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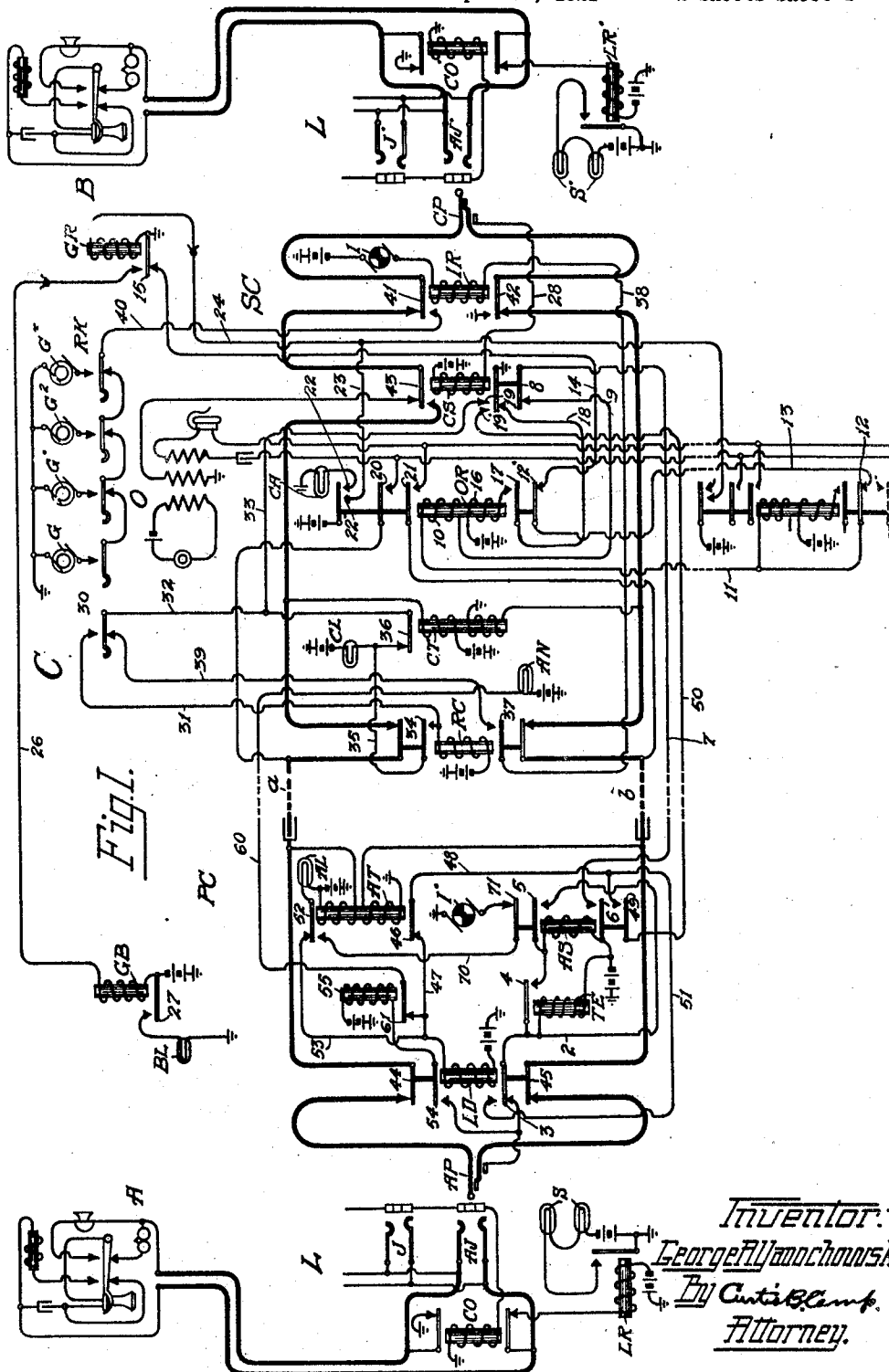
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G. A. YANOCHOWSKI

