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G. H. PETERSON

TRUNK CIRCUITS

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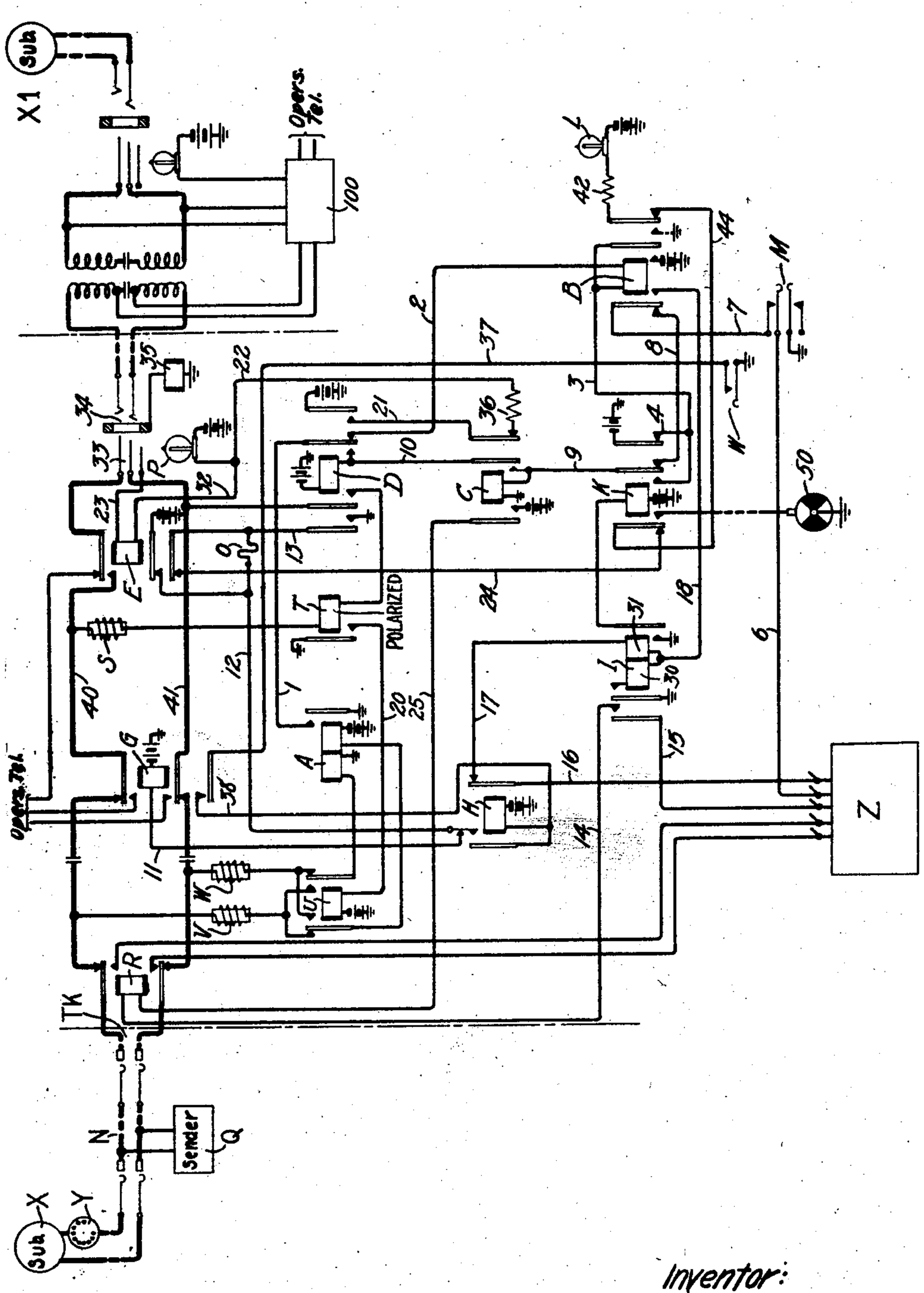

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UNITED STATES PATENT OFFICE.

GEORGE H. PETERSON, OF BROOKLYN, NEW YORK, ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK.

