

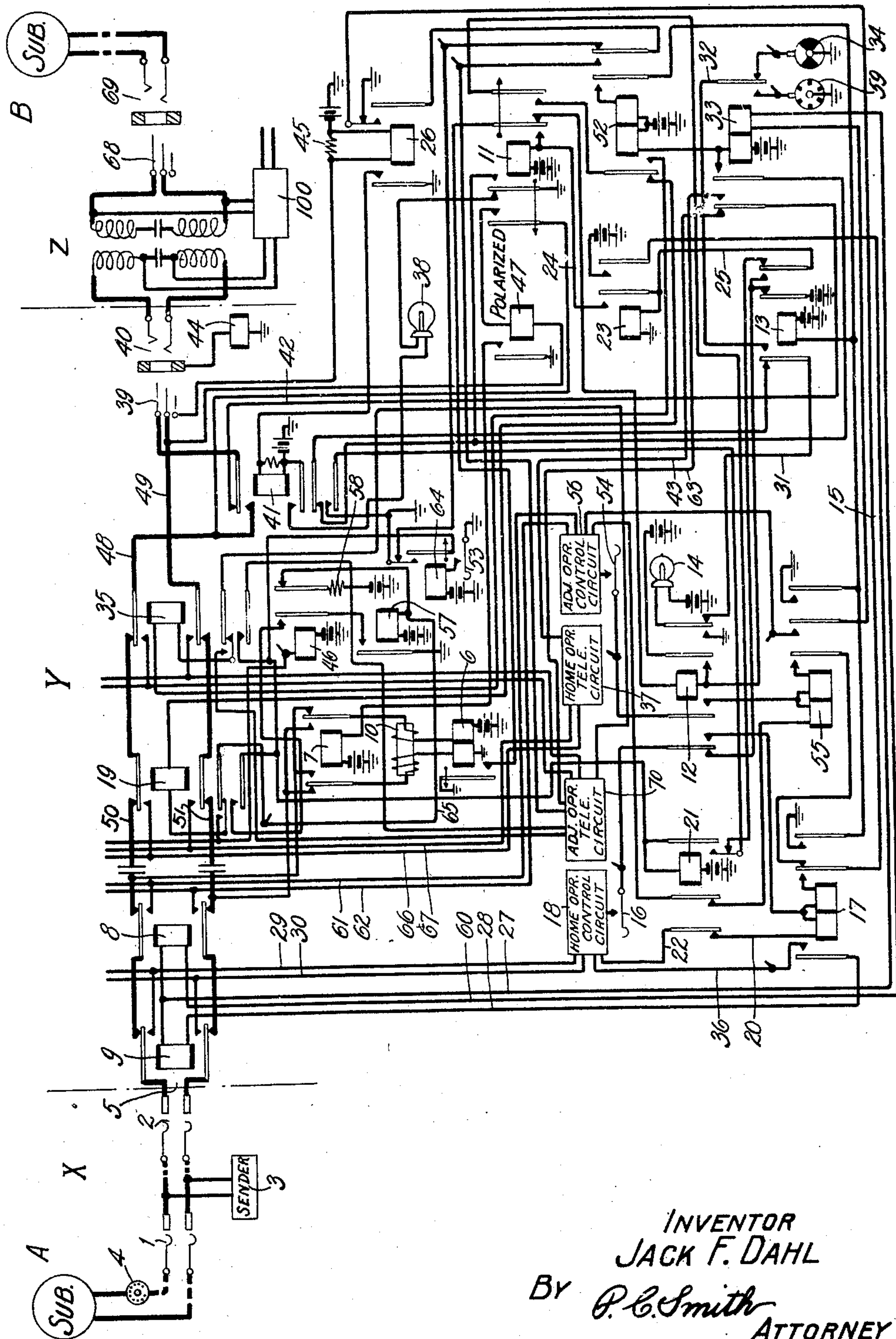
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J. F. DAHL

TRUNK CIRCUITS

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TRUNK CIRCUITS.

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This invention relates to telephone exchange systems and more particularly to exchange systems in which connections are established from subscribers' lines in full mechanical offices of an exchange area, serially through a plurality of manual offices to wanted subscribers' lines, and has for its object the improvement of the trunking facilities at the first manual office through which such connections are established.