TELEPHONE SYSTEM

Filed Sept. 12, 1921

2. Sheets-Sheet 1



Inventor:
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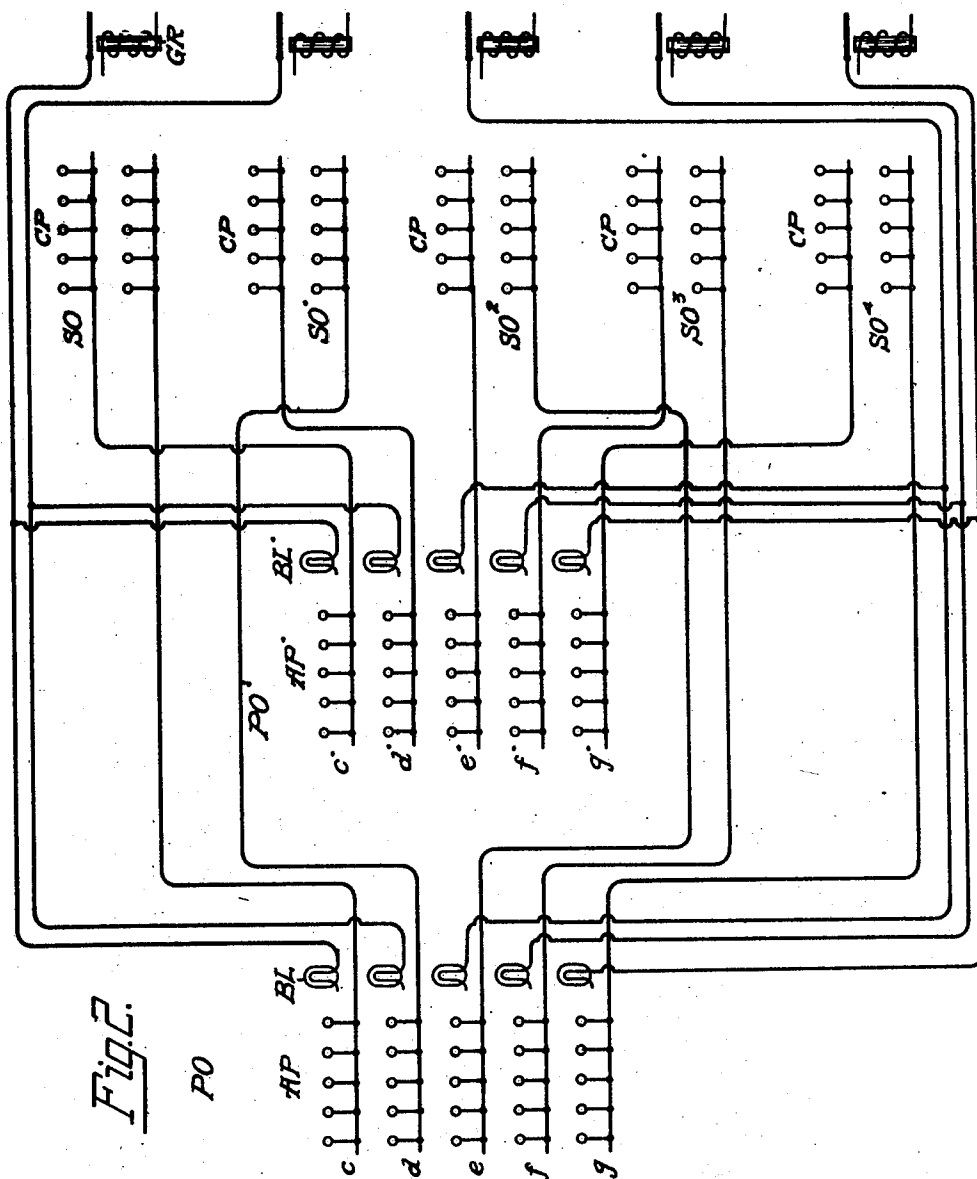
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TELEPHONE SYSTEM

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

GEORGE A. YANOSCHOWSKI, OF CHICAGO, ILLINOIS, ASSIGNOR TO KELLOGG SWITCHBOARD AND SUPPLY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

TELEPHONE SYSTEM.

Application filed September 12, 1921. Serial No. 499,990.

To all whom it may concern:

Be it known that I, GEORGE A. YANOSCHOWSKI, a citizen of the United States of America, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Telephone Systems, of which the following is a specification.

My invention relates to telephone systems, and has to do more particularly with divided switchboard systems in which primary and secondary operators are provided for interconnecting calling and called subscribers' lines.

An object of my invention is the provision of an improved and simplified divided switchboard system operating in connection with a circuit arrangement provided with multiple line lamp distribution, automatic ringing and listening, instantaneous disconnect and recall and secret service.

Another object of my invention is to manually distribute the calls, by means of primary operators, to idle secondary operators. The call when initiated is made to appear before a plurality of primary operators' positions by means of the well known multiple jack line lamp distribution system, which gives a plurality of primary operators access to each incoming call.

A feature of my invention is the provision of an improved system in which the exchange switchboard is divided into primary and secondary sections, or separate primary and secondary boards are provided. The primary section of the switchboard is divided into operators' positions which are equipped with answering jacks only and answering plugs. The telephone lines are each provided with a plurality of answering jack terminals each having an associated line lamp signal and each associated lamp and jack appearing at different primary operators' positions. The primary operators' positions are provided with primary cords so arranged that the first idle one of the primary operators who seizes a call excludes other primary operators who attempt to seize the call. The secondary section of the switchboard at which the secondary oper-

ators are located is divided into positions; said positions are provided with calling plugs and multiple jacks only as is well understood in the art. The answering plugs of the primary operators' positions lead and are distributed among the different secondary operators, and when a call appears before a number of primary operators, the first operator to seize the call merely uses an answering plug which extends to an idle secondary operator and plugs into an answering jack of the calling line, thereby extending the connection to an idle secondary operator.

Another feature of my invention is the provision of the busy signaling means whereby when a secondary operator at a secondary position is completing a connection to a called line, all the circuits extending to this particular secondary operator's position from the primary positions are designated busy to the primary operator by means of suitable visual signaling means.

Another feature of my invention is the provision of distinctive indicating means to the primary operator, should she answer a call subsequent to the first operator seizing the call; this distinctive indicating means being in the form of a flashing signal so as to notify the primary operator that the call has already been answered by another primary operator, and I also provide suitable means to prevent the attempted connections to be extended to a secondary operator to which this primary cord leads. That is, I provide means so that when a primary operator connects to a calling line, which line has already been seized by another primary operator, the call is not extended to a secondary operator.

Another feature of my invention is the provision of indicating means for the secondary operator, to whom the call was extended by a primary operator, to notify the said secondary operator that the answering plug of the cord has been disconnected from the calling line.

The above features, as well as others, will be more fully described in the ensuing specification.

For a better understanding of my invention, reference may be had to the accompanying drawings, in which—

Fig. 1 illustrates the preferred circuit arrangement embodying my invention; and

Fig. 2 illustrates diagrammatically one method of extending the cords from the primary operators' positions to the secondary operators' positions.

