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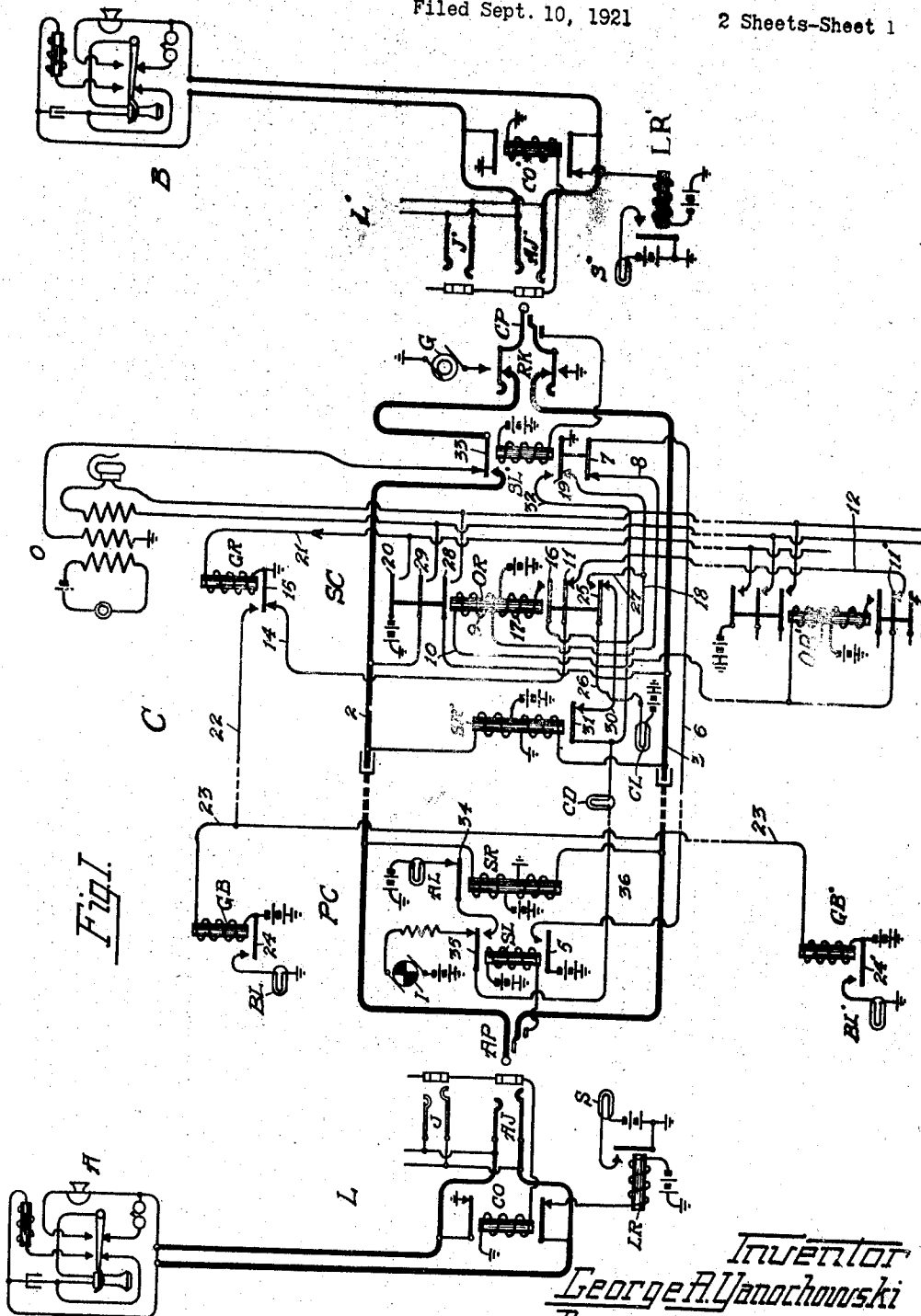
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1,532,216

