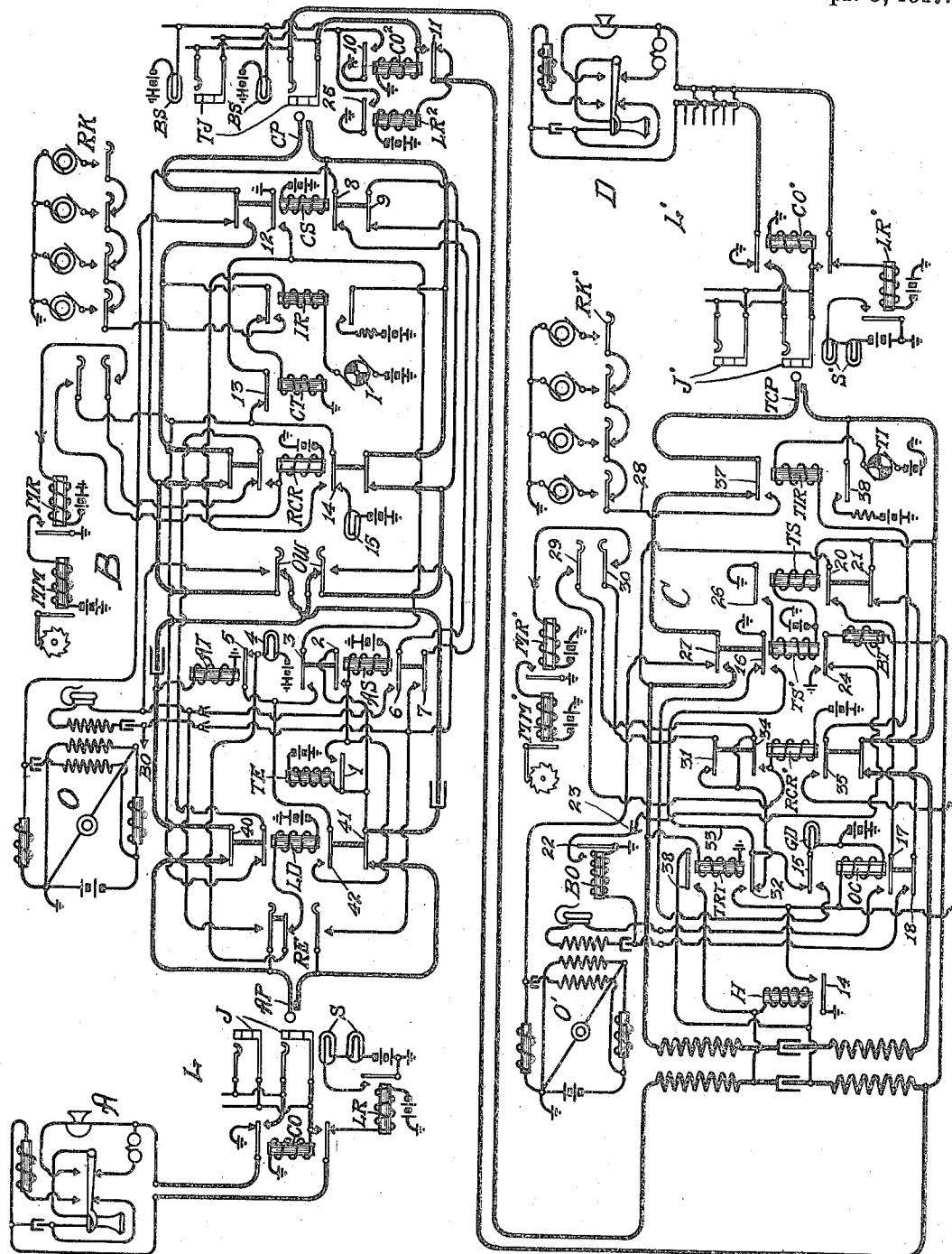


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TELEPHONE SYSTEM.
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TELEPHONE SYSTEM.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, HIRAM D. CURRIER, a citizen of the United States of America, residing in Chicago, 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 operators' link circuits for handling trunk connections between exchanges, an object of my invention being to provide an improved and simplified circuit arrangement for ordering connections which are to be extended from any subscriber's cord circuit through a trunk circuit to subscribers' lines in a distant exchange.