Referring now more particularly to the circuit arrangement of Fig. 1, I show a calling substation A terminating at the exchange in a line circuit L, which comprises the usual line relay LR, cut-off relay CO, line signals S and multiple answering jacks AJ. The answering multiple jacks AJ and line signals S appear before different primary operators' positions, and upon initiation of a call, the multiple line signals are lighted and any one of the operators before whom these signals appear may answer the call. The switchboard is divided into two sections, a primary section and a secondary section. The primary section contains a number of operators' positions and each primary operator has appearing before her a number of these multiple answering jacks. The positions of the primary section are equipped with answering plugs only and answering supervisory signals, and the connecting circuit C, as illustrated in Fig. 1, comprises a primary operator's cord PC, which comprises an answering plug AP which is inserted into the answering jack AJ to connect to a calling line. A high resistance test relay TE is provided which is energized when the answering plug AP is inserted into the answering jack AJ of the calling line. The said relay TE upon energization closes a circuit for the answering supervisory relay AS. The high resistance test relay TE and the answering sleeve supervisory relay AS are for permitting only one operator to seize a call, as will be more fully described in the ensuing specification.

An answering tip supervisory relay AT is provided for the usual supervisory purposes, and controls the lighting of the answering supervisory lamp AL. The primary operator's cord PC leads to a secondary operator's cord circuit SC by means of the conductors *a*, *b*, and the secondary section of the exchange switchboard is equipped with calling plugs only and contains a number of secondary operators' positions, each of which have multiple jacks J so that a call extended to a second operator's position may be extended to the called line through the agency of the calling plug CP of the secondary operator's cord and the multiple jacks J. The secondary operator's cord SC comprises a calling plug CP for connecting to a called line, and a calling sleeve supervisory relay CS which is energized upon the insertion of a calling plug CP into the multiple jack

of a called line. A calling tip supervisory relay CT is also provided which is energized upon the response of the called subscriber and is for the usual supervisory purposes for controlling the calling supervisory lamp CL.

An operator's listening relay OR is also provided which when energized connects the secondary operator's set O to the cord conductors so that she can converse with the calling subscriber. A party-line ringing key RK is provided which controls the connection of ringing generators G, G', G² and G³, and in association with the ringing key RK I provide a ringing control relay RC which controls the application of ringing current to the called line, and in association therewith I also provide an interrupter relay IR which is intermittently energized and de-energized through the agency of the constantly rotating interrupter I for intermittently connecting ringing current of the proper generator frequency to the call bell of the called line. A calling line lamp CA is also provided which when lighted signals the secondary operator that a call is awaiting her attention. A group relay GR common to a secondary operator's position is also provided for purposes as will be more fully hereinafter described.

Each circuit C at any one particular secondary operator's position is provided with a non-interfering relay OR. These relays have a chain engagement to prevent connecting the operator's set to more than one cord at a time. The group relay GR when operated lights the position busy lamps BL at each primary operator's position that has circuits extending to one particular secondary operator. If through inadvertence more than one call is extended to a busy secondary operator, the relays OR operate to connect the secondary operator's head set to the calls one at a time as the connections are completed.

To the right of the drawing, Fig. 1, I show a called substation B terminating at the exchange in a line circuit L', comprising the usual line relay LR', cut-off relay CO', line signals S' and multiple jacks J'.

Fig. 2 illustrates diagrammatically one method which may be employed in distributing the primary cords from the primary operators' positions to the secondary operators' positions, but it is to be understood, however, that other methods of distribution may be used.

In the drawing I illustrate two primary operators' positions PO and PO', each having a plurality of answering plugs AP for use in answering calls from subscribers' lines which terminate at their positions. The secondary operators' positions SO, SO', SO², SO³ and SO⁴ are provided with calling plugs CP for use in extending calls to called subscribers' lines which terminate in multi-

ple jacks J' at each of the secondary operators' positions. The primary operators' positions PO are provided with a number of answering plugs AP which I divide into five groups c, d, e, f and g , and as herein shown, the first group of plugs AP from the primary operators' positions PO lead to the secondary operators' positions SO and terminate in the calling plug CP. The second group d leads to the secondary operator's position SO' ; the third group e leads to the secondary operator's position SO^2 ; the fourth group f leads to the secondary operator's position SO^3 ; and the fifth group g leads to the secondary operator's position SO^4 . The primary operator's position PO' is also provided with answering plugs AP divided into similar groups c', d', e', f' , and g' , and lead, respectively, to the secondary operators' positions SO, SO' , SO^2 , SO^3 and SO^4 . The secondary operator's position is provided with a group relay GR which is energized at the time that the secondary operator is extending a connection to a called line to light a busy signal lamp BL at each primary operator's position that has access to this particular secondary operator, so that none of these operators will extend calls to this secondary operator while she is extending a connection to a called line.

From the above description it may be readily seen that the calls will be thus evenly distributed among the different secondary operators. The primary operators distribute the calls manually to the different secondary operators. The line lamp distribution makes all calls accessible to each primary operator, thereby permitting any primary operator to answer any call and extend the connection to any idle secondary operator that she has access to. This makes it possible for one primary operator to answer all calls at night without moving from her position.

Having described in general the apparatus embodying my invention, I will now describe in detail the operation of the circuit as illustrated in Fig. 1.

Assuming now that the subscriber at the calling 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. The line relay LR upon energization closes its alternate contact to light the multiple line signals S to signal the primary operators before whom the answering jacks AJ are positioned, and one of the primary operators seizes the call by inserting an answering plug AP leading to an idle secondary operator's position into the answering jack AJ. The insertion of the plug AP into the jack AJ closes an energizing circuit for the high resistance test relay TE of the primary cord PC and the cut-off relay CO of the line circuit L,