TELEPHONE SYSTEM

Filed Sept. 10, 1921

2 Sheets-Sheet 1



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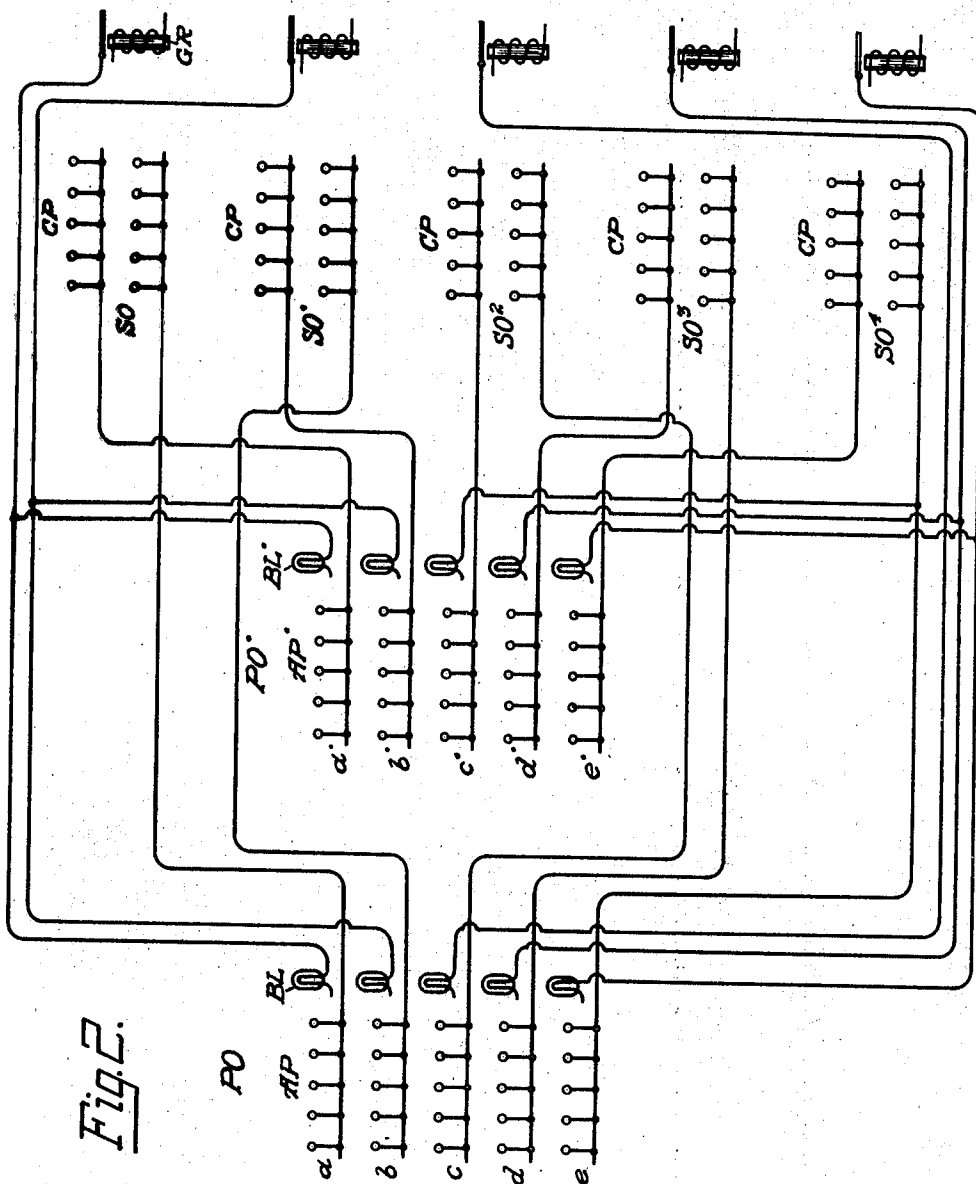
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TELEPHONE SYSTEM

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

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TELEPHONE SYSTEM.

Application filed September 10, 1921. Serial No. 499,778.

To all whom it may concern:

Be it known that I, GEORGE A. YANOSCHOWSKI, a citizen of the United States of America, resident of 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, and an object of my invention is the provision of an improved and simplified divided switchboard system.

In the multiple switchboard systems of the type now used, the board is divided into operators' positions, and each operator has appearing before her a number of answering jacks and line signals, supervisory lamps, answering and calling plugs, and multiple jacks, all of which are well known in the art. A call from a subscriber is answered by a certain operator at whose position this subscriber's line terminates, and after receiving the number of the wanted line, extends the connection to the called line through the agency of the calling plug and multiple jack of the called line appearing before her position.

A feature of my invention is the provision of an improved system in which the exchange switchboard is divided into a primary and a secondary section. The primary section of the switchboard is divided into operators' positions and all the lines terminating at the exchange are distributed before the primary operators in the primary section of the switchboard. Thus the primary operators' positions are provided with only answering jacks and answering plugs. The secondary section of the switchboard at which the secondary operators are located is only provided with calling plugs and multiple jacks of the line terminating at the exchange.

The answering plugs of a primary operator's position are distributed among and terminate in calling plugs at the different

secondary operators' positions and when a call appears before a primary operator, she merely uses an answering plug to extend the call to an idle secondary operator. The act of plugging into the answering jack of the calling line extends the connection to the idle secondary operator.

Another feature of my invention is the provision of 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 position from the primary positions are designated busy to the primary operators by means of suitable signals.

Another feature of my invention is the provision of means whereby should two primary operators happen to extend connections to one secondary operator's position at the same time, suitable means are provided at the secondary operator's position to prevent connecting more than one call from the two primary operators to the secondary operator's head set at one time.

Another feature of my invention is the provision of means for manually distributing the calls to idle secondary operators. From this it will be seen that a great deal of time can be saved by bringing all the calls before a few primary operators who can manually distribute the calls to idle secondary operators. The primary operators can thus distribute the calls to the secondary operators according to the rate at which the secondary operators can handle them. The secondary operators are thus kept busy at all times that there are calls before the primary operators, and any secondary operator can complete a connection from any calling line that the primary operator, can connect to.

The above features as well as others will be more fully described in the ensuing specification and for a better understanding of my invention reference may be had to the accompanying drawings in which:

Fig. 1 illustrates the preferred circuit arrangement for carrying out my invention.

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 signal S, answering jack AJ and the multiple jack J. The switchboard is divided into two divisions, a primary section and a secondary section, or separate boards may be used. The primary section contains a number of operators' positions, and each operator has appearing before her a number of answering jacks as is well understood. The positions of the primary sections are equipped with answering plugs only and the connecting circuit C as illustrated in Fig. 1 comprises a primary operator's circuit PC which comprises an answering plug AP which is inserted into the answering jack AJ to connect to the calling line. A sleeve relay SL is provided which energizes upon the insertion of the answering plug AP into the answering jack AJ of a calling line, and a supervisory relay SR which is energized over the calling line and controls the lighting of the answering supervisory lamp AL.

