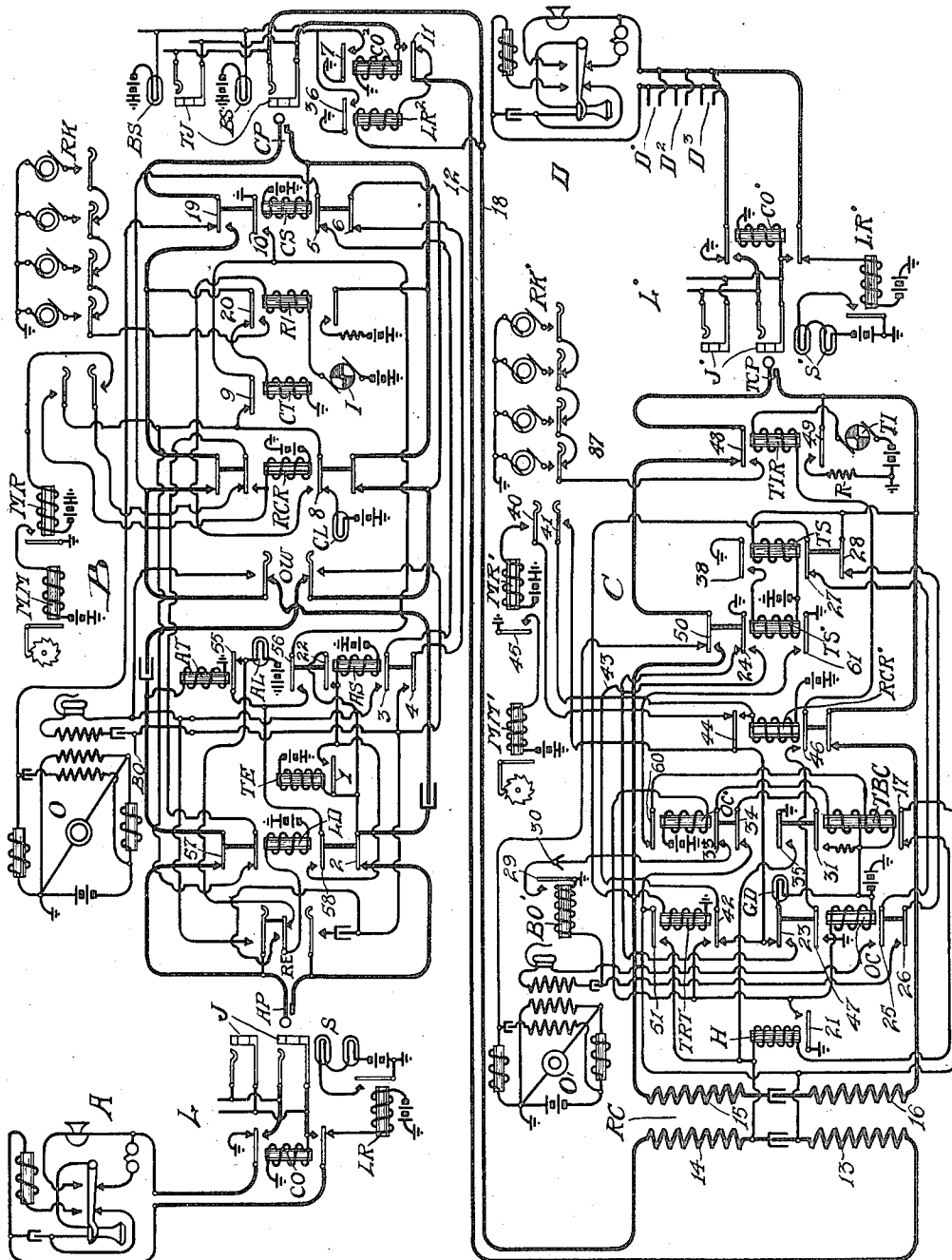


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TRUNK CIRCUIT.

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TRUNK-CIRCUIT.

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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 Trunk-Circuits, of which the following is a specification.

My invention relates to telephone systems, and has to do more particularly with trunking systems in which calls are extended from the calling substation through operator's cord and trunk circuits to called substations, an object of my invention being to provide an improved system of the above character.