In systems in which certain offices are equipped with mechanical switching apparatus, whereas other offices employ manual operators for establishing connections, it is found desirable that the manual operators be given the information required for them to extend or complete the connections incoming from the mechanical office without the necessity of communicating orally with the calling subscriber. To this end, each operator's position in the manual office, is provided with call indicator mechanism, including a set of number indicating devices, which is operated automatically under the control of registering mechanism in the mechanical office, to inform the manual operator of the number and character of the required connection. It is customary, in arrangements of this character, to provide each trunk circuit incoming to an operator's position from the distant mechanical office, with a signal lamp, the illumination of which advises the operator that a call is awaiting her attention on the corresponding trunk. At her convenience she associates the calling trunk with the common indicating mechanism at her position, and thereupon the wanted designation is set up and displayed before the operator, who proceeds to complete the connection.

Where no attempt is made to secure a uniformity in the distribution of the calls to the several operators in an office of this character, it may frequently occur during busy hours of the day, that an excessive number of calls simultaneously appear on the trunks of any given operator's position, while at a position adjacent thereto only a comparatively few calls are awaiting attention. In order that the completion of calls shall not be unduly delayed on this account, provision is made whereby an operator adjacent to a home operator's position may assist the home operator by tending to some of the calls at her position.

In systems of this character, it may further be undesirable because of cost to extend direct trunks from each office having mechanical switching apparatus to each manual terminating office. In such a case, tandem offices are provided which are directly accessible from originating mechanical offices, at which tandem offices are located operators' positions equipped with number indicating devices. These operators, in turn, trunk desired connections to terminating manual offices in which subscribers' lines, the number of which are indicated on the number indicating mechanism, terminate. It then becomes necessary for the tandem operator to converse with the terminating manual operator to inform her of the desired line number. It is desirable that this be done over the established connection between the operators' positions without the knowledge of the calling subscriber, and this is done by splitting the trunk at the tandem position and connecting the tandem operator's telephone circuit to the calling end of the trunk circuit at her position.

Where provision is made to enable an operator at a position, adjacent to the home position on which a call is incoming from a mechanical office, to attend to calls at the home position, it is necessary upon splitting the trunk circuit to connect the adjacent operator's telephone circuit to the trunk circuit rather than the home operator's telephone circuit.

In accordance with this invention, means is provided for automatically splitting the incoming trunk circuit at one point, when it is plugged up to a trunk circuit outgoing to a terminating office by the tandem home operator, and for connecting the telephone circuit of the home operator to the calling end of the trunk circuit, and for splitting the trunk circuit at another point, when it is plugged up by the tandem adjacent operator, and for connecting the telephone circuit of the adjacent operator to the calling end of the trunk circuit. Provision is also made whereby the release of the incoming trunk is maintained under the control of either operator after the trunk has been plugged up into an outgoing trunk jack.

More specifically, in accordance with one embodiment of the invention, chosen by way of example, two splitting relays 19 and 35 are

provided, relay 19 being operable when the trunk circuit is plugged into an outgoing trunk jack 40 after the home operator has depressed her display key 16, and the other
 5 relay 35 being similarly operable after the adjacent operator has depressed her display key 54. Either relay splits the trunk towards its incoming end and connects its outgoing end directly to talking leads extending, in one
 10 case to the home operator's telephone set, and in the other case to talking leads extending to the adjacent operator's telephone set. Specific provision is also made for transferring the holding ground of relays 17 and 55 from
 15 the normal contact of sleeve relay 26, to ground under the control of the home operator's release key 53, or a similar key at the adjacent operator's position.

The invention is illustrated in the accompanying drawing, wherein a calling subscriber's line is shown at the left of the drawing, terminating in an office X equipped with mechanical switching apparatus, and at the right of the drawing a called subscriber's line
 25 terminating in the manual office Z, connection being extended between the offices X and Z through a manual tandem office Y.