which circuit is traced from battery through the winding of the high resistance test relay TE, conductor 2, normal contact 3 of the link disconnect relay LD, sleeve contacts of the connected plug AP and jack AJ to ground through the cut-off relay CO. The relay TE upon energization closes its alternate contact 4 to establish an energizing circuit for the answering sleeve supervisory relay AS, traced from battery, through the winding of relay AS, alternate contact 4 of relay TE; conductor 2, normal contact 3 of relay LD, sleeve contacts of the connected plug AP and jack AJ to ground through the winding of the cut-off relay CO. The relay AS upon energization closes its alternate contact 5, establishing a substitute energizing circuit for the relay AS, independent of the alternate contact 4 of the test relay TE, this substitute circuit being traced from battery through the winding of the relay AS, its alternate contact 5, conductor 2, normal contact 3 of the relay LD, the sleeve contacts of the connected plug AP and jack AJ to ground through the winding of the cut-off relay CO. The relay CO is also energized to open the circuit of the line relay LR and the line relay LR de-energizing brings about the effacement of the multiple line signals S. The answering tip supervisory relay AT is also energized over a circuit traced from battery through the upper winding of relay AT, normal contact 44 of relay LD, tip contacts of the connected plug AP and jack AJ, through the substation, back through the ring contacts of the connected plug AP and jack AJ, normal contact 45 of relay LD to ground through the lower winding of relay AT; and the energization of the relay AT prevents the premature lighting of the answering supervisory lamp AL. The relay AS upon energization closes its alternate contact 6, establishing an energizing circuit for the operator's listening relay OR of the secondary cord SC of the idle secondary operator's position, traced from battery through alternate contact 6 of the relay AS, conductor 7, normal contact 8 of the calling sleeve relay CS of the secondary cord SC, conductor 9, the winding 10 of the operator's listening relay OR, conductor 11, through the series contacts 12 of the chain of relays OR of the secondary operator's position, conductor 13, normal contact 12' of the relay OR, conductor 14, to ground at normal contact 15 of the group relay GR, which relay GR is common to the secondary operator's position to which the call has been extended by the primary operator. The relay OR energizes over this circuit and upon energization opens its normal contact 12', opening the initial energizing circuit of the relay OR, but a substitute circuit is established for the said relay which

may now be traced from battery through the lower winding 16 of the relay OR, alternate contact 17 of the relay OR, conductor 18, to ground at normal contact 19 of the calling sleeve supervisory relay CS. The closing of alternate contacts 20 and 21 of the relay OR connects the secondary operator's set O to the cord conductors, and the closing of alternate contact 22 closes an energizing circuit for the call indicating lamp CA, traced from battery through alternate contact 22 to ground, through the lamp CA. The lamp CA is lighted and indicates to the secondary operator that a call has been extended to her position and also indicates to her that her operator's set has been connected to the cord conductors, and she now inquires the wants of the calling subscriber at the substation A.

The closing of alternate contact 22' also closes an energizing circuit for the group relay GR, traced from battery through alternate contact 22', conductors 23 and 24 to ground through the winding of relay GR. The group relay GR is common to the secondary operator's position of which the cord circuit SC is one, and energizes when a call is extended to the secondary position, and the closing of alternate contact 15 of the group relay GR upon its energization establishes an energizing circuit for the primary operator's group busying relay GB of the primary operator's position that extended the call to this secondary operator, traced from ground through alternate contact 15 of relay GR, conductor 26, through the winding of the relay GB to battery. Each primary operator's position is provided with a number of primary operators' group busying relays GB, which are common to the cords at the primary operator's positions that have circuits that lead to the secondary operator's position. Each primary operator's position is provided with a group relay GB, which group relay GB is common to all of the primary cords PC that extend to this secondary operator's position to which a call has been extended by the primary operator. The relay GB upon energization closes its alternate contact 27 and establishes a circuit for the busy lamp BL from battery through alternate contact 27, through the lamp BL to ground. The busy lamps BL at the other primary operators' positions are also lighted, thus advising the primary operators of the busy condition of the secondary operator's position, and this busy condition remains until the secondary operator has extended the connection to the called line.

The operator's set having been connected to the cord conductors as above described, she now inquires the wants of the calling subscriber at substation A. Assuming that it is the called subscriber at substation B

that is wanted, the operator tests the multiple jack J' appearing at her position as to its idle or busy condition, and if the line is busy she will receive the customary busy click. Assuming that the line is idle she inserts the calling plug CP into the multiple jack J' of the called line, and this act closes a series energizing circuit for the calling sleeve supervisory relay CS and the cut-off relay CO' of the line circuit L' of the called substation B, the circuit being traced from battery through the winding of the relay CS, conductor 28, the sleeve contacts of the connected plug CP and jack J' to ground at the cut-off relay CO'. The calling sleeve relay CS upon energization opens its normal contact 19, opening the energizing circuit of the operator's listening relay OR through its holding winding 16, and the relay OR now de-energizes and the opening of its alternate contacts 20 and 21 disconnects the operator's set O from the cord conductors. The opening of alternate contact 22 of relay OR also effaces the call indicating signal CA and the opening of alternate contact 22' opens the energizing circuit of the group relay GR. The group relay GR is now de-energized and the opening of its alternate contact 15 opens the energizing circuit of the group relays GB. The group relays GB de-energizing open their alternate contacts 27 to efface the busy indicating lamps BL, notifying the primary operators that the secondary operator has extended the call to the called line and is now available so that other connections may be extended to her position. The closing of alternate contact 19 of relay CS also closes an energizing circuit for the supervisory lamp CL from battery through the lamp CL, normal contact 36 of relay CT, conductors 32 and 33 to ground at alternate contact of relay CS, the said lamp remaining lighted until the called subscriber answers.