The primary operator's circuit PC is extended to the secondary operator's circuit SC by means of the conductors 2 and 3. The secondary section of the exchange switch board 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 secondary operator's position may be extended to the called line through the agency of the multiple jacks J. The secondary operator's circuit SC comprises a calling plug CP for connecting to a called line and a sleeve relay SL', which is energized upon the insertion of a calling plug CP into the jack of a called line. A supervisory relay SR' is provided which is for the usual supervisory purposes, and controls the combined calling indicator and supervisory lamp CL. A noninterfering and operator's testing relay OR is also provided which when energized connects the secondary operator's set O to the cord conductor so that she may converse with the calling subscriber. A ringing key RK is provided which when actuated connects ringing current to the called line from the generator G. A disconnect lamp CD is also provided which when lighted signals the secondary operator when the calling subscriber replaces his receiver, and is caused to flash by an inter-rupter I when the primary operator has taken down the connection as will be described more in detail later. A group relay

GR common to an operator's position is also provided for purposes as will be more fully hereinafter described.

To the right of the drawing of 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 signal S', answering jack AJ' and multiple jack 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, however, it is to be understood that other methods may be employed. 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 multiple jacks J' at each of the secondary operators' positions. The primary operator's position PO is provided with a number of answering plugs AP which I divide into five groups, *a*, *b*, *c*, *d* and *e*, and as herein shown, the first group of plugs AP from the primary operator's position PO leads to the secondary operator's position SO and terminates in calling plugs CP, the second group *b* leads to the secondary operator's position SO', the third group *c* leads to the secondary operator's position SO², the fourth group *d* leads to the secondary operator's position SO³, and the fifth group *e* leads to the secondary operator's position SO⁴. The primary operator's position PO' has its answering plug AP divided into similar groups *a'*, *b'*, *c'*, *d'* and *e'*, and lead respectively to the secondary operators' positions SO, SO', SO², SO³, and SO⁴. Each secondary operator's position is provided with a group relay GR which is energized at the time the secondary operator is extending a connection to a called line to light a busy signal lamp BL at each primary operator's position who has answering cords terminating at this secondary operator's position so that none of these primary operators will extend calls to this secondary operator's position while she is extending a connection to a called line, and from the above description it may readily be seen that the calls will be thus evenly distributed among the different secondary operators' positions. Fig. 2 is for illustration purposes only.

Each circuit at the secondary operator's position is provided with a non-interfering relay OR. These relays are connected in a chain circuit so that the secondary operator's set cannot be connected to more than

one calling line at a time. If a number of calls be extended to one secondary operator's position they will be automatically handled one at a time. That is, as soon as one call is completed by the secondary operator, the chain relays will operate to connect the next waiting call to the operator's set.

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

Assuming now that a subscriber at the calling substation A initiates a call, the removal of the receiver thereat closes an energizing circuit for the line relay LR, and line relay LR energizing closes its alternate contact to establish a circuit for the line signal S. A primary operator at whose position the calling line A terminates notes the lighted signal S and inserts an answering plug AP leading to an idle secondary operator into the answering jack AJ of the calling line, which establishes a series energizing circuit for the cut-off relay CO of the line circuit L and the sleeve relay SL of the primary cord PC from battery through the winding of the relay SL, the sleeve contacts of the connected plug AP and jack AJ to ground through the winding of the cut off relay CO. The cut off relay CO and sleeve relay SL energize over this circuit and the cut off relay CO energizing opens the circuit of the line relay LR to efface the line signal S. The sleeve relay SL energizing closes its alternate contact 5, establishing an energizing circuit for the operator's listening relay OR, of the idle secondary operator's cord SC, traced from battery through alternate contact 5 of the sleeve relay SL, conductor 6, normal contact 7 of the sleeve relay SL', conductor 8, through the winding 9 of the operator's listening relay OR, conductor 10, through the contact 11' of the chain of relays OR' as will presently be described, conductor 12, normal contact 11 of the relay OR, conductor 14 to ground at normal contact 15 of the group relay GR, which group relay is common to the secondary operator's position. The relay OR upon energization opens its normal contact 11 thus opening its initial energizing circuit through its winding 9, but the closing of its alternate contact 16 establishes a locking circuit for itself traced from battery through the winding 17 of relay OR, its alternate contact 16 and conductor 18 to ground at normal contact 19 of sleeve relay SL'. The closing of alternate contact 20 of relay OR establishes an energizing circuit for the group relay GR from battery through alternate contact 20 of the relay OR, conductor 21 to ground through the winding of the group relay GR. The group relay GR is common to the secondary operator's position of which the cord SC is one, and energizes when a call is extended

to that secondary position, and the closing of alternate contact 15 of relay GR upon energization establishes an energizing circuit for the primary operator's group busying relay GB, traced from ground through alternate contact 15 of relay GR, conductor 22, conductor 23 to battery through the windings of the relays GB. Each primary operator's position is provided with a primary operator's group busying relay GB, and this relay GB is common to all the cords of this primary operator's position that lead to the secondary operator's position. I also show a primary operator's group busying relay GB' which we will assume is associated with another primary operator's position, and the circuit of this relay is traced from ground at alternate contact 15 of the relay GR, over conductors 22 and 23 to battery through the winding of the relay GB' of the other primary operator's position. The closing of alternate contact 24 of the relay GB establishes a circuit for the busy lamp BL from battery through alternate contact 24 to ground through the lamp BL. The alternate contact 24' of the relay GB' is also closed, establishing a circuit for the busy lamp BL' and the busy lamps BL at all the operators' positions whose primary cords lead to this secondary operator's position are lighted, thus notifying the primary operators of the busy condition of this secondary operator the moment she has been seized by a primary operator. If the call had been extended to a busy secondary operator, the relay OR of the cord could not be energized owing to the fact that another relay OR at this operator's position and relay GR would be energized.