The general practice now followed in handling trunk calls in multi-exchange systems is for the A operator to communicate by means of a special orderwire circuit with a trunk operator in the desired distant exchange who receives the number of the wanted line from the A-operator and then assigns a trunk to which the A-operator has access whereupon the A-operator connects the calling line with the assigned trunk and the B or trunk operator extends such trunk to the jack of the wanted line. In systems of this character so-called A and B operators are employed and separate and distinct orderwire and trunk circuits are employed and one of the features of my invention is the provision of a control circuit associated with the subscriber's cord circuit whereby the originating operator after inserting the calling plug in a trunk selected by her uses this connection as an orderwire preferably by throwing a special orderwire key which severs the cord circuit and connects her telephone set with the calling end of the cord. Thus the originating operator may pass the call to the distant operator and does so without the calling subscriber hearing the order when it is passed. I also preferably make this orderwire key of the two-way type so that when thrown one way the orderwire circuit is connected and when thrown the other way a recall circuit is established.

For a better understanding of my invention, reference will be had to the accompanying drawing in which a calling substation A

and called substation D are shown terminating in line circuits L and L' respectively, at different exchanges, together with an operator's cord circuit B and a trunk circuit C. The substations A and D are of a well-known common battery type and chosen for the purpose of illustration, said substations terminating in line circuits L including line and cut-off relays LR and CO respectively. Multiply connected jacks J are provided and in the present embodiment of my invention a line signal S is provided for each jack, the jacks being distributed among different operators. That is, when a call is initiated over any line, the line signals S are lighted and any one of a plurality of operators can seize the call.

The operator's cord circuit B comprises the usual answering plug AP and calling plug CP, the circuit shown being of the two-conductor type and said plugs being connected by tip and sleeve conductors. At the answering end of the cord circuit I provide a comparatively high resistance test relay TE which is connected to the sleeve strand and energized when the answering plug is inserted whereby the answering sleeve relay AS is connected to the sleeve conductor. With this arrangement the first operator to answer a call seizes it to the exclusion of any subsequent operator. That is, when the first plug AP is connected to a calling line, the sleeve relay AS associated therewith is connected to the sleeve strand and should a second operator attempt to seize this call the high resistance relay TE of the second cord circuit can not operate and this prevents the second operator from connecting to this line. An answering tip relay AT is also associated with the answering end of the cord being connected with the tip strand. I have also provided an instantaneous recall arrangement including a link disconnect relay LD. Should a calling subscriber desire to recall as soon as his receiver has been replaced and prior to the removal of the operator's cord B from his line the replacing of his receiver energizes the link disconnect relay LD thereby disconnecting relays AT and AS so that the subsequent removal of his receiver will again light his line lamp so that the recall may be seized by the same or a different operator.

In connection with the calling end of circuit B, I provide a calling sleeve relay CS and a calling tip relay CT which are operated in a well-known manner. Automatic party line ringing is also provided and to this end I have provided a party line key RK together with a ringing control relay RCR which is energized when the ringing key is actuated together with an interrupter relay IR which alternately connects ringing generator and calling tip relay CT of the called line. A call register is also provided comprising a meter relay MR and meter magnet MM which are controlled through common contacts of the ringing key.

I also provide automatic listening and disconnecting, the operator's cord circuit O being connected to the cord circuit through the sleeve relay AS when connection is made to a calling line and again disconnected by the operation of sleeve relay CS when connection is extended to another line or a trunk jack.

In order to handle the recalls and trunking connections I preferably provide a two-way key including the recall contacts RE and the orderwire contacts OW. This key when thrown one way being adapted to operate contacts RE to connect the operator's telephone set O with the cord circuit and at the same time restore the link disconnect relay LD, and when the key is thrown in the other direction the orderwire contacts OW are actuated to first sever the talking conductors of the cord circuit and then connect the operator's telephone O to the calling end of the cord whereby the operator may converse with the operator to whom the trunk connection is being extended and at the same time prevent the calling subscriber from hearing her pass a call to the distant operator.