TRUNK CIRCUITS.

Application filed September 23, 1924. Serial No. 739,396.

To all whom it may concern:

Be it known that I, GEORGE H. PETERSON, residing at Brooklyn, in the county of Kings and State of New York, have invented certain Improvements in Trunk Circuits, of which the following is a specification.

This invention relates to telephone exchange systems in which connecting operators are employed for extending connections, with indicating mechanisms at such operators' positions to identify the designations of desired lines.

The invention is shown as applied to a system employing automatic switch mechanisms for extending calling subscribers' lines to tandem operators' positions, which are provided with indicating apparatus for registering the numbers of wanted lines. Tandem operators at these positions trunk the calls to completing operators at exchanges in which the desired lines are located.

In trunking a call, the tandem operator plugs the incoming end of the calling trunk into an idle trunk outgoing to the desired exchange and gives the B operator the number displayed by the incoming apparatus at her position, whereupon the B operator completes the call in the usual manner.

The principal feature of the invention is the provision of means for automatically splitting the calling trunk when it is plugged up to an outgoing trunk and for connecting the tandem operator's telephone set to that portion connected to the outgoing trunk whereby the tandem operator is enabled to converse with the B operator without the calling subscriber hearing the conversation. The tandem operator's telephone set is afterward disconnected from the trunk and the talking circuit completed so as to allow the calling subscriber to converse with the called subscriber.

Other features of the invention will be pointed out in the detailed description to follow.

The invention is illustrated in the accompanying drawing wherein the subscriber's station X in addition to being provided with the usual sub-station apparatus is also provided with an impulse sending device Y. The subscriber's line is automatically connected to a tandem operator's position shown between the broken vertical lines by means of automatic switches N over trunk TK, one of said switches selecting an idle trunk provided with a sender Q and this trunk in turn being extended to a trunk TK leading to the tandem operator's position. The trunk at the tandem operator's position terminates in a plug 33 adapted to be placed into a trunk jack 34 extending to a "B" operator's completing position at another exchange.

Associated with the trunk TK at the tandem operative position is a display board Z provided with the usual display lamps or indicators. These lamps or indicators are operated by impulses transmitted from the sender Q in which is stored up the impulses transmitted by the sending device Y at the subscriber's station X. The automatic switches N, sender Q and the display board equipment and circuits are fully disclosed in the patent to A. E. Lundell and E. H. Clark 1,464,084 and will therefore not be described in detail in this specification.

The "B" operator's telephone set and apparatus shown in the outline 100 is fully disclosed in a copending application S. N. 738,488, filed Sept. 18, 1924, in the names of Rand S. Bailey and Edgar P. Broe to the same assignee as in the present application.

The operation of the system is as follows:

The sender Q is automatically connected to the subscriber's line upon the initiation of a call whereupon the connection is extended to the tandem operator's trunk TK which terminates in the plug 33. When the call is extended to the sender Q the subscriber manipulating the sending device Y transmits impulses corresponding to the number of the wanted line. These impulses are received by and stored upon the sender Q. When the connection is extended to the trunk, the circuit of relay A is completed by a closure of the circuit in the automatic equipment. The operation of relay A completes the circuit of relay B as follows:

Ground, contacts of relay A, 1, contacts of relay D, 2, winding of relay B, 3, 4, contacts of relay K, battery to ground. The operation of relay B completes the circuit of lamp L as follows: ground, contacts of relay B, resistance 42, lamp L, battery to ground. After relay B operates it locks to battery through its own contact.

The lighting of the lamp L notifies the tandem operator of a call whereupon she

depresses the display button M which closes the circuit of relay I as follows: ground at Z, 6, contacts of key M, 7, contacts of relay B, 18, winding 31 of relay I, 17, contacts of relay H, 16 to battery at Z. Relay I in operating locks to ground through its windings 30 and 31 under control of relay H and prepares a circuit for operating relay R and also completes the circuit of relay K. The operation of relay K completes the circuit of relay C as follows: ground, battery, contacts of relay B, 3, contacts of relay K, 9, winding of relay C, to ground. The operation of relay C extends battery to conductor 10 extending to the winding of relay D, but as the other terminal of the winding D is likewise connected to battery it fails to operate at this time. The operation of relay C completes the circuit of relay R as follows: ground, battery, contacts of relay C, 25, winding of relay R, 14, contacts of relay I, 15 to ground at Z. The operation of relay R severs the trunk conductors and connects the sender Q to the display board Z, thereby causing the operation of the sender which transmits the stored-up impulses which operate the indicators to display before the tandem operator the number of the wanted line.