The closing of alternate contact 25 of relay OR establishes an energizing circuit for the combined calling indicator and supervisory lamp CL, traced from battery through the winding of the lamp CL, conductor 26, alternate contact 25, conductors 27 and 18, to ground at normal contact 19 of the sleeve relay SL'. The lamp CL lighting notifies the secondary operator that a call has been extended to her position and the closing of alternate contacts 28 and 29 of the relay OR connects the operator's set O to the cord conductors 2 and 3 and the operator noting the lighted signal CL now inquires the wants of the calling subscriber at the substation A.

Assuming now that it is the subscriber at the substation B that is wanted, the secondary operator associated with the secondary cord SC takes the calling plug CP of the cord SC that was selected by the primary operator PC and tests the multiple jack J' of the wanted substation B as to its idle or busy condition, and if the line is busy, the operator will receive the customary busy click in her head receiver. Assuming that the line is idle, she inserts the calling plug

CP into the multiple jack J' of the wanted line, and depresses the ringing key RK to impress ringing current over the line to the called substation B from the generator G to actuate the call bell of the called substation B. The insertion of the calling plug CP into the jack J' establishes a series energizing circuit for the cut off relay CO' of the line circuit L', and the sleeve relay SL' of the secondary cord SC, the circuit being traced from battery through the winding of the relay SL', the sleeve contacts of the connected plug CP and jack J' to ground through the cut off relay CO'. The sleeve relay SL' upon energization opens the locking circuit of the operator's listening relay OR at its normal contact 19 and relay OR upon de-energization opens its alternate contact 20 to open the energizing circuit of the group relay GR. The group relay GR de-energizing opens its alternate contact 15 to open the energizing circuit of the primary operator's group busying relays GB and GB', and the relays GB and GB' thus de-energize to open their alternate contacts 24 and 24' to open the energizing circuit of the busy lamps BL and BL'. The busy lamps BL and BL' are effaced to notify the primary operators that the primary cords PC leading from their positions to the secondary operator to which these cords lead that the secondary operator has established the connection to the called line and that she is now idle and is available so that further connections can now be extended to this secondary operator's position. The opening of alternate contacts 28 and 29 of relay OR disconnects the operator's set O from the cord conductors. The closing of contact 25 of the relay OR permits the combined call indicator and supervisory relay CL to remain lighted over a circuit traced from battery through the lamp CL, conductor 26, normal contact 25 of the relay OR, conductor 30, normal contact 31, of the supervisory relay SR', conductor 32 to ground at alternate contact 19 of the sleeve relay SL'.

The operator now depresses the ringing key RK to transmit ringing current from the ungrounded pole of the generator G, through the closed contact of the actuated ringing key RK, tip contacts of the connected plug CP and jack J', through the condenser and call bell at the substation B, the ring contacts of the connected jack J' and plug CP to ground at the alternate contact of the ringing key RK. Ringing current is thus applied to the line of the called substation B upon each actuation of the ringing key RK, and upon the response of the called subscriber at the called substation B, an energizing circuit is established for the supervisory relay SR', traced from battery through the upper winding of

the relay SR', alternate contact 33 of the sleeve relay SL', tip contacts of the connected plug CP and jack J', through the now closed contacts of the substation switch hook, back through the ring contacts of the connected jack J' of the plug CP, through the lower winding of the relay SR' to ground. The relay SR' energizing opens its normal contact 31, thus effacing the signal CL notifying the secondary operator that the called subscriber at the substation B has answered.

The calling subscriber at the substation A and the called subscriber at the substation B are now in conversational circuit and the talking circuit may now be traced over the heavily marked conductors. Assuming now that conversation has terminated, the replacing of the receiver at the calling substation A opens the energizing circuit of the supervisory relay SR. The supervisory relay SR de-energizing, closes its normal contact 34 establishing a circuit for the answering supervisory relay AL traced from battery through the lamp AL, normal contact 34 of relay SR, alternate contact 35 of the sleeve relay SL, conductor 36, through the cord disconnect lamp CD, conductor 32, to ground at alternate contact 19 of the sleeve relay SL'. The replacing of the receiver of the called substation B opens the energizing circuit of the supervisory relay SR', and the closing of the normal contact 31 again establishes a circuit for the supervisory lamp CL over a circuit as previously described.