Now as to the trunk circuit C, I preferably provide a number of multiply connected trunk jacks TJ for each trunk and distribute these jacks among different operator's positions and above each such jack I provide a busy signal BS which is lighted while the trunk C is in use so that no other operator will attempt to connect therewith. Two relays are provided at the outgoing end of the trunk for controlling the signals BS, said relays being in the nature of line and cut-off relays LR² and CO². When an operator connects with the trunk jack TJ the associated cut-off relay CO² is operated over the sleeve strand and this lights all of the associated lamps BS. Also if the plug of the trunk C is in the jack of a called line and the plug CP has been withdrawn from the trunk jack TJ then the line relay LR² is operated over the trunk conductor to maintain the signals BS lighted until the trunk plug is removed. I also provide a repeating coil for the trunk circuit and a high resist-

ance bridged relay H which relay in accordance with well-known practice is of a high enough resistance to prevent the actuation of the tip relay CT of a connected cord B.

When an operator inserts a plug CP in a trunk jack TJ, relay H energizes followed by the operation of an operator's cut-in relay OC which relay serves to connect the distant operator's telephone O¹ to the trunk circuit, this relay also serving to light the combined guard and disconnect lamp GD which remains lighted until the trunk plug is inserted in the jack of the called line. Upon the connection of the distant operator's telephone O¹ with the trunk the operator's busy relay BO energizes to connect ground to the sleeve conductor of all of the idle incoming trunks terminating at this distant operator's position which ground connection serves to operate the line relays LR² of these trunks and thereby light their associated busy signals BS so that no originating operators will attempt to connect to any of the trunks going to this busy distant operator, this busy condition being maintained until the operator has extended the call by inserting the trunk plugs TCP in the line jack of the wanted line. In connection with relay BO the conductor leading from its contact 22 is common to all of this operator's trunk circuits. That is, there is a connection 23 extended from the alternate contact 22 of BO to a normal contact 24 on each of the relays TS¹ of this operator's trunks. It will thus be seen that no matter which one of her trunks are used all of the idle ones terminating at her position are maintained busy as long as the relay BO is energized.

As each operator's telephone is common to both the operators' cord circuits B and the incoming trunk circuits C at her position it will be apparent that relay BO energizes each time a link circuit is used, energizing when the incoming end of the link is connected with, and deenergized when the outgoing end of the link is connected with, this period of energization of BO maintaining all the distant trunk jacks extending to her position busy.

At the calling or outgoing end of trunk circuit C (which is preferably of the two-conductor type although my invention is not limited to this), I provide a trunk sleeve relay TS and an auxiliary trunk sleeve relay TS¹, both relays always operating together and being provided because there are more contacts to be controlled than good practice will permit to be placed upon a single electromagnet. A trunk tip supervisory relay TRT is also provided, and automatic party line ringing, and to this end I provide a ringing key RK¹ and ringing control relay RCR¹ energized when the ringing key is actuated. A trunk interrupter relay TIR is also provided

being adapted to alternately connect ringing current and the trunk tip relay to the tip conductor of the trunk. In connection with the trunk circuit I have also shown a meter device consisting of a meter relay MR¹ and a meter magnet MM¹.

Operation.

Having described in general the apparatus embodied in my preferred arrangement I will now describe more in detail the operation of the system.

Assuming that a call is initiated at substation A by the removal of the receiver thereat, line relay LR is energized over the calling line effecting the operation of line signals S. An operator inserts an answering plug AP into a jack J of the calling line connecting relays TE and CO in series and causing the energization of TE but not that of CO whereupon the sleeve relay AS is connected to the sleeve conductor of the cord through alternate contact 1 causing the energization of AS and CO in series followed by the energization of the tip relay AT over the calling line. Relay AS therefore closes its alternate contact 2 effecting a locking circuit for itself through the sleeve conductor independent of alternate contact 1. The closing of alternate contact 3 of AS does not effect the lighting of supervisory lamp 4 on account of the interruption of normal contact 5. The closing of alternate contacts 6, 7, of AS connects operator's telephone O in circuit with the cord through normal contacts 8, 9 of the calling sleeve relay CS.

Before proceeding further with the description of the connection I will refer briefly to the arrangement for excluding operators who may subsequently connect to this same line. Assuming that a second operator inserts a plug AP into another jack J of this calling line subsequent to the insertion of the first plug, this second operator's telephone will not be connected to this calling line due to the fact that the test relay TE of the second cord will not become energized because of the parallel circuit established through the comparatively low resistance relay AS of the first cord. Therefore the sleeve relay AS of the second cord does not energize and the second operator receiving no reply to her inquiry knows that the call has been seized.