The operation of relay R opens the circuit of relay A by disconnecting it from the calling line. Relay A upon restoring removes ground from the winding of relay B allowing it also to restore.

Relay B in restoring removes battery from the circuit which originally operated relay C. Relay C however remains operated as its circuit is completed through the winding of relay D, as follows: ground, winding of relay C, contacts of relay C, 10, winding of relay D, battery to ground. Relay D operates at this time thereby preparing an energizing circuit for relay G.

The operation of relay K and the release of relay B connects lamp L through interrupter 50 to ground thus causing the lamp L to flash, indicating to the operator that the display button has been operated and that the connection is extended to the trunk.

After the code impulses have all been received, ground is removed from conductor 15 at the display board Z, thereby opening the circuit of relay R which restores and disconnects the trunk conductors from the display board and connects them through to the conductors 40 and 41.

When relay R restores, assuming the calling subscriber's receiver is still off the hook, relay A is again energized over the calling trunk. The operation of relay A at this time connects ground over conductor 1 the right hand inner contacts of relay D, conductor 10, and contacts of relay C to the winding of relay C, thereby shunting it and causing it to restore. Relay D does not restore, however, as it is locked through its inner right hand contacts to the ground supplied by relay A and therefore is under control of relay A. Relay C in restoring closes its right hand back contacts thereby shunting lamp P with resistance 36 and preventing its illumination when plug 33 is inserted in the outgoing trunk.

The tandem operator upon perceiving the number of the wanted line tests for an idle trunk extending to an exchange in which the wanted line is located. Assuming that the trunk terminating in jack 34 is idle the plug 33 is inserted into the jack thereby completing the circuit of relay E as follows: ground, sleeve circuit of jack 34 including sleeve relay 35, sleeve of plug 33, winding of relay E, to battery to ground through lamp P and resistance 36 in parallel, it being remembered that relay C is released and relay D operated at this time. Before the operation of relay E, battery was connected through its contacts to conductor 12, and thence through the contacts of relay H to the winding of relay G, thereby shunting it. Upon the operation of relay E, this shunt is removed and relay G operates in the previously prepared circuit.

The operation of relay D also connected the winding of polarized relay T to the talking conductor 41, thus establishing a bridge across conductors 40 and 41 including the windings of relay T and impedance coil S.

The operation of relays E and D allows the circuit of relay G to be completed as follows: ground, contacts of relay D, 13, resistance O, 12, contacts of relay H, 11, winding of relay G, battery to ground.

The operation of relay G severs the trunk conductors and connects the operator's telephone set to conductors 40 and 41, allowing the operator to converse with the operator at the exchange wherein the called line is located but prevents the calling subscriber from hearing this conversation.

After the tandem operator gives the "B" completing operator the number of the wanted line, she depresses release button W, which completes the circuit of relay H, as follows: ground, contacts of button W, 37, contacts of relay G, 38, winding of relay H, battery to ground. When relay H operates it locks to ground through contacts of relay D as follows: ground, contacts of relay D, 13, resistance O, 12, contacts of relay H, winding of relay H, battery to ground.

The operation of relay H breaks the circuit of relay I causing it to restore. The restoration of relay I, opens the circuit of relay K, allowing it to restore and open the flashing circuit for the lamp L.

Relay H in operating opens the circuit of relay G which releases and disconnects the

operator's telephone from the plug end of the trunk and closes the trunk conductors through.

The polarized relay T is operated over the trunk from the "B" operator's position when the called party answers and when so operated causes the operation of relay U which connects the windings of relay A, in reverse order to the talking conductor, extending to the calling line so as to reverse battery therein for the purpose of operating the charging apparatus in the automatic office N.