To simplify the disclosure the line switch 1, district selector 2, and sender 3 of the
 30 mechanical office X have been only diagrammatically illustrated. For a full disclosure of this apparatus reference may be made to the patent to F. A. Stearn, 1,505,171, issued August 19, 1924. At the tandem office Y an
 35 interconnecting trunk circuit incoming from the office X has been disclosed with the complete equipment thereof. The control and indicator circuits at the home and adjacent operators' positions, which may be connected
 40 to all of the incoming trunk circuits of these positions, have been illustrated by small rectangles 18 and 56. This indicator mechanism may be of the type disclosed in the patent to A. E. Lundell and E. H. Clark, 1,464,084,
 45 issued August 7, 1923.

The "B" operator's equipment shown in outline at office Z is fully disclosed in a co-pending application, Serial No. 738,488, filed
 50 September 18, 1924, in the name of R. S. Bailey and E. P. Broe, and a complete disclosure thereof herein is deemed unnecessary.

It is thought that the invention may be best understood from a description of the manner in which a call is extended from substation
 55 A in office X to the substation B in office Z. Upon the removal of the receiver at substation A, the line switch 1 functions in the usual manner to select an idle district selector 2, and thereupon an idle sender, such as 3, becomes associated with the calling line. The
 60 calling subscriber then manipulates his calling dial 4 in accordance with the office and numerical designation of the desired line, whereupon the registers of the sender function in the usual manner to register the full

line designation. Following the registration of the office portion of the designation, the sender operates to set the district selector 2 upon a group of trunks extending to the
 tandem office Y, through which access to the
 70 desired terminating office Z may be obtained. The selector 2 then proceeds to hunt for and seize an idle trunk 5 extending to such tandem office Y.

When the connection is extended to the
 75 trunk 5 a circuit is established for the relay 6 of the trunk 5 which may be traced in part from battery, through the right winding of relay 6, the right winding of impedance coil 10, the right back contact of relay 7, the upper
 80 back contacts of relays 8 and 9, and thence through the selector 2 and the sender 3, returning through the lower back contacts of relays 8 and 9, the left back contact of relay 7, the left winding of impedance coil 10 to
 85 ground through the left winding of relay 6. Relay 6 energizes in this circuit and establishes a circuit for relay 12, which may be traced from battery, through the inner right
 90 back contact of relay 13, winding of relay 12, inner right back contact of relay 11, to ground at the contact of relay 6. Relay 12 upon energizing, closes a locking circuit for itself independent of the contact of relay 13, which
 95 extends from battery, through the inner right front contact of relay 12, and thence to ground as traced at the contact of relay 6. At its outer right contact relay 12 establishes
 100 a circuit for lamp 14, whereby the lamp 14 becomes lighted as a signal to the operator that a call is incoming on trunk 5 at her position.

The home operator, noting the illumination of lamp 14, depresses the display key 16 at her position, whereupon a circuit is estab-
 105 lished for relay 17 which may be traced from battery at control circuit 18, over conductor 22, the outer left contact of relay 21, conductor 20, the left winding of relay 17, the outer left front contact of relay 12, the contact of
 110 key 16 to ground at the control circuit 18. Relay 17, operating in this circuit locks through both of its windings and its inner right front contact, over conductor 15 to
 115 ground at the right normal contact of relay 26, independently of key 16, and at its outer right contact closes an obvious circuit for relay 13. At its outer left contact it prepares a circuit for relay 9. Relay 13, upon energizing, opens at its inner right contact the
 120 initial energizing circuit of relay 12, and closes at its outer right front contact a circuit for relay 23, which may be traced from battery, through the inner right contact of relay 12, the outer right front contact of relay 13,
 125 conductor 25, to ground through the winding of relay 23. Relay 23, upon energizing, extends conductor 25 through its inner right contact, over conductor 24, through the winding of relay 11 to battery, thus placing the
 130

windings of relays 23 and 11 in series, but relay 11 can not operate so long as battery is connected to conductor 25 at the inner right contact of relay 12.

5 With relays 17 and 23 both energized, a circuit is now effective for energizing relay 9, which may be traced from battery at the outer right contact of relay 23, over conductor 27, winding of relay 9, conductor 28, the
10 left contact of relay 17, conductor 36, to ground at the control circuit 18. The operation of relay 9 severs the incoming trunk conductors from the windings of relay 6, and connects these conductors over the front con-
15 tacts of relay 9 and conductors 29 and 30 to the control circuit 18, thereby causing such an operation of the sender as to initiate the transmission of impulses to the control circuit 18 in accordance with the registrations re-
20 corded in the sender, to record the line designation in the control circuit 18 in the well known manner.