The general practice of handling trunk calls in multi-exchange systems is to have an operator commonly known as an A-operator, answer the incoming calls by means of an operator's cord circuit, and then in case of a trunk call, to communicate with a trunk or B-operator in the desired exchange by means of order-wires which are independent of the trunk circuits, the so-called A-operator then connecting to an assigned trunk leading to the desired exchange which has been assigned by the trunking operator, whereupon the trunk operator extends the assigned trunk to the called line. This method of trunking calls requires special trunking operators and special trunking positions at a multiple switchboard. Systems of the above-described character have been found faulty due to the stacking up of calls at a B or trunk operator's position, and to overcome this objection, I provide circuits in which the A-operator in addition to the usual answering and multiple jacks has trunk jacks accessible from her position extending to different exchanges and terminating at plugs before A operators in such exchanges so that each operator has both outgoing and incoming trunks. Each trunk is preferably multiply connected to a number of such trunk jacks which are distributed among the different operators' positions and I also provide busy indicating means in connection with each trunk jack in the form of a visual signal which indicates when such trunks are in use and with this arrangement the trunk calls are evenly distributed among the operators. I also provide a control circuit whereby when an operator is busy putting up a connection either in the nature of a

local connection or a trunking connection, all trunks which terminate at her position indicate busy at the outgoing jack ends. A feature of my invention is the provision of a control circuit, which operates means whereby it is impossible for two A or originating operators to connect with the same trunk operator at one time. The trunk operator being indicated busy until she has extended the connection that she is handling to the called line, when the said control circuit restores making the trunk circuits associated with her position available for establishing further connections. There are other features of my invention and these will be more particularly referred to in the following specification and appended claims.

For a better understanding of my invention reference may be had to the accompanying drawing in which a calling substation A and a called substation D are shown terminating in the line circuits L and L', respectively, at different exchanges, together with an operator's cord circuit B and a trunk circuit C. Substations A and D are of the well-known type, terminating in the line circuits L and L' which circuits comprise the usual line relay LR, cut-off relay CO and the multiple jacks J. I show a multiple line lamp arrangement, that is, a line signal as S, is provided for each jack so that when a call is initiated over any line all of the line signals will be lighted, and any one of a plurality of operators may seize the call.

The cord circuit B comprises the usual answering plug AP and calling plug CP, the two plugs being conductively united by the heavily marked conductors. At the answering end of the cord circuit B, I provide a high resistance test relay TE which is operated when an answering plug is inserted into the jack of the calling line, whereby the answering sleeve supervisory relay AS is connected with the sleeve conductor through the alternate contact of the relay TE. The first operator to answer the call seizes it to the exclusion of others, that is, upon the insertion of the first plug AP, into the jack of a calling line, the relay AS associated therewith is connected to the sleeve strand and should a second operator attempt to seize the call, the relay TE of the second cord cannot operate and this prevents the

second operator from connecting to this line.

An answering tip supervisory relay AT is associated with the answering end of the cord circuit B, the said relays AT and AS controlling the answering supervisory lamp AL. I also provide an instantaneous disconnect and recall arrangement including a link disconnect relay LD, which is operated when the calling subscriber replaces his receiver, and prior to the removal of the operator's plug from the connected jack, to disconnect relays AT and AS, allowing the associated line circuit L to restore to normal, and should the said calling subscriber recall, the removal of his receiver will again light the signals S so that the recall may be seized by the same or another operator. The calling end of the cord circuit D is provided with a calling sleeve supervisory relay CS and a calling tip supervisory relay CT.

To provide automatic party line ringing, I show a party line key RK and a ringing control relay RCR, the said relay being energized when ringing key RK is actuated to close an energizing circuit for a ringing interrupter RI, which alternately connects ringing current to the called line, due to the interruption of the interrupter I. A call meter is provided comprising a meter relay MR and a meter magnet MM. Automatic listening and disconnect is also provided, the operator's set O being connected to the cord circuit B upon the energization of the relay AS and disconnected from the cord circuit upon the energization of the relay CS of the calling end of the cord circuit.

In order to handle recalls and trunking connections, I provide a two-way key comprising the recall contacts RE and the orderwire contacts OW. The key when thrown in a direction to operate the contacts RE connects the operator's set O with the cord circuit B and at the same time restores the link disconnect relay LD, and when the said key is thrown in the opposite direction to operate the orderwire contacts OW, the talking conductors of the cord circuit are opened and then the operator's set O is connected with the calling end of the cord circuit B whereby the operator at the said cord circuit B may converse with the operator to whom the trunk connection is being extended.

Now as to the trunk circuit C, I provide a number of multiply connected trunk jacks TJ for each trunk and distribute these jacks among the different operators' positions and above each jack I show a busy signal BS, which is lighted when the trunk circuit C is in use, so that no other operator will attempt to connect therewith. I provide two relays at the outgoing end of the trunk for controlling the signals BS, the said relays comprising a cut-off relay CO² and a line relay LR².

When an operator connects with a trunk jack TJ, its associated cut-off relay CO² is oper-

ated over the sleeve strand and this lights all of its associated busy lamps BS. I also show a repeating coil RC for the trunk circuit C and a high resistance bridge relay H which relay is of high enough resistance to prevent the actuation of the tip relay CT of the cord circuit B.