When the calling subscriber replaces the receiver relay A becomes de-energized and upon restoring removes ground from the locking contact of relay D.

Relay D restoring removes battery from the coil 36 which shunted lamp P, thereby causing the lamp to light, opens the circuit of relay H causing it to restore and also removes relay T from across the trunk to give a disconnect signal to the distant "B" completing operator. Upon observing the lighting of lamp P the tandem operator removes the plug 33 from the jack 34 thereby releasing relay E.

Relays E and H in restoring replace the battery shunt to the G relay preventing its operation in the handling of a succeeding call as heretofore described.

Relay I may also be restored for the purpose of wiping out the displayed number in case the tandem operator presses a second display key to bring in another number before she depresses the release key associated with the first trunk.

What is claimed is:

1. In a telephone exchange system, the combination of a trunk circuit terminating in a plug, an operator's telephone set, and means automatically responsive to the insertion of said plug into an outgoing line jack for disconnecting the plug from the talking conductors of said trunk and for connecting the operator's telephone set to said plug.

2. In a telephone exchange system, the combination of a call indicator trunk terminating in a plug, an operator's telephone set, a relay, a trunk jack, means controlled by said relay when said plug is placed in said jack for disconnecting the talking conductors of said trunk from the plug and connecting said telephone set to said plug, a key, and means controlled by said key for releasing said relay to disconnect said operator's telephone set from said plug and to reconnect said trunk conductors thereto.

3. In a telephone exchange system, the combination of an operator's position, a trunk terminating at the outgoing end in an automatic switch and at the incoming end in a plug at said operator's position, an indicator and a display key at said position, means controlled by said key for causing said indicator to be connected to said trunk, a relay, an outgoing trunk from said position and a trunk jack therefor, means for causing the operation of said relay when said key is operated and the plug is placed in the trunk jack, to disconnect said incoming trunk from said outgoing trunk and to connect said operator's telephone set to said outgoing trunk, a release key, and means controlled thereby for causing said operator's telephone set to be disconnected from said trunk.

4. In a telephone exchange system, the combination of an operator's position, a trunk terminating at its outgoing end in an automatic switch and at its incoming end in a plug at said position, an indicator associated with the incoming end of said trunk, an operator's telephone set, a relay, an outgoing trunk jack at said position, means for operating said relay when said plug is placed in said jack, the operation of said relay serving to connect the operator's telephone set to said outgoing trunk jack and to open the incoming end of said trunk, a key, and means controlled by said key for releasing said relay, to cause the disconnection of the operator's telephone set from said outgoing trunk jack and the closing of the incoming end of said trunk.

5. In a telephone exchange system, the combination of an incoming trunk circuit terminating at an operator's position in a plug, an outgoing trunk jack thereat, a relay arranged to be operated when the plug is placed in the trunk jack, a second relay, an operator's telephone set at said position, means controlled by the first relay for causing the operation of the second relay to disconnect the incoming trunk from the outgoing jack and connect the operator's telephone set to the outgoing trunk, a key, and means controlled by said key for releasing the second relay to disconnect the operator's telephone set from said outgoing trunk, and to reconnect said incoming trunk to said trunk jack.

6. In a telephone exchange system, the combination of a trunk circuit terminating at an operator's position in a plug, an indicator and a display key thereat, means controlled by said display key for connecting said indicator to said trunk, a control relay, an operator's telephone set, a trunk jack, and means for causing the operation of said control relay when said plug is placed in said jack after said display key is operated for connecting the operator's telephone set to said trunk jack and for disconnecting said trunk from said jack.

7. In a telephone exchange system, the combination of a trunk circuit terminating at one end in a plug, an indicator and a display key, means controlled by said dis-

play key for connecting said indicator to said trunk circuit, a control relay, an operator's telephone set, a trunk jack, means for causing the operation of said control relay when said plug is placed in said jack for connecting the operator's telephone set to said trunk jack and for disconnecting said trunk from said jack, a release key, and means controlled by said release key for releasing said control relay to disconnect the telephone set from the trunk jack.