The secondary operator now depresses the proper ringing key plunger of the ringing key RK to impress the proper ringing generator current over the called line to ring the call bell at the called substation B. The depression of the ringing key plunger associated with the selected generator frequency momentarily operates the end springs of the ringing key. The closing of alternate contact 30 of the end springs establishes an energizing circuit for the ringing control relay RC traced from battery through the winding of the relay RC, conductor 31, alternate contact 30 of the end springs, conductors 32 and 33, to ground at alternate contact 19 of the relay CS. The relay RC upon energization closes its alternate contact 34 establishing a locking circuit for itself traced from battery through the winding of the relay RC, alternate con-

tact 34, conductor 35, normal contact 36 of the calling tip supervisory relay CT, conductors 32 and 33 to ground at alternate contact 19 of the relay CS. The closing of alternate contact 37 of the relay RC establishes an energizing circuit for the interrupter relay IR, traced from battery through the interrupter I, through the winding of the relay IR, conductor 38, alternate contact 37 of the relay RC, conductor 39, normal contact 30 of the end springs, conductor 32 and 33 to ground at alternate contact 19, of the relay CS. The relay IR is intermittently energized and de-energized over the circuit as just traced, to intermittently connect ringing current over the called line, the ringing circuit being traced from the ungrounded pole of the generator G, which we will assume is the selected generator frequency, the closed contact of the ringing key plunger over the ringing conductor 40, alternate contact 41, of the relay IR, the tip contacts of the connected plug CP and jack J', through the condenser and call bell of the called substation B back through the ring contacts of the connected jack J' of the plug CP', to ground at alternate contact 42 of the relay IR. The called subscriber at the substation B in response to his call signal removes his receiver from the switch hook and when the relay IR is in one of its de-energized positions, an energizing circuit is established for the calling tip supervisory relay CT', traced from battery through the upper winding of the relay CT, alternate contact 43 of the relay CS, normal contact 41 of the relay IR, tip contacts of the connected plug CP and jack J', the now closed contacts of the substation switch hook of substation B, back through the ring contacts of the connected jack J' and plug CP, normal contact 42 of relay IR, to ground through the lower winding of the relay CT. The relay CT upon energization opens its normal contact 36 which opens the locking circuit for the ringing control relay RC, and the ringing control relay RC is de-energized and the opening of its alternate contact 37 opens the energizing circuit of the relay IR, and the relay IR remaining at normal prevents further application of ringing current to the called line. The opening of normal contact 36 of the relay CT also opens the circuit of the supervisory lamp CL and the supervisory lamp CL is effaced and notifies the secondary operator of the cord circuits C that the called subscriber at substation B has answered. The calling subscriber at the substation A and the called subscriber at the substation B are now in conversational circuit, which may be traced over the heavily marked conductors.

Assuming now that the subscribers at the substation A and the substation B have finished the conversation, they replace their

receivers upon the respective switchhooks. The replacing of the receiver of the calling substation A opens the energizing circuit of the answering tip supervisory relay AT, and the closing of its normal contact 46 establishes an energizing circuit for the link disconnect relay LD, traced from battery, through the winding of the relay LD, conductor 47, normal contact 46 of the relay AT, conductor 48, alternate contact 49 of the relay AS, conductor 50 to alternate contact 19' of the relay CS. The link disconnect relay upon energization opens its normal contact 3, opening the initial energizing circuit of the answering sleeve supervisory relay AS, but a substitute energizing circuit is closed for the said relay traced from battery through the winding of the relay AS, alternate contact 5 of the relay AS, conductor 2, alternate contact 3, of the relay LD, conductor 51, alternate contact 42 of the relay AS, conductor 50, to ground at alternate contact 19' of the relay CS.

The closing of normal contact 52 of relay AT closes an energizing circuit for the answering supervisory lamp AL, from battery through the lamp AL, normal contact 52 of the relay AT, conductors 53 and 47, normal contact 46 of relay AT, conductor 48, alternate contact 49 of the relay AS, conductor 50 to ground at alternate contact 19' of the relay CS. The lighting of the answering supervisory lamp AL over this circuit notifies the primary operator that the calling subscriber at substation A has replaced his receiver. The closing of alternate contact 54 of the relay LD establishes an energizing circuit for the high resistance relay 55, traced from battery through the winding of the said relay 55, alternate contact 54 of the relay LD, the ring contacts of the connected plug AP and jack AJ, to ground through the cut off relay CO for purposes as will be presently described. The current flowing over this circuit is not sufficient to energize relay CO, but it does permit relay 55 to energize. The link disconnect relay LD upon energization opens its normal contacts 44 and 45 to disassociate the primary cord PC from the line, and the opening of normal contact 3 of the said relay LD permits the de-energization of the cut off relay CO, thus placing the line circuit L of the calling subscriber A at normal so that should the subscriber wish to recall he may do so even though the answering plug AP remains in the jack AJ. The relay 55 energizes to ground through the cut off relay CO of the now restored line circuit L, but due to the high resistance of the relay 55, the cut off relay CO remains at normal and does not make the jacks J of the calling line test busy.

The called subscriber at the substation

B replacing his receiver upon the switch-hook opens the energizing circuit of the calling tip supervisory relay CT. The said relay restoring to normal again closes its normal contact 36, closing the energizing circuit for the calling supervisory lamp CL to ground at alternate contact 19 of relay CS. The supervisory lamp AL of the primary operator's position is now lighted, and the calling supervisory lamp CL at the secondary operator's position is lighted, indicating to the two operators that the conversation has terminated, and that the subscribers at the calling substation A and the called substation B have replaced their receivers. The primary operator now withdraws the answering plug AP from the jack AJ, opening the energizing circuit of relay 55. Relay 55 de-energizing closes contact 61, thus causing the lamp AN to glow at the secondary operator's position. The secondary operator now withdraws plug CP from jack J', and the withdrawal of the calling plug CP from the multiple jack J' of the called line by the secondary operator opens the series energizing circuit of the calling sleeve relay CS of the cut off relay CO. The sleeve relay CS de-energizing opens its alternate contacts 19 and 19'. The opening of alternate contact 19 effaces the supervisory signal CL and the opening of alternate contact 19' opens the holding circuits of the link disconnect relay LD and the answering supervisory relay AS. The apparatus used in establishing the connection between the substation A and the substation B is now at normal and available for use in establishing other connections.