The lighted answering supervisory lamp AL notifies the primary operator that the calling subscriber has replaced his receiver, and the lighting of the supervisory lamp CL at the secondary operator's cord end notifies the said secondary operator that the called subscriber has replaced his receiver. The lighting of the call disconnect lamp CD notifies the secondary operator that the calling subscriber at the substation B has replaced his receiver and the primary and secondary operators having received disconnect signals know that conversation is terminated. The primary operator removes the answering plug AP from the answering jack AJ. The withdrawal of the plug AP from the jack AJ opens a series energizing circuit for the sleeve relay SL and the cut off relay CO and the opening of alternate contact 35 of the relay SL effaces the answering supervisory signal AL. The de-energization of SL closes a circuit through disconnect lamp CD, extending from battery through interrupter I, normal contact 35 of relay SL, through lamp CD to ground at contact 19 of relay SL'. The flashing of lamp CD notifies the secondary operator that the primary operator has removed the answering plug AP from the jack of the

calling line. The secondary operator now withdraws the plug CP from the jack J'. The withdrawal of the calling plug CP from the multiple jack J' of the called line
 5 opens the series energizing circuit of the sleeve relay SL' and the cut off relay CO' and the opening of alternate contact 19 of the relay SL' effaces the signal CL'. The apparatus now used in establishing the con-
 10 nection between the calling subscriber at the substation A and the called subscriber at the substation B is now at normal and available for use in establishing other connections.

15 While I have illustrated my invention operating in connection with specific circuit arrangements, it is to be understood that my invention is adaptable to other systems, and that changes and modifications will readily
 20 suggest themselves by those skilled in the art, and I therefore aim to cover all such changes and modifications as come within the spirit and scope of the appended claims.

Having described my invention what I claim as new and desire to secure by Let-
 25 ters Patent is:

1. A telephone system including a calling subscriber's line terminating at one switch-
 board, a called subscriber's line terminating
 30 at a second switchboard, a circuit extending between said boards for connecting said lines in telephonic conversation, a signal for said circuit at each of said boards, means
 35 controlled by one of said subscribers for operating both of said signals, and means controlled by an operator for effacing one of said signals and for flashing the other of said signals.

2. A telephone system including a calling
 40 subscriber's line terminating at one switchboard, a called subscriber's line terminating at a second switchboard, a circuit extending between said boards for connecting said lines in telephonic conversation, a signal for said
 45 circuit at each of said boards, means controlled by one of said subscribers when signaling for disconnection for operating both of said signals, and means controlled by an operator when disconnecting said circuit
 50 from one of said lines for effacing one of said signals and for flashing the other of said signals.

3. A telephone system including a switch-
 board having answering jacks and a circuit
 55 provided with an answering terminal, a second switchboard having multiple jacks and a calling terminal for said circuit, an operator's set at said second switchboard, automatic means responsive to the connection
 60 of said answering terminal to one of said answering jacks for connecting the said operator's set at said second switchboard to said circuit.

4. A telephone system including a switch-
 65 board having answering jacks and a circuit

provided with an answering terminal, a second switchboard having multiple jacks and a calling terminal for said circuit, an operator's set at said second switchboard, automatic means responsive to the connection
 70 of said answering terminal to one of said answering jacks for connecting the said operator's set at said second switchboard to said circuit, and means responsive to the connection of said calling terminal to one of
 75 said multiple jacks to disconnect said operator's set from said circuit.

5. A telephone system including a switch-
 board divided into operators' positions, an-
 80 swering terminals at said switchboard, a second switchboard divided into operators' positions, multiple terminals at said second switchboard, circuits extending from said
 85 first switchboard to said second switchboard, answering terminals for said circuits at said first switchboard, calling terminals for said circuits at said second switchboard, and
 90 manual means for connecting said answering terminals to said answering jacks whereby calls are manually distributed to the oper-
 95 ators at the second of said switchboards.

6. A telephone system including a switch-
 board divided into operators' positions, an-
 100 swering terminals at said switchboard, a second switchboard divided into operators' positions, multiple terminals at said second switchboard, circuits extending from said
 105 first switchboard to said second switchboard, answering terminals for said circuits at said first switchboard, calling terminals for said circuits at said second switchboard, manual
 110 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 means
 115 for indicating to the operators at said first switchboard which operators are idle at said second switchboard.

7. A telephone system including a switch-
 board having operators' positions, answering
 120 terminals on said switchboard, a second switchboard having operators' positions, multiple terminals on said second switchboard, circuits extending from different positions on said first switchboard to different
 125 positions on said second switchboard, answering terminals at said first switchboard for said circuits, calling terminals at said second switchboard for said circuits, manual
 130 means for connecting the answering terminals of said circuits to said answering jacks to manually distribute the calls to the operators at said second switchboard, and manual
 135 means for connecting said calling terminals to said multiple jacks to complete the connections.

8. A telephone system including a switch-
 board having operators' positions, answering
 140 terminals on said switchboard, a second switchboard having operators' positions, 130

multiple terminals on said second switchboard, circuits extending from different positions on said first switchboard to different positions on said second switchboard, answering terminals at said first switchboard for said circuits, calling terminals at said second switchboard for said circuits, manual means for connecting the answering terminals of said circuits to said answering jacks to manually distribute the calls to the operators at said second switchboard, and manual means for connecting said calling terminals to said multiple jacks to complete the connections, and means at said first switchboard for visualizing to the operators thereat which operators at the second switchboard are busy and which are idle.