The opening of the circuit of relay 6 by the operation of relay 9 causes the release of
25 relay 6, and in turn the release of relay 12. Relay 12, upon releasing, removes battery at its inner right contact from the conductor 25 thereby permitting relay 11 to become energized in series with relay 23. With relay 12
30 released, the circuit of lamp 14 is transferred from steady ground at the outer right front contact of relay 12 to interrupted ground at interrupter 34, over a circuit which may be traced from battery, through lamp 14, outer
35 right back contact of relay 12, conductor 31, left front contact of relay 13, the conductor 32, right back contact of relay 33, interrupter 34 to ground. Lamp 14 then flashes as an indication to the operator that the call in-
40 coming on trunk 5 has received her attention and that the desired line designation is being recorded on her control circuit 18. Relay 11, upon energizing, prepares a circuit for the splitting relay 19, and also prepares a cir-
45 cuit for establishing a bridge across the calling end of the trunk circuit as will herein-after be described.

After the complete number has become re-
50 corded in the control circuit 18, ground is removed at the control circuit from conductor 36 and relay 9 thereupon releases, disconnecting conductors 29 and 30 extending to the control circuit, from the incoming end of trunk 5 and again connecting the incoming
55 end of the trunk to the windings of relay 6. Since the sender has now completed its functions, it now becomes disconnected from the district selector 2 and the calling line, and the calling line becomes connected with the in-
60 coming end of the trunk 5. When relay 6 is again connected to the incoming end of the trunk circuit 5, it reenergizes and at its front contact and the inner right front contact of relay 11, establishes a holding circuit for
65 relay 11 and shunts the winding of relay

23, whereupon relay 23 deenergizes, removing at its outer right contact the battery connection to the winding of relay 9 and also opening the initial energizing circuit of relay 11.

The tandem home operator perceiving the complete number on her indicator, and noting that the office designation is for a line terminating in manual office Z, tests the jack 40 of a trunk extending to such office by touch-
75 ing the tip of plug 39 to the sleeve of the jack 40.

If the outgoing trunk is busy, she will receive a busy click in her telephone circuit, over a circuit which may be traced from plug
80 39 to the upper back contact of relay 41, conductor 42, outer left back contact of relay 33, conductor 43, through the tone coil of her telephone circuit indicated diagrammatically by the rectangle 37. If the trunk is idle,
85 as will be assumed, she inserts the plug 39 into the jack 40, thereby closing a circuit from ground through coil 44, sleeve of jack 40, sleeve of plug 39, winding of relay 26 and
90 resistance 45 in parallel to battery. Relay 26 operates in this circuit, closing an obvious circuit for relay 41. At its right contacts, relay 26 transfers the locking circuit of relay 17 over conductor 15, from direct ground to
95 ground at the normal contacts of the home operator's position relay 24, the holding circuit now extending over the alternate right contact of relay 26, the outer right back con-
100 tact of relay 52, the normal contacts of relay 64 to ground.

At its uppermost lower front contact, relay 41 prepares a circuit for disconnect lamp 38 but the lamp does not light at this time as its circuit is open at the inner left back contact
105 of relay 11. Relay 41 opens at its upper back contact the connection from the tip of plug 39 to the test lead 42, and at its upper front contact extends a connection from the tip of plug 39 to the conductor 48. A bridge
110 is also closed by relay 41 across the tip and ring conductors 48 and 49 of the trunk circuit, extending from the tip of plug 39, over the upper front contact of relay 41, outer left
115 front contact of relay 11, winding of polarized relay 47, to the ring contact of plug 39, thus establishing a circuit extending to the office Z for supervisory purposes.