Assuming that conversation has terminated and the subscribers A and B have replaced their receivers upon their respective switchhooks, as above described, and before the plugs AP and CP have been removed from their respective jacks, that the subscriber at the calling substation A wishes to recall, the removal of the receiver at the recalling substation A closes a circuit for the line relay LR, and the line relay LR energizing closes a circuit for the multiple line signals S, and the same primary operator may answer the recall, or another primary operator may seize it to the exclusion of the other primary operators.

Assuming that the same primary operator seizes the recall that originally established the connection for the calling subscriber A, she now withdraws the answering plug AP from the connected jack AJ, and this withdrawal allows the relay 55 to restore, and the restoration of the said relay 55 closes a circuit through the disconnect lamp AN of the secondary operator's cord circuit SC that established the connection to the called line, the circuit being traced from battery through the lamp AN, conductor 60, normal

contact 61, of the relay 55, conductor 47, normal contact 46 of the relay AT, conductor 48, alternate contact 49 of the relay AS, conductor 50 to ground at alternate contact 19' of the sleeve relay CS. The lighting of the disconnect lamp AN notifies the secondary operator that the primary operator has withdrawn the answering plug AP from the jack AJ of the calling line, as previously described. The primary operator now inserts an answering plug into the jack AJ and the connection is extended as before mentioned.

Should the calling subscriber at the substation A initiate a call, the removal of the receiver at the substation brings about the lighting of the line signals S as previously described, and assuming that the call is answered by the primary operator who handled the call originally, now should another primary operator of a primary cord PC insert an answering plug into the multiple answering jack of the calling line after the call has been seized by the first operator, the insertion of the plug AP of the second primary cord PC brings about the energization of the answering tip supervisory relay AT of this second primary cord, and the closing of alternate contact 52 of the relay AT establishes a circuit for the answering supervisory lamp AL traced from battery through the said lamp, alternate contact 52, conductor 70, normal contact 71 of the relay AS to ground through the constantly rotating interrupter I'. The circuit closed through the interrupter I' causes the answering supervisory lamp AL of the second primary cord to flash indicating to the primary operator of the second primary cord PC that the call has been seized by another primary operator. The secondary operator is not connected to the calling line over the second primary cord PC that has been inserted into the calling line as the test relay TE of the second cord does not energize, due to the low resistance winding of the relay AS of the first primary cord, and the relay TE of the second primary cord is shunted and in failing to energize no circuit is established for the answering sleeve supervisory relay AS of the second primary cord, and said relay AS of the second primary cord remains at normal, and as its alternate contact 6 is not closed, the operator's listening relay OR of the secondary cord SC is not operated, and the operator's set O of the secondary cord SC is not connected.

The relay 55 energizes upon the restoration of the switch hook at the calling substation and when the relay LD energizes is held up to ground through the cut off relay CO, and should a calling subscriber at the substation A initiate a recall and another operator seize the recall, the relay

55 will not shunt out the test relay TE of the other cord that is answering the recall, due to the multiple connection of the test relay TE of the second cord and the relay 5 55 of the connected cord that originally established the connection. After conversation has terminated the supervisory signals AL and CL of the primary cord and secondary cord PC and SC respectively are 10 lighted. The primary operator in response to the signal AL withdraws the plug AP from the jack AJ and brings about the lighting of the disconnect lamp AN at the secondary operator's position giving her a 15 visual indication that the answering plug has been withdrawn, and the additional lighting of the supervisory signal CL notifies her that disconnection has taken place at the primary end, and that the called 20 subscriber has replaced his receiver and that the plug CP may now be withdrawn.

The initial energizing circuits of the operator's listening relays OR of a secondary operator's position extends through a chain 25 relay arrangement in which the energizing circuits through the windings 10 of the operator's relays are carried through a series connection through the normally closed contacts 12, 12', etc., of the operator's relay 30 OR. Now should two primary operators happen to extend connections to one secondary operator at the same time, the relay OR of the secondary cord to which one of the primary operators has extended the con- 35 nection from a primary cord of her position operates over a circuit as previously described, through the chain relay arrangement including contacts 12, 12', etc., of other relays OR. Upon the energization of relay OR its contact 12' is opened and should 40 a second primary operator extend a connection to the same secondary operator at the same time as the first, the operator's relay OR of this second selected secondary 45 cord will fail to operate as the series chain connection through contacts 12, 12', etc., is broken at the contact 12' of the relay OR of the first cord, and thus relay OR of this second cord will not energize due to the 50 break in the series contact connection and the operator's set will not be connected, and it will thus be seen that only one call can be extended to a secondary operator at the same time. Relay GR energizing also opens 55 the original energizing circuits for relays OR. If several calls are extended to one secondary operator's position they will be automatically connected to the secondary operator's set one at a time as she completes 60 the connections. The call lamps are not lighted until the corresponding relay OR is energized.

While I have illustrated my invention operating in connection with a specific circuit arrangement, it is to be understood that

my invention is adaptable to other systems and that changes and modifications will readily suggest themselves to those skilled in the art, and I therefore aim to cover all such changes and modifications as come 70 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 switchboard divided into positions, a calling line appearing in multiple answering terminals at a plurality of said positions, a second switchboard divided into positions, circuits 80 extending from one of said positions upon said first board to positions upon said second board; the answering ends of said circuits being located at said first switchboard, and the calling ends of said circuits being 85 located at said second switchboard, an operator's head set at one position upon said second board, means responsive to the direct connection of one of said circuits with any one of the multiple answering terminals of 90 said calling line to connect said operator's set to said circuit, and subscriber controlled means for disconnecting his line from said circuit.