When an operator inserts a plug CP into the trunk jack TJ, relay H energizes followed by the operation of the operator's cut-off relay OC and the relay OC¹, the relay OC operating to connect the distant trunk operator's telephone set O¹ to the trunk circuit and also operates to close a circuit for the combined guard and disconnect lamp GD, which remains lighted until the trunk plug is inserted in the jack of the called line. Upon connection of distant operator's telephone set O¹, the operator's busy relay BO¹ energizes to connect ground to all of the trunk busy control relays TBC of the idle incoming trunks terminating at this distant operator's position, which ground connection serves to operate the said relays followed by the operation of the line relays LR² of these trunks. The said line relays operating close circuits through their associated busy signals BS. The operation of relays TBC also opens the circuit for the relays H of the trunk circuits associated with the operator's position so that no originating operator can converse or connect to any of the trunks extending to this busy operator's position. And should an operator connect to this busy distant trunk operator, no circuit will be established for the relay H due to the interrupted circuit of relay H at the open contacts of the relays TBC. Also the instant that an operator answers a call by connecting an answering plug AP to a calling line, all idle incoming trunk circuits terminating at her position are rendered inoperative or busy by the actuation of trunk busy relay BO¹, followed by the actuation of relays TBC. This busy condition is maintained until the operator has extended a call by inserting the trunk plug TCP into the line jack of the wanted line. In connection with trunk busy relay BO¹, the conductor leading from its alternate contact 29 is common to all of this operator's trunk circuits. That is, there is a connection 30 extending from the alternate contact 29 of relay BO¹ to the normal contact 33 of each of the relays OC¹ of this operator's trunks and it will thus be seen that no matter which one of her trunks is seized, all of the idle ones terminating at her position are maintained busy as long as the relay BO¹ is energized. As each operator's set is common to both the cord circuits B and the trunk circuit C at the position, it is seen that its associated busy relay energizes each time a link circuit is used, energizing when the incoming end of the link is connected with a calling line

and again deenergizing when the outgoing end of the link or trunk is connected with a called line or trunk circuit.

At the calling or outgoing end of the trunk circuit C, I provide a pair of trunk sleeve relays TS¹ and TS, both relays operating together, and being provided because there are more contacts to be controlled than good practice will permit to be placed upon a single relay. A trunk tip supervisory relay TRT is also provided, as is also automatic party line ringing, and to this end I provide a ringing key RK¹ and a 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 to the tip conductor of the trunk due to the interruptions of the trunk interrupter TI. I also show a meter device consisting of a meter relay MR¹ and a meter magnet MM¹.

Referring now more in detail to my invention as illustrated in the accompanying drawing, and assuming that the subscriber at the substation A wishes to converse with the subscriber at substation D, located at a different exchange, the subscriber at the substation A removes his receiver from the switch-hook, effecting the operation of the line relay LR to light the line signals S. One of a plurality of operators seizes the call in response to the lighted signals by inserting an answering plug AP into the jack J of the calling line. The insertion of the answering plug AP into the jack J connects the cut-off relay CO of the line circuit L and the high resistance test relay TE of the cord circuit B in series circuit. The high resistance test relay TE operates but the cut-off relay does not due to the high resistance of said test relay TE. The test relay TE operating connects the answering sleeve supervisory relay AS to the sleeve conductor of the cord circuit B through the alternate contact 1 of relay TE. Relay AS and relay CO now operate in series, the circuit being traced from battery through the winding of the relay AS, the alternate contact 1 of the relay TE, normal contact 2 of relay LD, the sleeve contacts of the connected plug and jack through the winding of the cut-off relay CO to ground. The relay AS then closes a locking circuit for itself traced from battery through its winding, alternate contact 22 of relay AS to ground through relay CO, the relay TE being shunted out by relay AS, restores to normal. The relay CO operating opens the energizing circuit of the line relay LR, the line relay LR restoring brings about the effacement of the line signals S. The relay AS upon energizing closes its alternate contacts 3 and 4 to connect the operator's set O to the cord circuit B through the said alternate contacts 3 and 4 of the relay AS,

and the normal contacts 5 and 6 of the calling sleeve supervisory relay CS of the cord circuit B. Upon the connection of the operator's set to the link circuit the operator's relay BO energizes and places a busy potential upon all the idle operator's link and trunk circuits associated with the operator's set O.

Before describing the further operation of the system illustrated, I will describe briefly the method of excluding operators who may subsequently connect to this same line. Assuming that a second operator inserts an answering plug AP into another jack of the calling line after the first operator has inserted the plug AP, the second operator's set will not be connected to the calling line due to the failure of the test relay TE of the second cord circuit to operate because of the parallel circuit established through the low resistance sleeve supervisory relay AS of the first cord circuit, therefore the relay TE of the second cord does not operate, thus failing to connect the operator's set of the second cord circuit and the said operator receiving no response knows that the call has been seized and withdraws the plug from the connected jack.