Relay 41 at its lowermost contact, also establishes a circuit for the splitting relay 19, corresponding to the home operator's posi-
120 tion, extending from battery, resistance 58, back contact of relay 46, in parallel with the winding of relay 57, thence over conductor 65, the lower intermediate normal contact of relay 19, winding of relay 19, left back con-
125 tact of relay 52, outer right front contact of relay 11, right normal contacts of relay 21, to ground at the lowermost contact of relay 41. Relay 19 operates in this circuit, locking
130 over its lower intermediate alternate contact

to battery through the winding of relay 46. Relay 46 operates in this locking circuit and at its outer back contact opens the shunt around relay 57, for a purpose to be hereinafter described. At its upper and uppermost lower contacts, relay 19 disconnects the trunk conductors 50 and 51, and connects the conductors 66 and 67 extending to the home operator's telephone circuit, over the upper back and uppermost lower back contacts of relay 35, to the trunk conductors 48 and 49. The home operator is now enabled to converse with the "B" operator at the office Z, but the calling subscriber can not hear the conversation. The home operator now gives the "B" operator the number of the desired wanted line as indicated on the indicator and control circuit 18.

After the tandem home operator has given the number, she depresses the wipe out key 53, thereby operating relay 64, which opens the previously traced holding circuit of relay 17. At its alternate contact, relay 64 closes a circuit for relay 21, which may be traced from battery, winding of relay 21, lowermost front contact of relay 19, alternate contact of relay 64 to ground. Relay 21 energizes, locking over its right alternate contact to ground at the lower front contact of relay 41, opening at its outer left back contact the initial energizing circuit of relay 17, and at its normal right contacts opening the holding circuit of splitting relay 19. Relay 19 thereupon deenergizes, disconnecting the operator's telephone circuit from conductors 48 and 49 and establishing the continuity of the trunk circuit between the originating office X and the terminating office Z. Relay 17 upon deenergizing opens the circuit of relay 13 which upon releasing opens the previously traced flashing circuit for lamp 14, and the lamp becomes dark.

In response to the instructions given to the "B" operator at office Z, the "B" operator in the well known manner extends the connection over plug 68 and jack 69 to the line of the desired subscriber. Upon the response of the called subscriber at station B, apparatus 100 functions in the manner set forth in the above mentioned specification, to reverse the direction of current flowing through the polarized relay 47, whereupon relay 47 energizes, closing an obvious circuit for reversing relay 7. Relay 7 now reverses the direction of current flowing in the trunk 5 extending to the originating office X for supervisory or call charging purposes.

When the calling subscriber replaces his receiver on its switchhook, relay 6 releases in turn releasing relay 11. Relay 11 upon releasing, completes the circuit of the disconnect lamp 38, and at its outer left contact opens the bridge through polarized relay 47. The "B" operator at the terminating office is thereby given a disconnect signal in

the usual manner, and proceeds to take down the connection at her position. At the originating office the apparatus is restored in the manner fully set forth in the patent to Stearn hereinbefore referred to.

Upon observing the lighting of lamp 38, the tandem operator removes plug 39 from the jack 40, thereby releasing relay 41. The release of relay 41 opens the circuit of the disconnect lamp 38 and opens the locking circuit of relay 19 which then releases. All apparatus at the tandem operator's position is now restored.

If at the time the call came in from the mechanical switching office X, the home operator had been too busy with other calls to attend to such incoming call, the adjacent operator, if free, would have attended to it by depressing her display key 54. At this time relays 6 and 12 are operated as previously described, and therefore upon the operation of key 54 a circuit is established for relay 55, extending from battery at the adjacent operator's control circuit 56 over the inner left contact of relay 21, left winding of relay 55, inner left front contact of relay 12, contact of key 54 to ground at the adjacent operator's control circuit 56. Relay 55, upon energizing, closes a locking circuit for itself through both of its windings and its inner right contact, the inner right back contact of relay 17, conductor 15 to ground at the right normal contacts of relay 26, independent of the contacts of key 54. Relay 55 closes an obvious circuit for relay 13, which upon energizing, causes the operation of relay 23 and performs the other functions as previously described. With relays 23 and 55 operated, a circuit is now closed, extending in series through the winding of relay 8 and the right winding of relay 33, which may be traced from ground at the adjacent operator's control circuit 56, intermediate contact of relay 55, right winding of relay 33, conductor 60, winding of relay 8, conductor 27 to battery at the outer right contact of relay 23. Relay 8, upon energizing in this circuit, connects the incoming conductors of the trunk circuit 5 over conductors 61 and 62 to the adjacent operator's control circuit 56, and opens the connection of the trunk circuit to the windings of relay 6. As before, relay 6 deenergizes, releasing relay 12, whereupon relay 11 energizes.