2. A telephone system including a switchboard divided into positions, a calling line 95 appearing in multiple answering terminals at a plurality of said positions, a second switchboard divided into positions, a called line appearing in multiple jacks on several 100 of said last positions, circuits extending from one of said positions upon said first board to positions upon said second board, the answering ends of said circuits being located at said first switchboard, and the 105 calling ends of said circuits being located at said second switchboard, an operator's set at one position of said second switchboard, means responsive to the direct connection of one of said circuits with any one of said 110 multiple answering terminals of said calling line to connect said operator's set thereto, means responsive to the connection of said circuit to said called line to disconnect said operator's set from said circuit, and sub- 115 scriber controlled means for automatically disconnecting his line from said circuit.

3. A telephone system including a switchboard divided into positions, a calling line appearing in answering jacks at a plurality 120 of said positions, a second switchboard divided into positions, circuits extending from one of said positions upon said first board to positions upon said second board, the answering ends of said circuits being located 125 at said first switchboard and the calling ends of said circuits being located at said second switchboard answering terminals for said circuits at said first switchboard adapted to make physical connection with said 130

answering jacks, manual means for connecting said answering terminals to said answering jacks whereby calls are manually distributed to the operators at the second of said switchboards, and subscriber-controlled means for automatically disconnecting a subscriber's line from one of said circuits.

4. A telephone system including a switchboard divided into positions, a calling line appearing in answering jacks at a plurality of said positions, a second switchboard divided into positions, circuits extending from one of said positions upon said first board to positions upon said second board, answering terminals for said circuits at said first switchboard adapted to make direct physical connection with said answering jacks, manual means for connecting said answering terminals to said answering jacks whereby calls are manually distributed to the operators at the second of said switchboards, an operator's telephone set at said second switchboard, means for automatically connecting said operator's telephone set to one of said circuits when its answering terminal is connected to one of said answering jacks to connect said operator's set at said second switchboard in conversational circuit with the calling line, means for indicating to the operators at said first switchboard when the operators are idle at said second switchboard, and subscriber controlled means for disconnecting the subscriber's line from said circuit.

5. A telephone system including a switchboard divided into positions, a calling line appearing in answering jacks at a plurality of said positions, a second switchboard divided into positions, a called line appearing in multiple jacks on several of said last positions, circuits extending from one of said positions upon said first board to positions upon said second board, answering terminals for said circuits at said first switchboard adapted to make direct physical connection with said answering jacks, manual means for connecting said answering terminals to said answering jacks whereby calls are manually distributed to the operators at the second of said switchboards, an operator's telephone set at said second switchboard, means for automatically connecting said operator's set to one of said circuits when its answering terminal is connected to one of said answering jacks to connect said operator's set at said second switchboard in conversational circuit with the calling line, means for indicating to the operators at said first switchboard when operators are idle at said second switchboard, calling terminals for said circuits at said second switchboard, manual means for connecting said calling terminals to said multiple jacks to complete connections, and subscriber controlled means for automati-

cally freeing a subscriber's line from one of said circuits.

6. A telephone system including a switchboard divided into positions, a calling line appearing in answering terminals at a plurality of said positions, a second switchboard divided into positions, circuits extending from one of said positions upon said first board to positions upon said second board, manual means for directly and physically connecting one of said circuits to said calling line, busy signaling means at a position of said first switchboard for visualizing whether or not the operators at said second switchboard are busy or idle, an operator's set for said circuits at said second switchboard, means for automatically connecting said operator's set to one of said circuits when the answering end of said circuit is connected to one of said answering terminals, and subscriber controlled means for disconnecting the subscriber's line from one of said circuits.

7. A telephone system including a switchboard divided into positions, a calling line appearing in answering terminals at a plurality of said positions, a second switchboard divided into positions, multiple jacks at said second switchboard, circuits extending from one of said positions upon said first board to positions upon said second board, manual means for directly and physically connecting one of said circuits to said calling line, an operator's set at one position of said second switchboard, automatic means at said position for connecting and disconnecting the operator's set from the circuits that terminate thereat when the circuits are connected to said answering terminals and said multiple jacks respectively, automatic means for preventing the connection of said operator's set to more than one circuit at said position at one time, and subscriber controlled means for automatically freeing a subscriber's line from one of said circuits.

8. A telephone system including a switchboard divided into positions, a calling line appearing in answering terminals at a plurality of said positions, a second switchboard divided into positions, a called line appearing in multiple jacks on several of said last positions, circuits extending from one of said positions upon said first board to positions upon said second board and adapted to have direct physical connection with said answering terminals, an operator's telephone at one position on said second switchboard, means including a double wound relay responsive to the connection of one of said circuits to a line of said first switchboard for automatically connecting said operator's set to said circuit, means for preventing the operative connection of said operator's set to more than one of said circuits at a time, and subscriber controlled

means in said one circuit at said one position of said first board for automatically freeing a line from said circuit.

9. A telephone system including a switchboard divided into positions, a calling line appearing in answering terminals at a plurality of said positions, a second switchboard divided into positions, circuits extending from one of said positions upon said first board to positions upon said second board and adapted to have direct physical connection with said answering terminals, manual means for connecting said circuits to said answering terminals, an operator's set at said second switchboard for said circuits, means for automatically connecting said operator's set to one of said circuits when the same is connected to one of said answering terminals, means at said first switchboard for indicating to an operator thereat whether or not operators at certain of said positions on said second switchboard are idle or busy, and subscriber controlled means in said one circuit for freeing the subscriber's line from said one circuit.