Again taking up the first connection above referred to, the first operator ascertains the number of the wanted subscriber and finding that the wanted line terminates at a distant exchange, she will insert the calling plug CP into an idle trunk jack TJ leading to the wanted exchange, such idle condition being indicated by the absence of the illumination of busy signals BS. Upon insertion of plug CP into the trunk jack, the circuit for relays CS and CO² is established over the sleeve

contacts of the plug and jack effecting their energization, the energization of CO² causing the closure of its alternate contact 10 and the lighting of all of the busy signals BS associated with the jacks of this trunk. The closing of alternate contact 11 of CO² effects the continuity of the sleeve talking conductors of the trunk. The relay CS having energized, its normal contacts 8, 9 disconnect the operator's telephone O and the closing of alternate contact 12 establishes a circuit through normal contacts 13, 14 and supervisory lamp 15 effecting its illumination until the called subscriber responds as will be more clearly described.

Connection having been made to trunk C as described, sleeve relay CS and tip relay CT of cord circuit B are connected in series with the high resistance trunk relay H, which relay is energized but due to its high resistance prevents the energization of CT. Responsive to the closing of alternate contact 14 of H a circuit for the operator's connecting relay OC is established whereby said relay energizes closing its alternate contact 15 and establishing a circuit for the guard lamp GD through normal contact 16 of TS¹ to ground. The closing of alternate contacts 17, 18 of OC connects the operator's telephone O¹ through normal contacts 20, 21 of sleeve relay TS to the trunk talking conductors. At this time the operator's busy relay BO is connected through contacts 18 and 21 and then through the winding of trunk sleeve relay TS to battery causing the energization of BO but its high resistance prevents the energization of TS. Therefore alternate contact 22 of BO is closed connecting ground to its common conductors 23, the conductors 23 which extend to idle trunks being effective to cause the illumination of the busy signals BS, associated with the jacks of such idle trunks. This busy indication serves to keep other operators from extending connections to this busy operator. That is, while she is answering this trunk call it is desirable to keep other operators from extending trunk connections to her positions, such other operators in such case selecting trunks which extend to idle operators in the desired exchange. The circuit by which the busy lamps are maintained lighted may be traced from ground at alternate contact 22 of relay BO, conductors 23 to normal contacts 24 of all the idle trunk circuits at this operator's position, sleeve conductor of such trunks C, normal contacts 11 and relays LR² to battery. The relays LR² of these trunks are thus energized closing their alternate contacts 25 and lighting the associated busy lamps BS. This ground connection from alternate contact 22 does not effect the trunks which are included in taking connections between or to substations due to the fact that the relay TS¹ of such trunks are energized

and their normal contacts 24 open. Thus this common ground at 22 cannot interfere with established connections by tying a number of trunks together.

5 Connection having been established between the cord B and trunk C, the operator at B actuates the orderwire key OW thereby interrupting the talking conductors of the cord circuit and connecting her operator's
10 telephone O to the calling end of the cord and thus into talking association with the operator's telephone O at the distant exchange. The operator at B now orders the number of the wanted substation but due
15 to the interruption of the talking strands B the calling subscriber does not hear this number as it is being passed along to the distant operator. The operator at B after having given the order, restores the orderwire key
20 OW and the operator at C after testing the wanted line in the usual manner and finding it idle inserts the trunk plug TCP into a jack J¹ thereof connecting the trunk sleeve relay TS and cut-off relay CO¹ in series and effect-
25 ing their energization. Upon energization of TS its normal contacts 20, 21 are interrupted effecting the deenergizations of the associated relay BO and thus removing the busy condition of all of this operator's idle in-
30 coming trunks by extinguishing their signals BS. The interruption of contacts 20, 21 also disconnects the operator's telephone and the closing of alternate contact 26 causes the energization of the auxiliary trunk sleeve
35 relay TS¹ whereupon its normal contact 24 is interrupted preventing any subsequent energization of relay BO from interfering with the conversational connection of this trunk. The closing of alternate contact 27
40 of TS¹ establishes the continuity of the tip conductor of the trunk and the interruption of normal contact 16 effaces guard lamp GD.