9. A telephone system including a manual switchboard divided into operators' positions, answering terminals at said manual switchboard, a second manual switchboard divided into operators' positions, multiple terminals at said second switchboard, circuits extending from different positions at said first switchboard to different positions at said second switchboard, and a signal at a position on said first switchboard for each operator's position on said second switchboard to which a circuit extends from said portion on first switchboard for visualizing whether or not the operators associated with different positions on said second switchboard are idle or busy.

10. A telephone system including an operator's switchboard divided into positions, a second operators' switchboard divided into positions, circuits extending from the different positions of said first switchboard to the different positions at said second switchboard, an operator's set at one position at said second switchboard, automatic means at said position for connecting and disconnecting the operator's set with the circuits terminating at said operator's position, and automatic means at said second switchboard for preventing the connection of said operator's set to more than one circuit at said position at one time.

11. A telephone system including a manual switchboard divided into operators' positions, a second manual switchboard divided into operators' positions, circuits extending from different positions on said first switchboard to different positions on said second switchboard, an operator's telephone at one position on said second switchboard, means responsive to the connection of one of said circuits to a line at said first switchboard for automatically connecting said operator's set to said circuit, and means for preventing the operative connection of said operator's set to more than one of said circuits at one time.

12. A telephone system including a switchboard having a plurality of operators'

positions, a second switchboard having a plurality of operators' positions, circuits extending from the different positions on said first switchboard to different positions on said second switchboard, a disconnect signal at said first switchboard and one at said second switchboard individual to one of said circuits and operable when a subscriber signals for disconnection, and means for extinguishing the signal at said first switchboard and for intermittently operating the signal at the said second switchboard when the circuit is disconnected from the subscriber's line signaling for disconnection.

13. A telephone system provided with a switchboard divided into operators' positions, a second switchboard divided into operators' positions, circuits extending from one position on said first switchboard to a plurality of positions on said second switchboard, and means at said first switchboard for indicating to the operator at said position whether or not the operators at the said positions on said second switchboard are idle or busy.

14. A telephone system provided with a switchboard divided into operators' positions, a second switchboard divided into operators' positions, circuits extending from one position on said first switchboard to a plurality of positions on said second switchboard, means at said first switchboard for indicating to the operator at said position whether or not the operators at the said positions on said second switchboard are idle or busy, answering terminals at said position on said first switchboard, answering terminals for said circuits, said busy means acting to advise the operator at said first switchboard which circuits she should connect to said answering jacks via said answering terminals to distribute the calls to idle operators at said second switchboard.

15. A telephone system provided with a switchboard divided into operators' positions, a second switchboard divided into operators' positions, circuits extending from one position on said first switchboard to a plurality of positions on said second switchboard, means at said first switchboard for indicating to the operator at said position whether or not the operators at the said positions on said second switchboard are idle or busy, answering terminals at said position on said first switchboard, answering terminals for said circuits, said busy means acting to advise the operator at said first switchboard which circuits she should connect to said answering jacks via said answering terminals to distribute the calls to idle operators at said second switchboard, multiple terminals at said second switchboard, and calling terminals for said circuits at said second switchboard for completing connection to said multiple jacks.

16. A telephone system including an operator's position, manually operated cord circuits thereat, an operator's set, automatic means controllable independent of said operator for connecting said set to said cord circuits; means for preventing said set from being connected to more than one circuit at a time; and means whereby if several of said cord circuits are seized at one time extending to said position, the operator's set will be automatically connected first to one and then to another as quickly as the operator establishes connections.

17. In a telephone system including calling telephone lines appearing in a primary operator's position and called telephone lines appearing in a secondary operator's position, a group of cord circuits for interconnecting said calling and called lines, the answering ends of said cord circuits appearing at the primary operator's position and the calling ends of said cord circuits appearing at the secondary operator's position, an operator's telephone set for the secondary operator's position associated with said group of cord circuits, automatic means for connecting said operator's set to a cord circuit when said cord circuit is solely connected to a calling line, group busying means common to said cord circuits for indicating the busy condition of said operator's set to the primary operator when said operator's set is connected to any one of said cord circuits, means for disconnecting said operator's set from said cord circuit when said cord circuit is connected to a called line, means for preventing a connection between said operator's set and a second cord circuit subsequently connected to a calling line provided said first means have operated, and said second means have not operated.

18. In a telephone system including a calling telephone line and called telephone lines, operator's link circuits for interconnecting said calling and called lines, an operator's telephone set, automatic means including a double wound locking relay operable to connect said operator's set to one of said cord circuits when said cord is connected to a calling line, means for preventing the connection of said operator's set with a second cord circuit connected to a calling line subsequently to said first cord at the same time said operator's set is connected to said first cord, means operable upon the connection of said first cord with one of said called lines to disconnect said operator's set from said first cord and to permit the connection of said operator's set with said second cord, and individual supervisory means for said link circuits adapted to operate intermittently to signal for a disconnection at the calling end of the link circuit when the answering end of the link circuit is disconnected

from the calling line and the calling end is connected to the called line.

19. In a telephone system including a plurality of answering terminals and a plurality of calling terminals, a group of link circuits for interconnecting said terminals, an operator's telephone set common to but normally disconnected from said link circuits, electromagnetic means for automatically connecting said operator's set to a link circuit connected to one of said answering terminals to the exclusion of a second link circuit connected to an answering terminal subsequently to said first link circuit, group busying means common to said cord circuits for indicating the busy condition of said operator's set when said operator's set is connected to anyone of said cord circuits, means operable upon the connection of said first link circuit with one of said calling terminals to disconnect said operator's set from said first link circuit and to permit its connection with said second link circuit, and supervisory means adapted to operate intermittently to signal for a disconnection at the calling end of the link circuit when the answering end of the link circuit is disconnected from the answering terminal and the calling end remains connected to the calling terminal.