With relays 11 and 33 energized, a circuit is now closed to lock relay 33 and energize relay 52, this circuit extending from battery, through the left winding of relay 52 and the left winding of relay 33 in parallel, through the inner left contact of relay 33 to ground at the inner left contact of relay 11. Relay 52, upon energizing, locks over its right winding and inner right front contact, to ground at the outer right contact of relay 55. The circuit of lamp 14 is now transferred from

steady ground at the right contact of relay 12, to interrupted ground at the fast interrupter 59, over a circuit extending from battery, through the lamp 14, the outer right back contact of relay 12, conductor 31, left front contact of relay 13, conductor 32, right front contact of relay 33 to ground through the interrupter 59. The lamp 14 now flashes rapidly as an indication to the operators at both the home and adjacent positions that the adjacent operator is attending to the incoming call on trunk 5.

When the pulses have all been received and the indicator lamps associated with control circuit 56 display the complete designation, the adjacent operator tests the trunk extending to the desired terminating office Z, establishing a test circuit which may be traced, from the tip of plug 39, upper back contact of relay 41, conductor 42, outer left front contact of relay 33, conductor 63 to the tone coil of the adjacent operator's telephone circuit, diagrammatically indicated at 70. If the trunk tested is idle, and the operator receives no click in her telephone circuit, she inserts plug 39 into jack 40. In response thereto relays 26 and 41 operate as before. Since, however, relay 52 is now operated, a circuit is closed for splitting relay 35, extending from battery at the adjacent operator's telephone circuit 70, through a relay and resistance corresponding to relay 57 and resistance 58, the intermediate lower normal contact and winding of relay 35, the left front contact of relay 52, the outer right contact of relay 11, normal right contacts of relay 21, to ground at the lowermost contact of relay 41. Relay 35, upon energizing, locks over the alternate contact of its intermediate lower armature, to battery at the adjacent operator's telephone circuit 70, through a relay corresponding to relay 46. Relay 35 now connects conductors 48 and 49 of the trunk circuit through its upper and uppermost lower front contacts to the talking conductors of the adjacent operator's telephone circuit to enable the operator at the adjacent position to converse with the "B" operator at office Z.

To wipe out the display on the indicator and control circuit 56 the adjacent operator depresses her release key, not shown, corresponding to key 53 which closes a circuit for relay 21 extending from battery, through the winding of relay 21, the lower front contact of relay 35, to ground at the alternate contact of a relay at the adjacent operator's telephone circuit corresponding to relay 64. From this point the circuit functions in the manner previously described.

If the tandem operator after having completed a connection to the "B" operator, for example in the manner previously described in connection with a call handled by the tandem home operator, fails to depress the key 53, and then proceeds with a second call over

another incoming trunk corresponding to trunk 5, her telephone circuit 37 is disconnected from the first trunk 5 in the following manner: It will be recalled that when the splitting relay 19 operated it locked in series with relay 46, operating such relay 46. With the relay 46 operated when the operator depresses the display key of the second trunk, corresponding to key 16, and inserts the second trunk plug into the jack of an outgoing trunk, the relays 26 and 41 of the second trunk operate, the relay 41 closing a circuit for the splitting relay of the second trunk, corresponding to the winding 19, in series with the winding of relay 57 of the home operator's telephone circuit. Since at this time relay 46 is operated in series with the splitting relay of the first trunk, and relay 57 is not shunted by resistance 58, relay 57 operates. The splitting relay of the second trunk being marginal does not, however, energize in series with relay 57.