The operator at C now actuates the proper ringing button thereby connecting generator
45 to the ringing conductor 28, the actuation of such button while in its fully actuated position, also effecting the closure of common contacts 29, 30 whereupon a circuit for the meter relay MR¹ is established from battery
50 through the winding of MR¹, alternate contact 30, normal contacts 31, 32, conductor 33 and alternate contact 16 to ground. Relay MR¹ therefore energizes causing the operation of meter magnet MM¹ and a single oper-
55 ation of the meter to record the established connection. The closing of the alternate contact 29 of the ringing key establishes an energizing circuit for the ringing control relay RCR¹ traced from battery through the wind-
60 ing of said relay, alternate contact 29, normal contact 32, conductor 33 to ground at alternate contact 16. Relay RCR¹ therefore closes its alternate contact 34 establishing a locking circuit for itself through said nor-
65 mal contact 32 to ground at alternate contact

16. Alternate contact 35 of RCR¹ also closes establishing an operating circuit for the trunk interrupter relay TIR traced from battery through interrupter TI, relay TIR, alternate contacts 35 and 14 to ground. Re-
70 lay TIR therefore alternately connects the ringing conductors 28 and the tip trunk conductor and relay TRT to the called line, each energization of TRT being effective to cause the transmission of ringing current through
75 alternate contact 37 and over the called line back through alternate contact 38 to battery and ground.

Upon response of the called subscriber and the first subsequent closure of normal con-
80 tact 37, a circuit for the trunk tip relay TRT is established traced from ground through the winding thereof, alternate contact 27, normal contact 37 over the called line re-
85 turning through the winding of trunk sleeve relay TS to battery. The tip relay TRT is therefore energized closing its alternate contact 38 thereby shunting relay H which de-
energizes and due to the interruption of nor-
90 mal contact 32 of tip relay TRT, relay RCR¹ is deenergized and further operations of the interrupter relay are prevented. The closing of the shunt across the winding of relay H
also establishes a low resistance path over
95 the trunk circuit so that the tip relay CT of the cord is energized interrupting the circuit for the supervisory signal 15 which is there-
by effaced. The subscribers are now con-
100 nected over a conversational circuit traced over the heavily marked conductors.

After completing conversation the sub-
scribers replace their receivers upon their
respective switch-hooks, the replacing at
called station D effecting the restoration of
105 trunk tip relay TRT whereby the shunt is removed from around the winding of relay H so that its high resistance causes the restoration of the calling tip relay CT of cord circuit B. The restoration of CT closes an
operating circuit for the supervisory lamp
110 15 through normal contacts 14, 13 and alternate contact 12. The replacing of the receiver at substation A effects the restoration of answering tip supervisory relay AT
whereby a circuit for the supervisory lamp
115 4 is established through normal contact 5 and alternate contacts 3, 12 to ground light-
ing said lamp 4. It will be noted that link disconnect relay LD being in multiple with
120 lamp 4 also energizes when relay AT restores, the energization of LD causing the disconnection of the link circuit at contacts
40, 41 so that the subscriber at A can recall without awaiting the removal of the answer-
125 ing plug from the jack. The closing of alternate contact 42 of relay LD establishes a locking circuit for the sleeve relay AS traced from battery through the winding of AS alternate contact 42, 3, 12 to ground. Thus the supervisory lamps are maintained
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lighted until the cord is taken down irrespective of whether the subscriber at A does or does not recall.

The operator at cord B noting the disconnect signal withdraws plugs AP and CP from their respective jacks, the restoration of plug CP permitting the deenergization of sleeve relay CS whereby the interruption of its alternate contact 12 allows the restoration of relays LD, TE and AS so that the cord B is again at normal.

Also upon the removal of the plug CP from the trunk jack TJ the trunk cut-off relay CO² deenergizes, but lamps BS are not effected because line relay LR² is connected to the sleeve conductor of the trunk and is energized over a circuit traced to ground through alternate contact 24 of relay TS¹. Thus the busy signals BS of this trunk are maintained lighted, and remain so until the trunk plug TCP is removed from the jack of the called line. However, when the cord plug CP was removed from the trunk jack the bridge relay H of the trunk deenergized interrupting the circuit of relay OC which restores connecting disconnect lamp GD in circuit with battery and ground through normal contacts 15 and 32 and alternate contact 16 whereupon the operator withdraws the trunk plug from the jack of the called line. This last act permits of the restoration of relays TS and TS¹ and the interruption of alternate contact 16 to TS¹ interrupts the circuit for lamp GD causing its effacement. The interruption of alternate contact 24 of TS¹ removes ground from the sleeve conductor of the trunk causing the restoration of the trunk line relay LR² and the effacement of the associated busy signals BS. The apparatus of the trunk being at normal it is now available for other connections.