Again taking up the connection, the operator now ascertains the wants of the calling subscriber and finding that the wanted line terminates at a distant exchange, inserts the calling plug CP into an idle trunk jack TJ leading to the wanted exchange, which idle trunk jack is indicated by the effaced busy signals BS. The insertion of the plug CP into the trunk jack TJ closes a series energizing circuit for the relay CO² and the sleeve supervisory relay CS, said circuit being traced from battery through the winding of the relay CS, sleeve contacts of the connected plug and jack through the winding of the cut-off relay CO² to ground. The cut-off relay CO², upon energizing, closes its alternate contact 7, thereby bringing about the lighting of all of the busy signals BS associated with the jacks of this connected trunk, and also effecting the continuity of the sleeve conductor of the trunk. The relay CS, upon energizing, opens its normal contacts 5 and 6, disconnecting the operator's set O from the cord circuit, and also closes an energizing circuit for the calling supervisory lamp CL traced from battery through the said lamp, normal contact 8 of relay RCR, normal contact 9 of relay CT, to ground at alternate contact 10 of relay CS. The insertion of the plug CP into the trunk jack TJ establishes a series circuit for the relay CS and CT of the cord circuit B and the high resistance trunk relay H, the circuit being traced from battery through the winding of relay CS, sleeve contacts of the connected plug and jack, the alternate contact 11 of relay CO², conductor

12, the winding 13 of the repeating coil RC, the normal contact 17 of relay TBC, the winding of relay H, the winding 14 of the repeating coil, RC, conductor 18, the tip contacts of the connected plug and jack, the alternate contact 19 of relay CS, normal contact 20 of relay IR, through the winding of relay CT to ground. The relay CS of the cord circuit B and the relay H of the trunk circuit C are energized, but due to the high resistance of the relay H of the trunk circuit C, the calling tip supervisory relay CT of the cord circuit B fails to energize thereby permitting the supervisory signal CL to remain lighted until the called subscriber of the substation D answers.

The relay H having energized now closes a circuit for the relay OC, this circuit being traced from battery through winding of relay OC to ground at alternate contact 21 of relay H. The relay OC¹ is also energized upon the actuation of the relay H, the circuit being traced from battery through the winding of the said relay to ground at alternate contact 21 of relay H. The relay OC operating, closes a circuit for the combined guard and disconnect signal GD, traced from battery through the lamp GD, alternate contact 23 of relay OC to ground at normal contact 24 of relay TS¹. The closing of alternate contacts 25 and 26 of relay OC connects the operator's set O¹ through normal contacts 27 and 28 of relay TS to the trunk talking conductors. The closing of alternate contact 26 of relay OC establishes an energizing circuit for the operator's busy relay BO¹, the circuit being traced from ground through the winding of relay BO¹, alternate contact 26 of relay OC, normal contact 28 of relay TS, through the winding of relay TS to battery. The relay BO¹ operates but being of a comparatively high resistance does not permit the relay TS to energize. The relay BO¹, upon energizing closes its alternate contact 29 connecting ground to its common conductor 30. The conductors 30 which extend to the idle trunks of this operator's position cause the operation of the trunk busy control relays TBC associated with such idle trunks. The energization of the relays TBC of such idle trunks establishes a circuit for the busy signals BS associated with the jacks of such idle trunks due to the closure of their alternate contacts 31. The busy indication serves to keep other operators from extending connections to this busy operator.

It is desirable when the trunk operator is answering this trunk call to keep other operators from extending trunk connections to her position. The operation of the trunk busy control relays TBC opens the circuits of the relays H, and even should another operator connect to this trunk operator's position, she will not be able to converse with

the trunk operator due to the failure of relays OC and H to operate to associate the operator's telephone set with the calling trunk circuit. The circuits by which the relays TBC are maintained energized while the trunk operator is setting up a connection extends from ground at alternate contact 29 of relay BO¹, common conductors 30, normal contacts 33 of relays OC¹, of all the idle trunk circuits at this operator's position, through the upper windings of the relays TBC to battery. The closure of contact 31 of relays TBC establishes a circuit for the relays LR² of these trunk circuits, the circuit being traced from battery, through the alternate contact 31 of relays TBC, normal contacts 34 of relays OC¹, the windings 13 of the repeating coils RC, sleeve trunk conductors 12, normal contacts 11, the windings of relays LR², the tip trunk conductors 18, the windings 14 of repeating coils RC to ground at alternate contacts 35 of relays TBC. The relays LR² of these idle trunks operate closing their alternate contacts 36 to light their associated busy signals BS. Should another operator insert a plug into a trunk jack associated with this busy trunk operator's position, even though the busy signals BS are lighted, the second A-operator will receive no response as the circuits of the relays H are open at contacts 17 of relays TBC. The second A-operator receiving no response, knows that the trunk operator is busy setting up a connection and withdraws the plug from the trunk jack. It will thus be seen that no two A-operators can connect to the same trunk operator at one time. With this arrangement it will be seen that the calls are not stacked up at one trunk operator's position but are distributed among the idle trunk operators so that all the work is uniformly distributed. The ground connection from alternate contact 29 of trunk busy relay BO¹ does not affect busy trunks due to the fact that relays OC¹ of such trunks are energized and their normal contacts 34 are open.