8. In a telephone exchange system, the combination of a trunk circuit terminating at one end in a plug, an indicator and a display key, means controlled by said display key for connecting said indicator to said trunk and for preparing a circuit to control the opening of the trunk conductors a control relay in said control circuit, an operator's telephone set, a trunk jack, means for causing the operation of said control relay when said plug is placed in said jack for connecting the operator's telephone set to said trunk plug and for opening the trunk conductors, a release key, and means controlled by said release key for releasing said control relay to disconnect said operator's telephone set and to close the conductors of said trunk.

9. In a telephone exchange system, the combination of a subscriber's station provided with a sending device, a trunk circuit, automatic switching mechanism for connecting said subscriber's line with said trunk circuit, a sender associated with said switching mechanism responsive to the impulses transmitted by said sending device and for storing said impulses, an indicator associated with said trunk, a display key, means controlled by said key for connecting said sender to said indicator for registering thereon the impulses stored by said sender, a plug, associated with said trunk and a co-operating outgoing trunk jack, a control relay in said trunk circuit, an operator's telephone set, and means for operating said control relay when the display key is operated and the plug is placed in the jack for connecting the operator's telephone set to said trunk jack and for disconnecting the subscriber's station.

10. In a telephone exchange system, the combination of a subscriber's station provided with a sending device, a trunk circuit, automatic switching mechanism for connecting said subscriber's line with said trunk circuit, a sender associated with said switching mechanism responsive to the impulses transmitted by said sending device and for storing said impulses, an indicator associated with said trunk, a display key, means controlled by said display key for connecting said sender to said indicator for registering thereon the impulses stored by said sender, a plug associated with said trunk and a co-operating outgoing trunk jack, a control relay in said trunk circuit, an operator's telephone set, means for operating said control relay when the display key is operated and the plug is placed in the jack for connecting the operator's telephone set to said outgoing trunk jack and for disconnecting the subscriber's station from the plug, a release key and means controlled thereby for restoring said control relay to disconnect the operator's telephone set from said trunk jack and to reconnect the subscriber's station to the plug.

11. In a telephone exchange system, a trunk circuit terminating at one end in a plug, an outgoing trunk jack, a control relay associated with said trunk circuit adapted when operated to disconnect said trunk circuit from said plug and to connect an operator's telephone thereto, a second relay, means controlled by said second relay for shunting said control relay when the second relay is in a de-energized condition, and means for operating said second relay when the plug is placed in said jack, the operation of said relay removing the shunt from said control relay and allowing it to operate.

12. In a telephone exchange system, a trunk circuit terminating at one end in a plug, an outgoing trunk jack, a control relay associated with said trunk circuit adapted when operated to disconnect said trunk circuit from said plug, a second relay, means controlled by said second relay for shunting said control relay when the second relay is in a de-energized condition, and means for operating said second relay when the plug is placed in said jack, to remove the shunt from said control relay thereby allowing it to operate.

13. In a telephone exchange system, a trunk circuit terminating at one end in a plug, an operator's telephone, a trunk jack, a control relay associated with said trunk circuit, a second relay, means controlled by said second relay for shunting said control relay when the second relay is in a de-energized condition, means for operating said second relay when the plug is placed in said jack, the operation of said relay removing the shunt from said control relay allowing it to operate, the operation of said control relay serving to connect said operator's telephone to said trunk jack, a release key, and means controlled by said release key for causing said control relay to restore thereby disconnecting the operator's telephone set from said trunk jack.

14. In a telephone exchange system, the combination of a trunk circuit, the incoming end being provided with an indicator and a plug, an operator's telephone set, a control relay, an outgoing trunk circuit, and means for operating said control relay when said plug is associated with said outgoing

trunk circuit for connecting the operator's telephone set to the outgoing trunk circuit, and for opening the incoming end of said trunk.

15. In a telephone exchange system, the combination of a trunk circuit, the incoming end being provided with an indicator and a plug, a display key, means controlled by said display key for causing said indicator to be connected to said trunk, a control relay, an operator's telephone set, an outgoing trunk circuit, means for operating said control relay when said plug is associated with the outgoing trunk after the display key has been actuated, the operation of said control relay serving to connect the operator's telephone set to the outgoing trunk circuit and for opening the incoming end of said trunk, a release key, and means controlled by said release key for restoring said control relay to disconnect the operator's telephone set and to close the incoming end of said trunk.