From the above, it will be noted that from the time the cord plug CP is withdrawn until the trunk plug TCP is withdrawn, although the trunk or distant operator is busy in taking down this connection, only the busy lamps of this trunk are maintained lighted as the period of disconnection is very short.

In the preferred arrangement of the system I provide each operator with a number of cord circuits B and also a number of trunk circuits C terminating at her position in plugs TCP which extend from outgoing trunk jacks TJ from different exchanges. Thus each operator will also have a number of outgoing trunks jacks TJ extending to other exchanges. In order that an operator who seeks to extend a call over a trunk to a distant exchange may always know without preliminary testing of an operator in the desired exchange who is idle, and in order to provide a more equal distribution of the trunked connections or extensions, I

preferably arrange the busy signals so that when any operator is busy in the act of answering any call, that is a local call at her position or a trunked call, all trunk jacks at their exchanges leading to her position are maintained busy. Thus it will be seen that when a call is to be extended from a cord circuit B to a trunk circuit, the operator can tell at a glance which trunks lead to idle operators at the desired exchange. In this way the trunk calls will not pile up on one operator but will be distributed among the idle ones.

It will also be apparent from the foregoing that in my improved system the originating operator communicates with the distant operator over the connecting trunk which in this instance is also used as an orderwire for ordering up the connection with the distant subscriber. In this way I distinguish from the system wherein special orderwires are provided independent of the trunk circuits. Thus it will be seen that in my system instead of the originating operator communicating with a distant operator who assigns the trunk, the originating operator selects the trunk and then orders up the connection to the distant desired substation over the selected trunk. By means of the busy signals which are provided over the trunk jacks, the originating operator selects an idle trunk and upon plugging into the trunk jack automatically connects her cord circuit with the telephone of the selected operator, so that the actuation of the order wire key OW will immediately place the two operator's telephones in communication. It must be apparent that with this arrangement great efficiency of the trunks is secured and at the same time the extra orderwires are eliminated.

Even with the best distribution of lines by the use of the intermediate and main distributing frames I have found all A operators have considerable idle time between calls and it will be seen from the foregoing that the trunk connections coming into the operators are extended to them only when idle so that what formerly was lost time is now used for handling trunked connections.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. A telephone system comprising telephone lines terminating at an operator's position, operators' cord circuits for interconnecting said lines, trunk circuits extending from said position to other operators' positions, an operator's telephone for the cord circuits and one for the trunk circuits, means for automatically connecting and disconnecting the cord operator's telephone and said cord circuits, and an orderwire key individual to each cord circuit whereby the cord operator's telephone may be connected

in circuit with the trunk operator's telephone over a conversational circuit independent of that end of the cord circuit distant from the trunk.

- 5 2. A telephone system comprising telephone lines terminating at an operator's position, trunk circuits extending from said position to other operators' positions, cord circuits for interconnecting said lines or
10 said lines and trunk circuits, an operator's telephone for the cord circuits and one for the trunk circuits, automatic means for connecting the cord operator's telephone with the cord circuits, telephone lines at said
15 other operators' positions, and orderwire keys for said cord circuits for connecting the operator's telephone of a connected cord and a trunk over a conversational circuit including the cord and trunk but independent
20 of that end of the cord distant from the trunk.

3. A telephone system comprising telephone lines terminating at an operator's position, trunk circuits extending from said
25 position to other operators' positions, telephone lines, terminating at such other positions, cord circuits for interconnecting the first said lines or said lines and trunk circuits, an operator's telephone for the cord
30 circuits, automatic means for connecting the cord operator's telephone with the cord circuits when they are used for local connections, and orderwire keys for said cord circuits whereby a cord operator may order up
35 a connection from a line terminating at her position to a distant line over a cord and trunk circuit and prevent the subscriber at the calling line from hearing said order passed.