The operator at cord circuit B having extended connection to the trunk circuit C now actuates the two-way key to operate the orderwire key OW, thus connecting her telephone set O with that of the operator at the distant exchange, and to also open the tip and sleeve conductors of the cord circuit B so that the calling subscriber does not hear the number as it is being passed to the trunk operator. The operator at cord circuit B now repeats the number of the called substation to the trunk operator and then restores the orderwire key OW to normal. The trunk operator now tests the multiple jack of the called line in a well-known manner and assuming that the called line is idle inserts the trunk calling plug TCP into the multiple jack J¹ of the wanted

line. The insertion of the trunk plug TCP into the multiple jack J¹ of the called line establishes a series energizing circuit for the trunk sleeve supervisory relay TS and the cut-off relay CO¹ of the line circuit L¹, the circuit being traced from battery through the winding of the relay TS, sleeve contacts of the connected plug and jack through the winding of relay CO¹ to ground. The closing of the alternate contact 38 of relay TS closes an energizing circuit for relay TS¹ traced from battery through the winding of the said relay to grounded alternate contact 38. Upon the energization of the relay TS¹ its normal contact 24 assumes its alternate position opening the circuit of the guard signal GD and effacing it. Upon the energization of relay TS, its normal contacts 27 and 28 are interrupted disconnecting the operator's telephone set and also effecting the deenergization of the relay BO¹ and thus removing the busy condition of all of the operators' trunks. The relay BO¹ restoring allows the relays TBC to deenergize to open the circuits of relays LR² of all idle trunks, which relays in turn deenergize to extinguish the busy signals BS associated with said idle trunks. The normal contacts 17 of relays TBC again closing placing the relays H in operative relation with the idle trunk circuits. The operator now actuates the proper ringing plunger of the ringing key RK¹ thereby connecting the proper generator frequency to the ringing conductor 87. The actuation of the plunger in its fully depressed position also effaces the closure of the common end spring contacts 40 and 41 thereby closing a circuit for the ringing control relay RCR¹ traced from battery through the winding of the said relay, the alternate contact 41 of the end spring contacts, the normal contact 42 of relay TRT, conductor 43 to ground at alternate contact 24 of relay TS¹. Upon the pressure being released from the depressed key plunger the end springs restore to normal but a locking circuit for the relay RCR¹ is established traced from battery through its alternate contact 44, normal contact 42 of relay TRT, conductor 43 to ground at alternate contact 24 of relay TS¹. I also show a service meter, said service meter being actuated when the end springs assume their alternate position. The meter relay MR¹ is energized over a circuit traced from battery through the winding of said relay, alternate contact 40 of the end springs of the ringing key, normal contact 44 of relay RCR¹, normal contact 42, conductor 43 to ground at alternate contact 24. The meter relay closes its alternate contact 45, closing an energizing circuit for the meter magnet MM which is actuated to step the meter mechanism to register the established connection. The relay RCR¹ upon energizing closes an energizing circuit for

trunk interrupter relay TIR, said circuit being traced from battery through the interrupter TI, winding of interrupter relay TIR, alternate contact 46 of relay RCR¹ to ground at alternate contact 47 of relay OC. The interrupter relay TIR is thus intermittently energized and deenergized due to the interruptions of the interrupter TI which intermittently connects the ringing conductor 87 to the alternate contact 48 of the interrupter relay TIR to ring the call bell at the called substation, the ringing circuit being traced from the ungrounded pole of the generator, closed contact of the ringing key RK, alternate contact 48, tip contacts of the connected plug and jack, condenser and call bell at the called substation, the sleeve contacts of the connected plug and jack, the alternate contact 49 of relay TIR, through the resistance R to ground. Ringing current is thus intermittently transmitted to the calling substation D until the subscriber thereat responds.