20. In a telephone system including telephone lines, a group of cord circuits having answering terminals and calling terminals for interconnecting said telephone lines, an operator's telephone set common to, but normally disconnected from said cord circuits, a double wound listening relay in each cord circuit and operable to connect the operator's set to a cord circuit when its answering terminal is connected to one of said telephone lines, means for preventing the operation of the listening relay in a cord circuit connected to another calling line subsequently to said first cord circuit if said listening relay in said first cord circuit is still operated, means operable upon the connection of said first cord with a called line to effect disconnection of said operator's set from said first cord circuit and to permit the listening relay in said second cord to operate to connect said operator's set to said second cord, and supervisory means for each of said cord circuits adapted to operate intermittently to signal for a disconnection when the answering end of the cord circuit is disconnected from the answering terminal and the calling end of the cord circuit remains connected to the calling terminal.

21. In a telephone system comprising a number of telephone lines and a group of operators' cord circuits for interconnecting same, an operator's telephone set, automatic means including a double wound self-locking relay in each cord circuit to connect the operator's set to a cord circuit connected to

one of said telephone lines, automatic means in each cord circuit to disconnect the operator's set from a cord circuit connected to two of said telephone lines, the automatic means in a second cord circuit connected to another of said telephone lines subsequently to the connection of said first cord rendered inoperable until after said second automatic means in said first cord have operated, and supervisory means for each of said cord circuits adapted to operate intermittently to signal for a disconnection when the answering end of the cord circuit is disconnected from the calling line and the calling end of the cord circuit is connected to the called line.

22. In a telephone system including answering terminals and calling terminals and operators' cord circuits for interconnecting same, an operator's telephone set, a pair of relays in each of said cord circuits, one of said pair of relays adapted to operate to connect said operator's set to said cord circuit when said cord circuit is only connected to an answering terminal, the other of said pair of relays controlling contacts in the talking conductors of its associated cord circuit and adapted to operate to disconnect said operator's set when said cord circuit is connected to a calling terminal, means for preventing the operation of said first relay of the pair in a second cord circuit connected to a telephone line subsequently to said first relay and prior to the connection of said first cord with said calling terminal, and supervisory means for each of said cord circuits adapted to operate intermittently to signal for a disconnection when the answering end of the cord circuit is disconnected from the answering terminal and the calling end of the cord circuit is connected to the calling terminal.

23. In a telephone system comprising calling lines and called lines, link circuits each having an answering end and a calling end, a relay for said answering end and a relay for said calling end, an operator's set adapted to be connected to any link circuit whose answering end is first connected to a calling line by said first relay and adapted to be disconnected by said second relay when the calling end of said link circuit is connected to a called line, said second relay controlling contacts in the talking conductors of its associated link circuit, means for preventing the connection of said operator's set with another link circuit connected to a calling line subsequently to the connection of said first link circuit and calling line, and prior to the connection of said first link circuit with the called line, and supervisory means for each of said link circuits adapted to operate continually to indicate when the calling subscriber finishes conversation and to oper-

ate intermittently to signal for a disconnection at the calling end of the link circuit when the answering end of the link circuit is disconnected from the calling line and the calling end remains connected to the called line, said supervisory means being controlled by said relays.

24. In a telephone system including telephone lines, operators' cord circuits for interconnecting said lines, an operator's telephone set common to, but normally disconnected from said cord circuits, automatic means for connecting said operator's set to a cord circuit connected to a calling line, automatic means for disconnecting said operator's set from a cord connected to a called line, means operable to prevent the operator's set from being connected to more than one cord circuit at the same time, said last means restoring to permit said operator's set to be connected to another cord circuit when said first means and second means have operated, and an intermittently operable signal for signaling for a disconnection when the answering end of the cord circuit is disconnected from the calling line and the calling end remains connected to the called line.

25. In a telephone system including telephone lines, operators' cord circuits for interconnecting said lines, an operator's telephone set common to, but normally disconnected from said cord circuits, automatic means for connecting said operator's set to a cord circuit connected to a calling line, automatic means for disconnecting said operator's set from a cord connected to a called line, means operable to prevent the operator's set from being connected to more than one cord circuit at the same time, said last means restoring when said first means and second means have operated to permit said operator's set to be connected to another cord circuit connected to a calling line subsequently to said first cord, and a supervisory signal operable intermittently to signal for a disconnection when the answering end of the cord circuit is disconnected from the calling line, and the calling end is connected to the called line.

26. In a telephone system including a plurality of telephone lines and a group of operators' cord circuits for interconnecting same, an operator's telephone set, electromagnetic means in each of said cord circuits for connecting said operator's set to each cord circuit when the cord circuit is connected to a calling line, electromagnetic means in each cord circuit for disconnecting said operator's set, and means for preventing the connection of said operator's set to more than one of said cord circuits at the same time, and an intermittently operable signal for indicating to the operator at said group of cord circuits that

conversation has terminated and that the answering end of the cord circuit has been disconnected from the calling line while the calling end remains connected to the

5 called line.