16. In a telephone exchange system, the combination of a trunk circuit provided with a control relay, an operator's telephone set, a second relay which in its de-energized condition shunts said control relay, and means for operating said second relay for removing the shunt from said control relay, the removal of said shunt serving to allow the operation of said control relay to split said trunk circuit and to connect the operator's telephone set to one portion thereof.

17. In a telephone exchange system, the combination of a trunk circuit provided with a control relay, an operator's telephone set, a second relay which in its de-energized condition shunts said control relay, means for operating said second relay for removing the shunt from said control relay, the removal of said shunt serving to allow the operation of said control relay to split said trunk circuit and to connect the operator's telephone set to one portion thereof, a release key, and means controlled by said release key for restoring said control relay to disconnect the operator's telephone and to reconnect said trunk portions.

18. In a telephone exchange system, an operator's position, an operator's telephone circuit therefor, a first trunk circuit incoming to said position, means for extending a connection to the operator's position over said trunk, an indicating device at said position, means controlled at said position for associating said indicating device with said trunk, a second trunk circuit for extending said first trunk circuit and means jointly responsive to the extension of said first trunk to said second trunk and the operation of said controlled means to open the talking circuit between said first and second trunks and to connect said operator's telephone to said second trunk.

19. In a telephone exchange system, an operator's position, an operator's telephone circuit therefor, a trunk circuit incoming to said position, means for extending a connection to said operator's position over said trunk, an indicating device at said position, an assignment key controlled at said position for associating said indicating device with said trunk, a second trunk circuit outgoing from said position, means for associating said incoming trunk circuit with said outgoing trunk circuit for extending a connection thereover, means jointly responsive to the actuation of said assignment key and the extension of said incoming trunk circuit to said outgoing trunk circuit to open the talking circuit between said incoming and said outgoing trunk circuits and to connect said operator's telephone with said outgoing trunk circuit, and a release key at said position adapted when operated to disconnect said operator's telephone and to reclose said talking connection between said incoming and outgoing trunk circuits.

20. In a telephone exchange system, the combination of a trunk circuit terminating in a plug, an operator's telephone set, and a relay automatically responsive to the insertion of said plug into an outgoing line jack for disconnecting the plug from the talking conductors of said trunk and for connecting the operator's telephone set to said plug.

21. In a telephone trunking system, an incoming trunk operator's position, a trunk circuit terminating thereat in a plug, an outgoing line jack thereat, means located at said position and adapted to be associated with said trunk circuit for indicating the number of a wanted line, means associated with said trunk for associating said indicating means therewith, an operator's telephone set at said position, and other means automatically responsive to the insertion of said plug into said outgoing line jack for disconnecting the plug from the talking conductors of said trunk and for connecting the operator's telephone set to said plug.

22. In a telephone trunking system, an incoming trunk operator's position, a trunk circuit terminating thereat in a plug, an outgoing line jack thereat, means located at said position and adapted to be associated with said trunk circuit for indicating the number of a wanted line, means associated with said trunk for associating said indicating means therewith, an operator's telephone set at said position, and a relay automatically responsive to the insertion of said plug into said outgoing line jack for disconnecting the plug from the talking conductors of said trunk and for connecting the operator's telephone set to said plug.

23. In a telephone trunking system, an incoming trunk operator's position, a trunk circuit terminating thereat in a plug, an out-

going line jack thereat, means located at said position and adapted to be associated with said trunk circuit for indicating the number of a wanted line, means associated with said trunk for associating said indicating means therewith, an operator's telephone set at said position, and other means jointly responsive to the insertion of said plug into said jack and the association of said indicating means with said trunk for disconnecting the plug from the talking conductors of said trunk and for connecting the operator's telephone set to said plug.

In testimony whereof, I have signed my name to this specification this 20th day of September, 1924.

GEORGE H. PETERSON.