Upon the response of the called subscriber at the substation D, an energizing circuit for the tip trunk supervisory TRT is established over a circuit traced from ground through the winding of the said relay, the alternate contact 50 of relay TS¹, normal contact 48, tip contacts of the connected plug and jack through the substation, sleeve contacts of the connected plug and jack, through the winding of the relay TS to battery. Upon the operation of the relay TRT a low resistance path is established for the relay CT of the cord circuit B over a circuit traced from ground through the winding of the relay CT, normal contact 20 of relay IR, alternate contact 19 of relay CS, tip contacts of the connected plug and jack, conductor 18, winding 14 of repeating coil RC, alternate contact 51 of relay TRT, winding 13 of repeating coil RC, conductor 12, alternate contact 11 of relay CO² sleeve contacts of the connected plug and jack and through the winding of the relay CS to battery. The relay CT of the cord circuit B is thus energized opening its normal contact 9 to efface the calling supervisory signal CL, notifying the operator of the cord circuit B that the called subscriber has answered. The low resistance path established for the relay CT shunts out the relay H which relay restores to normal. The opening of normal contact 42 of relay TRT allows the relay RCR¹ to restore and further operations of relay TIR are prevented due to the opening of contact 46 of relay RCR¹. The relay H restoring opens the circuit for relays OC and OC¹ but the said relays do not deenergize as an alternate path has been established for them through alternate contact 42 of relay TRT. The calling subscriber at substation A and called subscriber at substation D are now in conversational circuit, the talking circuit

being traced over the heavily marked conductors.

After completing conversation the subscribers replace their receivers upon their respective switch-hooks. The subscriber at the called substation D upon replacing his receiver upon the switch-hook opens the energizing circuit for the trunk tip relay TRT whereby the shunt is removed from around the winding of the relay H, relay H again energizes and due to its comparatively high resistance causes the restoration of the relay CT of the cord circuit B. The restoration of the calling tip relay CT of cord circuit B brings about the lighting of the calling supervisory lamp CL from battery through said lamp, normal contact 8, normal contact 9 to ground at alternate contact 10. The replacing of the receiver at the substation A brings about the restoration of the answering tip supervisory relay AT which closes a circuit for the answering supervisory lamp AL traced from battery, normal contact 55 of relay AT, the alternate contact 56 of relay AS to ground at alternate contact 10 of relay CS. The link disconnect relay being in multiple with the lamp AL also energizes when the relay AT restores. The energization of the relay LD causes the disconnection of the link circuit at contacts 57 and 2 so that the subscriber at A can recall without awaiting the removal of the answering plug AP from the connected jack. The closing of alternate contact 58 of relay LD establishes a locking circuit for sleeve supervisory relay AS traced from battery, through the winding of the said relay, alternate contact 58 of relay LD, alternate contact 56 of relay AS to ground at alternate contact 10 of relay CS. The locking circuit of the relay AS permits the continued energization of the said relay until the removal of the plugs from their respective jacks. The operator at the cord circuit B noting the two lighted supervisory signals AL and CL withdraws plugs AP and CP from their respective jacks. The removal of the plug CP from its connected trunk jack TJ allows the supervisor relay CS to restore to normal. The restoration of the relay CS brings about the interruption of its alternate contact 10 allowing the restoration of the relays LD, TE and AS so that the cord circuit is again at normal and available for other connections.

Upon the removal of the plug CP from the trunk jack TJ, the cut-off relay CO² de-energizes but the busy signals BS remain lighted due to the operation of the line relay LR². The busy signals BS of this trunk are maintained lighted until the trunk calling plug TCP is removed from the jack of the called line. The withdrawal of plug CP from jack TJ allows the relay H to restore to

normal. The relay H restoring to normal opens the energizing circuit for the relay OC and OC¹, allowing both relays to restore to normal. Should the plug TCP remain in the jack of the called line due to the delay of the trunk operator, the relay TBC becomes energized over a circuit traced from battery through the lower winding of said relay TBC, normal contact 60 of relay OC¹ to ground at alternate contact 61 of relay TS¹. The closing of the alternate contact 31 of relay TBC closes an energizing circuit for relay LR² over the trunk conductors to ground at alternate contact 35, as previously described, the relay LR² remaining energized until the trunk plug is withdrawn from the jack of the called line. The relay LR² closing its alternate contact 36 brings about the lighting of the busy signals BS, thus indicating the busy condition of the trunk circuit C. Returning to the deenergization of the relay OC, the closing of its normal contact 23 brings about the lighting of the combined guard and disconnect lamp GD over a circuit traced from battery through the winding of the said lamp, normal contact 23, normal contact 42, conductor 43 to ground at alternate contact 24 of relay TS¹. The operator noting the lighted signal GD is aware that the plug CP has been withdrawn from the trunk jack TJ and now withdraws the trunk plug TCP from the jack of the called line. The withdrawal of the plug from the jack of the called line brings about the restoration of the relays TS and TS¹ and the restoration of the relay TS¹ brings about the opening of the energizing circuit of the relay TBC. The relay TBC restoring to normal opens the circuit of line relay LR² and line relay LR² restoring, effaces the busy signals BS. The apparatus of the trunk C being at normal, it is not available for establishing other connections.