27. In a telephone system including calling lines and called lines, operators' cord circuits for interconnecting same, an operator's telephone set, electromagnetic means in each of said cord circuits for connecting the operator's set to a cord circuit connected to a calling line, electromagnetic means for disconnecting said operator's set when said cord circuit is connected to a called line, means for preventing the operation of the electromagnetic means in a second cord circuit connected to a calling line subsequently to said first cord circuit and prior to its connection with a called line, said last means rendered ineffective to cause the electromagnetic connecting means in the second cord to operate when said electromagnetic disconnecting means in said first cord have operated regardless of whether or not the said electromagnetic connecting means in said first cord remain operated, and means for each of said cord circuits and operable intermittently to signal for a disconnection when the answering end of the cord circuit is disconnected from the calling line and the calling end remains connected to the called line.

28. In a telephone system including calling lines and called lines, operators' cord circuits for interconnecting same, an operator's telephone set, normally disconnected from said cord circuits, means for automatically connecting said operator's set to a cord when said cord is connected to a calling line, means for preventing said operator's set from being connected to other cord circuits which may be connected to other calling lines subsequently to the connection of said first cord and calling line, means for automatically disconnecting said operator's set from said first cord when said first cord is connected to a called line and to permit said operator's set to be automatically connected to one of said other cord circuits without any work on the part of the operator, and automatic means individual to said cord circuits and operable intermittently to signal for a disconnection when that particular connection is no longer desired and the answering end of the connected cord circuit is disconnected from the calling line while the calling end is connected to the called line.

29. In a telephone system including answering terminals and calling terminals, an operator's telephone set, operators' cord circuits normally disconnected from said operator's set and adapted for interconnection to said answering terminals and said calling terminals, means for automatically

connecting said operator's set to the first cord connected to an answering terminal to the exclusion of other cords connected to other answering terminals subsequently to the connection of said first cord and answering terminal, automatic means for disconnecting said operator's set from said first cord when it is connected to a calling terminal, means for permitting said operator's set to be automatically connected to one of said other cord circuits upon the completed connection of said first cord and calling terminal without the assistance of the operator, said last means permitting the operator's set to be automatically connected to another of said other cords upon the completed connection of said second cord with a calling terminal, and a supervisory signal individual to each of said cord circuits and operable intermittently to signal for a disconnection at the calling end of a connected cord circuit when the answering end of the connected cord circuit is disconnected from the calling line and the calling end is connected to the called line.

30. In a telephone system including calling lines and called lines, operators' cord circuits for interconnecting same, an operator's set normally disconnected from said cord circuits, means for automatically connecting said operator's set to the first cord circuit connected to a calling line to the exclusion of other cords subsequently connected to the other calling lines, means for automatically disconnecting the operator's set from said first cord circuit when the connection is completed with a called line, means for permitting the operator's set to be automatically connected to another cord circuit connected after the completed connection of said first cord circuit without any assistance on the part of the operator, and automatic intermittently operable means for said first cord circuit operable when the answering end of said first cord circuit is disconnected from the calling line and the calling end is connected to the called line to signal for a disconnection.

31. In a telephone system including answering terminals and calling terminals, link circuits having answering ends and calling ends, for engaging said answering terminals and calling terminals respectively, an operator's set, means for automatically connecting said operator's set to a link circuit when its answering end is connected to an answering terminal, means for automatically disconnecting the operator's set from said link circuit when its calling end is connected to a calling terminal, means for preventing the operator's set from being connected to other link circuits which have their answering ends connected to answering terminals subsequently to the connection of said first link with an answering terminal and prior

to the operation of said second means, said last means permitting the operator's set to be connected to one of said other link circuits when said first link is connected to a calling terminal, and to permit the operator's set to be connected successively to another link circuit previously connected to an answering terminal without any work on the part of the operator after she has completed the connection of the preceding link, and automatic means individual to said link circuits and operable intermittently to signal for a disconnection when the answering end of the connected link circuit is disconnected from the calling line while the calling end is connected to the called line.

32. In a telephone system including calling lines and called lines, a group of cord circuits for interconnecting same, an operator's telephone set common to but normally disconnected from said cord circuits, automatic means for connecting the operator's set to a cord circuit connected to a calling line and automatic means for disconnecting said operator's set when said cord circuit is connected to a called line, means for preventing the operator's set from being connected to other cord circuits connected to calling lines before the completion of the connection of said first cord circuit with a called line, said last means permitting the operator's set to be succes-

sively connected to the next cord circuit connected to a calling line independently of any act by the operator upon the completion of the connection of the preceding cord circuit, and a disconnect signal for each of said cord circuits and controlled by said first and second means.

33. In a telephone system including calling lines and called lines, operators' cord circuits, an operator's telephone set, automatic means individual to each of said cord circuits for connecting said operator's set to each cord circuit, automatic means individual to each of said cord circuits for disconnecting the operator's set from each cord circuit, means for preventing the operator's set from being connected to more than one cord at a time although any number of cords may be connected to calling lines at the same time, said last means permitting the operator's set to be successively and automatically connected to one of said connected cords after said operator's set has been disconnected from the preceding cord without any work on the part of the operator, and a disconnect signal for each of said cord circuits and controlled by said first and second means.

Signed by me at Chicago, in the county of Cook and State of Illinois, this 8th day of September, 1921.

GEORGE A. YANOCHOWSKI.