- 40 4. A telephone system comprising telephone lines terminating at an operator's position, trunk circuits extending from said position to another operator's position, telephone lines terminating at such other position,
45 a cord circuit for interconnecting the first said lines or said lines and trunk circuits, an operator's telephone, automatic means for connecting and disconnecting said operator's telephone and said cord circuit
50 when it is used to establish said first connections, and means whereby when a connection is to be extended from a calling line over a cord and a trunk circuit to a distant line, the cord operator may order up the
55 connection to the distant line over a connected cord and trunk to the exclusion of the calling line.

5. A telephone system comprising telephone lines, a trunk circuit adapted for use
60 in connecting said lines to other telephone lines, a cord circuit for interconnecting the first said lines or said lines and trunk circuit, an operator's telephone and means for automatically connecting it to the trunk
65 when connection is made with the trunk by

the cord when a connection is to be established between a calling line over a cord and trunk circuit to a distant line, and an orderwire key for the cord having circuit connections whereby the cord operator may
70 communicate with the trunk operator over the connected cord and trunk to order up the connection to the distant line to the exclusion of the calling line.

6. A telephone system comprising telephone lines, a trunk circuit adapted for use in connecting said lines to other telephone lines, a cord circuit for connecting the said first lines with said trunk circuit, an operator's telephone, means for automatically connecting
80 said operator's telephone to the trunk when connection is made with the trunk by the cord when a connection is to be extended to a distant line, and a key for the cord having circuit connections whereby
85 the operator may communicate with the trunk operator to order up the connection to the distant line.

7. A telephone system comprising telephone lines, a link circuit and a trunk circuit for interconnecting said lines, an operator's telephone for the link circuit, means for automatically connecting the telephone with the link circuit, automatic means for
90 disconnecting the operator's telephone from the link circuit, and a manual key for connecting the operator's telephone with the link circuit to the exclusion of the calling subscriber when said link circuit is connected
95 to the said trunk circuit so that the operator may communicate with an operator associated with the said trunk circuit.
100

8. A telephone system comprising telephone lines, an operator's link circuit and a trunk circuit for interconnecting said lines,
105 means responsive to the connection of said link circuit to a calling line for connecting the operator's telephone with the link circuit, means responsive to the connection of the link circuit with the trunk circuit for
110 automatically disconnecting the operator's telephone from the link circuit, and a key for connecting the operator's telephone with the link circuit to the exclusion of the calling line so that the operator may order up
115 a connection.

9. A telephone system comprising subscribers' lines provided with multiple answering jacks, operators' link circuits divided into groups, an operator's telephone
120 for each group of link circuits, means for permitting an operator to connect her telephone with a calling one of said lines to the exclusion of the other operators, a trunk circuit, and a key for connecting an operator's telephone with the trunk circuit to the
125 exclusion of the calling line.

10. A telephone system comprising subscribers' lines provided with multiple answering terminals, link circuits divided into
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groups, an operator's telephone for each group of link circuits, automatic means for permitting an operator to connect her telephone to one of said multiple terminals of a calling line to the exclusion of the remaining operators, a trunk circuit extending to a second exchange and an orderwire key for said link circuit having circuit connections whereby the link circuit operator may communicate with the trunk operator to order up a connection to the exclusion of the calling line.

11. A combination with a calling telephone line, a plurality of connecting terminals for said line located at a central office switchboard, operators' link circuits including means whereby any one of said link circuits may be connected to one of said line terminals to the exclusion of the remaining link circuits, a trunk circuit, and means whereby the link circuit operator may order up a connection over a trunk circuit to the exclusion of the calling line.

12. A telephone system including a calling subscriber's line provided with terminals through which said line may be seized to extend a call, link circuits provided with

answering terminals, means for preventing the operative connection of more than one of said link circuits to said line when said line signals for a connection, a trunk circuit, and means for permitting the link circuit operator to connect her telephone to the trunk circuit to the exclusion of the calling line.

13. A telephone system including telephone lines, each having a plurality of connecting terminals, link circuits having manually controlled answering terminals for connection with said line terminals, means to prevent the operative association of more than one answering terminal with the terminals of any one line, a trunk circuit extending to a second exchange, and a key for said connected operator's link circuit for permitting her to connect to said trunk circuit to the exclusion of the calling line.

Signed by me at Chicago, county of Cook and State of Illinois, in the presence of two witnesses.

HIRAM D. CURRIER.

Witnesses:

M. R. ROCHFORD,
WM. BERGHAHN.