From the foregoing it is thus seen that I have provided a system wherein it is impossible for more than one operator to effect connection with a trunk operator's telephone set at one time, even though they should disregard the trunk busy signals and plug into a jack connected to a trunk extending to the busy operator's position in an effort to effect connection with the said operator's telephone set.

While I have described my invention operating in connection with a certain circuit arrangement I do not wish to be limited to the same as my invention can be adapted to operate in conjunction with other circuit arrangements and many changes and modifications readily suggest themselves to those skilled in the art, therefore I do not wish to be limited to the exact structure as shown but aim to cover all such changes and modi-

fications that come within the spirit and scope of the appended claims.

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

1. In a multiple office telephone exchange system, a plurality of trunk lines extending between offices, an operator's telephone set adapted to be automatically connected to any of said trunk lines, and means for preventing more than one of said trunk lines from being connected to said telephone set at one time.

2. In a telephone system, a plurality of trunk lines extending to a distant exchange, an operator's telephone set adapted to be automatically connected with any of said trunk lines, and means responsive to such connection for preventing the connection of other of said trunk lines to said operator's telephone set.

3. In a telephone system, a plurality of trunk lines extending to a distant exchange, an operator's telephone set adapted to be automatically connected to said trunk lines, and means responsive to the connection of said telephone set to one of said trunk lines for rendering the remainder of said trunk lines inoperative.

4. In a telephone system, a plurality of link circuits and a plurality of trunk circuits, an operator's telephone associated with said trunk circuits, means responsive to the connection of one of said link circuits with one of said trunk circuits for automatically connecting said operator's telephone to said trunk circuit, and means for preventing the operative connection of said operator's telephone with another of said trunk circuits.

5. In a telephone system, a plurality of link circuits, a plurality of trunk circuits, an operator's telephone associated with said trunk circuits, means responsive to the connection of one of said link circuits to one of said trunk circuits for automatically connecting the said operator's telephone to said trunk circuit, and means for preventing the connection of said operator's telephone with another of said trunk circuits if a second of said link circuits should be connected to a second of said trunk circuits.

6. In a telephone system, trunk lines extending from one exchange to a second exchange, terminals for each end of said trunk lines, an operator's telephone set associated with the terminals at one end of said trunk lines, means responsive to the seizure of the terminal at the opposite end of one of said trunk lines for connecting said telephone set to said trunk line and for preventing the operative connection of said telephone set with another one of said trunk lines.

7. In a telephone system, trunk lines extending from one exchange to a second exchange, terminals for each end of said trunk

lines, an operator's telephone set associated with the terminals at one end of said trunk lines, means responsive to the seizure of the terminal at the opposite end of one of said trunk lines for connecting said telephone set to said trunk line and for preventing the operative connection of said telephone set with another one of said trunk lines, and means for rendering said telephone set free upon the connection of said trunk line to a called line.

8. In a multi-exchange telephone system, trunk lines extending from one exchange to a second exchange, an operator's telephone set associated with said trunk lines and adapted to be automatically connected with said trunk lines, and means for preventing the operative connection of said operator's telephone set with more than one trunk circuit at a time.

9. In a telephone system an operator's telephone set, trunk lines associated with said operator's telephone set, means for seizing one of said trunk lines thereby automatically connecting the said operator's telephone set with said trunk line, and means for preventing the operative connection of said telephone set with another of said trunk circuits while said first connection exists.

10. In a telephone system, an operator's telephone set, link circuits and trunk circuits associated with said operator's telephone set, means for seizing one of said link circuits thereby connecting said operator's set with said link circuit, and means for preventing the operative connection of said operator's set with one of said trunk circuits while said first connection exists.

11. In a telephone system, an operator's telephone set, trunk circuits and link circuits associated with said telephone set, means responsive to the seizure of one of said link or trunk circuits for automatically connecting the seized circuit to the said telephone set; and means for preventing the connection of said telephone set with any of said other trunk circuits while said first connection exists.

12. In a telephone system, a plurality of trunk lines extending from one exchange to a second exchange, an operator's telephone set at the second exchange adapted to be automatically connected to said trunk lines, and means responsive to the connection of said telephone set with one of said trunk lines for rendering the other of said trunk lines busy and for rendering said operator's telephone set inaccessible to the other of said trunk lines.

13. In a telephone exchange system, an operator's telephone set, link circuits, incoming and outgoing trunk circuits associated with the said operator's telephone set, automatic means for connecting the said operator's telephone set to said link circuits

and to said incoming trunk circuits, manual means for connecting said operator's telephone set to said outgoing trunk circuits, and means responsive to said automatic means for preventing the connection of the said telephone set to more than one incoming trunk circuit at a time.