10. A telephone system including a switchboard divided into positions, a calling line appearing in answering terminals at a plurality of said positions, a second switchboard divided into positions, circuits extending from one of said positions upon said first board to positions upon said second board and adapted to have physical connection with said answering terminals, means at said first switchboard for indicating to the operator at one of the positions of said first switchboard whether or not the operators at certain positions of said second switchboard are idle or busy, said busy means acting to advise the operator at said first switchboard which circuits she should connect to the answering terminals to distribute the calls to idle operators at said second switchboard, an operator's set at said second switchboard for said circuits, automatic means for connecting said operator's set to one of said circuits upon the connection of said circuit to one of said answering terminals providing said operator's set is not already connected to another of said circuits, and subscriber controlled means for freeing a subscriber's line from one of said circuits.

11. A telephone system including a switchboard divided into positions, a calling line appearing in answering terminals at a plurality of said positions, a second switchboard divided into positions, circuits extending from one of said positions upon said first board to positions upon said second board, means for automatically preventing operative connection of more than one of said circuits at one time to said calling line in response to a call on said line, and a super-

visory signal operable intermittently to notify an operator connecting a circuit to said calling line subsequently to the connection of another circuit to said calling line by another operator that the said other operator has seized the call.

12. A telephone system including a switchboard divided into positions, a calling line appearing in answering terminals at a plurality of said positions, a second switchboard divided into positions, circuits extending from one of said positions upon said first board to positions upon said second board, test means for said circuits whereby the first circuit to operatively connect to said calling line in response to a call thereover will prevent a second circuit from connecting to said calling line, a supervisory signal, means for intermittently operating said supervisory signal to indicate to the operator that the call has been answered by another operator, and means for causing said signal to operate continuously to signal for a disconnection.

13. A telephone system including a calling subscriber's line terminating in multiple answering terminals and multiple lamps, a plurality of cord circuits at different operators' positions for connecting to said calling line, test means for preventing the operative connection of more than one of said cord circuits to said calling line at the same time in response to a call over said line, a signal, means for operating said signal intermittently if two cord circuits are connected to said line in attempting to answer a call, and means for causing said signal to operate continuously to signal for a disconnection.

14. A telephone system including a calling subscriber's line and a called subscriber's line, a circuit extending through two operators' positions for connecting said calling subscriber's line to said called subscriber's line, a supervisory lamp at each of said positions, means at one of said operator's positions controlled by a subscriber for freeing his line from said circuit and for lighting the supervisory lamp at the said position, means responsive to the disconnection of the terminal of said circuit from the said calling line for operating the supervisory signal at the other of said positions, another circuit for connecting to said calling line, and automatic means for intermittently operating said signal at said one operator's position if said other circuit is connected to said calling line prior to the connection of said first circuit to notify the operator at said first cord that the call has already been answered.

15. A telephone system including a calling subscriber's line and a called subscriber's line, a link circuit having an answering terminal for connection to said calling subscriber's line and a calling terminal for connection to said called subscriber's line, a pair of

signals for said link circuit, subscriber controlled means for freeing one of said lines from said link circuit and for operating one of said signals, and operator controlled means for operating one of said signals, and operator controlled means for operating the other of said signals when said answering terminal of said circuit is disconnected from said calling line.

10 16. A telephone system including a calling subscriber's line, a link circuit for connection thereto, a supervisory signal, subscriber controlled means for disconnecting said link circuit from said subscriber's line, and elec-
15 tromagnet means operative when the operator removes the answering terminal of said link circuit from the jack of said line to operate said signal.

17. A telephone system including a switch-
20 board divided into positions, a calling line appearing in answering terminals at a plurality of said positions, a second switchboard divided into positions, a called line appearing in multiple jacks on several of said last
25 positions, circuits extending from one of said positions upon said first board to positions upon said second board and having manually controlled connection terminals adapted to be directly and physically con-
30 nected to said answering terminals, an operator's set at one position of said second switchboard, means responsive to the physical connection of one of said circuits to said calling line to connect said operator's set
35 thereto, means responsive to the connection of said circuit to said called line to disconnect said operator's set from said circuit, and automatic ringing means for signaling the said called subscriber.

40 18. A telephone system including a switchboard divided into positions, a calling line appearing in answering jacks at a plurality of said positions, a second switchboard divided into positions, a called line appearing
45 in multiple jacks on several of said last positions, circuits extending from one of said positions upon said first board to positions upon said second board, answering terminals for said circuits at said first switchboard,

manual means for connecting said answer- 50
ing terminals to said answering jacks whereby calls are manually distributed to the operators at the second of said switchboards, automatic supervisory means for indicating
55 to an operator at said first switchboard connecting to said calling line subsequently to another operator at said first switchboard that the call has been answered by said other operator, means for indicating to the opera-
60 tors at said first switchboard when the operators are idle at said second switchboard, calling terminals for said circuit at said second switchboard, manual means for connecting
65 said calling terminals to said multiple jacks to complete connections, and automatic ringing means for signaling the said called subscriber.

19. A telephone system including a switch-
board having a plurality of positions, sub-
scribers' lines terminating in multiple 70
answering jacks at a plurality of said positions, a second switch board having a plurality of positions, multiple jacks for said lines
75 at said second switchboard, groups of circuits extending from positions at said first switchboard to positions at said second switchboard, terminals for said circuits at
80 said first switchboard for connecting said circuits to calling lines, means for preventing the operative connection of more than one circuit to a calling line at the same time,
supervisory means for indicating to operators connecting to a calling subscriber's
85 line, subsequently to the connection of another operator, that the call has been answered by said other operator, busy means to advise the operators at said first board which operators at the second board are
90 busy, such manual distributing means in connection with the multiple line lamp distribution making it possible for the calls to be answered by different idle operators at said first board and to be extended to idle operators at said second board.

Signed by me at Chicago, in the county 95
of Cook and State of Illinois, this 10th day
of September, 1921.

GEORGE A. YANOCHOWSKI.