk circuit extending between 35 said exchanges and adapted to connect to said called line, a link circuit at said first exchange for connecting said calling line to said called line via said trunk circuit, ringing current means at said first 40 exchange, means for said link circuit for applying ringing current to said called line either manually or automatically, a supervisory signal for said link circuit for signaling for a disconnection when the calling 45 subscriber replaces his receiver upon its switchhook, and means for causing said signal to operate intermittently to denote a recall should a call be initiated over said calling line before the connection is taken 50 down.

18. A telephone system including a calling telephone line, a called telephone line terminating in the same exchange, a called 55 telephone line terminating in a distant exchange, a trunk circuit extending between said exchanges for extending a call from said first exchange to the called line at said second exchange, a link circuit for said first 60 exchange for connecting said calling line to said first called line and also for connecting said calling line to said second called line via said trunk circuit, automatic disconnect means for disconnecting said calling 65 line from said link circuit when connected to a called line in the same exchange

a supervisory signal for said link circuit, means for causing said signal to operate continuously to signal for a disconnection, and means for causing said signal to operate 70 intermittently to denote a recall over said calling line when the same is connected to a called line at said distant exchange via said trunk circuit.

19. A telephone system including a calling line terminating in multiple jacks and 75 line lamps in a telephone exchange, a called line terminating in said exchange, a trunk circuit, a link circuit for connecting said calling line to said called line or for connecting said calling line to said trunk circuit, 80 a supervisory signal for said link circuit adapted to operate continuously to signal for a disconnection, a pilot supervisory signal for each of said positions, means for causing said signals to operate intermittently 85 to denote a recall initiated over said calling line when said link circuit is connecting said calling line and said trunk circuit, and means for rendering said first means inoperable when said link circuit is connected 90 to said calling line and said called line so that a recall initiated over said calling line is indicated by said multiple line lamps.

20. A telephone system including a calling telephone line terminating in multiple jacks 95 and line lamps at a telephone exchange, a trunk circuit, a link circuit for effecting a local connection of said calling line or a trunk connection of said calling line, a supervisory lamp for said link circuit, means 100 for causing said lamp to light continuously to signal for a disconnection, automatic means for freeing said calling line from a local connection so that a recall initiated over said calling line will be indicated by 105 said multiple line signals even though said link circuit remains physically connected to said line, and automatic means for causing said lamp to light intermittently to denote 110 a recall when a call is initiated over said line and a trunk connection is established for said calling telephone line.

21. A telephone system including a calling telephone line terminating in a telephone 115 exchange, a called telephone line terminating at said telephone exchange and a called telephone line terminating in a distant exchange, a link circuit for said first exchange for interconnecting said calling and called 120 lines thereat, a trunk circuit for extending said calling line at said telephone exchange to said called line at said distant exchange, said link circuit for said first exchange for connecting said calling line to said trunk circuit, a supervisory signal for said trunk circuit at said second exchange for indicating a 125 connection between said link circuit and said trunk circuit and also for indicating a disconnection of said link circuit from said trunk circuit, said supervisory signal indicating the 130

completion of the proper connection whether said trunk circuit is connected to or disconnected from the called subscriber's line, a supervisory signal for said link circuit for signaling for a disconnection, and means effective only when said link circuit is connected to said trunk for causing said last signal to operate to denote a recall initiated over said calling line prior to the disconnection of said link circuit from said calling line and said trunk circuit.

22. A telephone system including a link circuit provided with a connection terminal, manual and automatic ringing means for said link circuit, automatic disconnect means and flash recall means for said link circuit, connection terminals adapted to register with said link terminal, automatic means for rendering operative said disconnect means and said flash recall means ineffective when said link terminal is connected to one of said connection terminals, and automatic means for rendering operative said flash recall means and said automatic disconnect means ineffective when said link terminal is connected to another of said terminals.

23. A telephone system including a calling line and a called line terminating in the same exchange, a trunk circuit extending between said exchange and a distant exchange, an operator's set for said link circuit, means for preventing said operator's set from being connected to said link circuit when said link circuit is interconnecting said calling and called lines, means for permitting said operator's set to be connected to said link

circuit when said link circuit is interconnecting said calling line and said trunk circuit, ringing current means at the first exchange, and means for applying ringing current to the called line or to the trunk circuit either manually or automatically.

24. A telephone system including a calling telephone line terminating in multiple jacks and line lamps at a telephone exchange, a trunk circuit, a link circuit for effecting a local connection of said calling line or a trunk connection of said calling line, an operator's head set for said link circuit but normally disconnected therefrom, a supervisory lamp for said link circuit, means for causing said lamp to light continuously to signal for a disconnection, automatic means for freeing said calling line from a local connection so that a recall initiated over said calling line will be indicated by multiple line signals even though said link circuit remains physically connected to said line, and automatic means for causing said lamp to light intermittently to denote a recall when a call is initiated over said line and a trunk connection is established with said calling telephone line, means for preventing said head set from being operatively connected to said link circuit when a local connection is established, and means for connecting said head set to said link circuit when a trunk circuit is established.

Signed by me at Chicago in the county of Cook and State of Illinois, this 23rd day of June, 1923.

MICHAEL B. STAZAK.