14. In a telephone system, an operator's telephone, trunk circuits associated with the said operators' telephone, a relay for said operator's telephone common to said trunk circuits, a relay for each of said trunk circuits for preventing the connection of said telephone to said trunk circuits, and means responsive to the energization of said first relay for energizing the relays of said trunk circuits.

15. In a telephone system an operator's telephone, trunk circuits and link circuits associated with said operator's telephone, means for automatically connecting said operator's telephone to one of said circuits, and means responsive to such connection for preventing said operator's telephone from being connected to a second of said circuits.

16. A telephone system including an operator's telephone, trunk circuits associated with said operator's telephone, a relay for said operator's telephone common to said trunks, a relay for each of said trunk circuits for preventing the connection of said telephone to said trunk circuits, and means responsive to an energization of said first relay to prevent energization of said trunk relays.

17. A telephone system including an operator's telephone, trunk circuits associated with said operator's telephone, a relay for said operator's telephone, a relay for each of said trunk circuits, and means controlled by said first relay for preventing an energization of said trunk relays whereby said operator's telephone is rendered inaccessible to the remaining trunk circuits.

18. A telephone system including an operator's telephone, trunk circuits associated with said operator's telephone, a relay for said operator's telephone, a relay for each of said trunk circuits, and means responsive to an energization of said first relay for preventing an energization of any of said remaining trunk relays thereby preventing the operative association of said operator's telephone with any of said trunk circuits.

19. A telephone system including a plurality of inter-office trunk circuits, an operator's telephone associated with said trunk circuits, means responsive to the connection of a link circuit to one of said trunk circuits for operatively connecting said operator's telephone with said trunk circuit.

20. A telephone system including a plurality of inter-office trunk circuits, an operator's telephone associated with said trunk circuits, means responsive to the connection

of a link circuit to one of said trunk circuits for operatively connecting said operator's telephone with said trunk circuit and a relay associated with said operator's telephone responsive to such connection for rendering said operator's telephone inaccessible to other of said trunk circuits.

21. A telephone exchange system including a plurality of operator's link circuits, a plurality of trunk circuits for extending calls from said link circuits to called subscribers' lines, an operator's telephone associated with said trunk circuits and adapted to be connected to any of said trunk circuits, and means for preventing the operative connection of said operator's telephone set to more than one of said trunk circuits at a time.

22. A telephone system including a plurality of A operators' connecting circuits, a plurality of trunk circuits for extending calls from A operators' circuits to called subscribers' lines, an operator's telephone set, means for connecting said operator's telephone set to each of said trunk circuits, and means responsive to the connection of said operator's set to one of said trunk circuits to prevent its connection to another of said trunk circuits.

23. A telephone system including a plurality of connecting circuits, a plurality of operators' trunk circuits for extending connections from said connecting circuits to called subscribers' lines, an operator's telephone, a relay for each of said trunk circuits, means controlled by each of said relays for connecting its associated trunk circuit with said operator's telephone, and means controlled by the operation of one of said relays to prevent the operation of another of said relays.

24. A telephone system including operators' link circuits; operators' trunk circuits; an operator's telephone set associated with said trunk circuits; busy signals for said trunk circuits; means responsive to the connection of an operator's link circuit to one of said trunk circuits for connecting said operator's telephone to said trunk circuit, to operate the busy signals of said trunk circuits, and for preventing the connection of another of said link circuits to said operator's telephone set via another of said trunk circuits.

25. A telephone system including operators' link circuits, operators' trunk circuits, an operator's telephone associated with said trunk circuits, means responsive to the connection of one of said link circuits to one of said trunk circuits to connect said operator's telephone with said trunk circuit, and means for preventing the connection of other of said link circuits to said operator's telephone as long as said operator's telephone is connected to said first trunk circuit.

26. A telephone system including a plurality of A operators' connecting circuits, a plurality of B operators' trunk circuits, an operator's telephone, a relay for each of said trunk circuits for connecting said operator's telephone thereto, and means responsive to the operation of one of said relays for preventing the operation of another of said relays.
27. A telephone system including operators' link circuits, operators' trunk circuits, an operator's telephone set associated with said trunk circuits, busy signals for said trunk circuits, means responsive to the connection of one of said operator's link circuits to one of said trunk circuits for connecting said operator's telephone to said trunk circuit, means also responsive to such connection for operating the busy signals of the other of said trunk circuits, and further means responsive to such connection for preventing the connection of another of said trunk circuits to said operator's telephone set while said set remains connected to said first trunk circuit.
- Signed by me at Chicago, county of Cook and State of Illinois, in the presence of two witnesses.
- HIRAM D. CURRIER.
- Witnesses:
G. A. JONCHOMESKI,
B. O'BRIEN.