The splitting relay of the first trunk, having locked in series with and operated relay 46, a circuit is now established from ground through the contact of relay 57, the inner contact of relay 46, the lower front contact of splitting relay 19 of the first trunk to battery through the winding of relay 21. Relay 21 releases relays 19 and 17 of the first trunk, disconnects the operator's telephone circuit from the first trunk and closes this trunk through for talking between the calling and called subscribers. When relay 19 releases, relay 46 also releases shunting relay 57 at its outer contact, thereby causing relay 57 to release and permitting sufficient current to flow through and to operate the splitting relay of the second trunk corresponding to relay 19. The operation of the splitting relay connects the operator's telephone circuit to this trunk. The circuits function similarly on second calls initiated by the adjacent tandem operator.

What is claimed is:

1. In a telephone system, a plurality of operators' positions, a trunk circuit incoming to one of said positions and terminating in a plug, a trunk signal, means at each operator's position operable by the operator thereat in response to said signal, a telephone set at each operator's position, and means allotted to each operator's position responsive to the operation of the responsive means of such position and to the insertion of said plug into an outgoing line jack for disconnecting the talking conductors of said trunk circuit and for connecting said plug to the telephone set of such operator's position.

2. In a telephone system, a plurality of operators' positions, a trunk circuit incoming to one of said positions and terminating in a plug, an indicating device at each position, means at each position for associating the indicating device of that position with said trunk circuit, a telephone set at each opera-

tor's position, and means allotted to each operator's position responsive to the association of the indicating device of such position with said trunk circuit and to the insertion of said plug into an outgoing line jack for disconnecting the talking conductors of said trunk circuit and for connecting said plug to the telephone set of such operator's position.

3. In a telephone system, an operator's position, a trunk circuit incoming to said position and terminating in a plug, a trunk signal, means controlled by the operator at said position in response to said signal, a telephone set at said position, a second operator's position, means controlled by the operator at said second position in response to said signal, a telephone set at said second position, means allotted to the first operator's position responsive to the operation of the responsive means of that position and to the insertion of said plug into an outgoing line jack for disconnecting the talking conductors of said trunk circuit and for connecting said plug to the telephone set of that operator's position, and means allotted to the second operator's position responsive to the operation of the responsive means of that position and to the insertion of said plug into an outgoing line jack for disconnecting the talking conductors of said trunk circuit and for connecting said plug to the telephone set of that operator's position.

4. In a telephone system, an operator's position, a trunk circuit incoming to said position and terminating in a plug, an indicating device at said position, means at said position for associating said indicating device with said trunk circuit, a telephone set at said position, a second operator's position, an indicating device at said second position, a telephone set at said second position, means at said second position for associating said second indicating device with said trunk, means allotted to the first operator's position responsive to the association of the indicating device of that position with said trunk circuit and to the insertion of said plug into an outgoing line jack for disconnecting the talking conductors of said trunk circuit and for connecting said plug to the telephone set of that operator's position, and means allotted to the second operator's position responsive to the association of the indicating device of that position with said trunk circuit and to the insertion of said plug into an outgoing line jack for disconnecting the talking conductors of said trunk circuit and for connecting said plug to the telephone set of that operator's position.

5. In a telephone system, a plurality of operator's positions, a trunk circuit incoming to one of said positions and terminating in the plug, a trunk signal, means at each operator's position operable by the operator thereat in response to said signal, a tele-

phone set at each operator's position, and relay means allotted to each operator's position responsive to the operation of the responsive means of such position and to the insertion of said plug into an outgoing line jack for disconnecting the talking conductors of said trunk circuit and for connecting said plug to the telephone set of such operator's position.

6. In a telephone system, an operator's position, a trunk circuit incoming to said position and terminating in a plug, an indicating device at said position, means at said position for associating said indicating device with said trunk circuit, a telephone set at said position, a second operator's position, an indicating device at said second operator's position, means at said second position for associating said second indicating device with said trunk, a telephone set at said second position, a relay allotted to the first operator's position responsive to the association of the indicating device of that position with said trunk circuit and to the insertion of said plug into an outgoing line jack for disconnecting the talking conductors of said trunk circuit and for connecting said plug to the telephone set of that operator's position, and a second relay allotted to the second operator's position responsive to the association of the indicating device of that position with said trunk circuit and to the insertion of said plug into an outgoing line jack for disconnecting the talking conductors of said trunk circuit and for connecting said plug to the telephone set of that operator's position.

7. In a telephone system, a plurality of operators' positions, a trunk circuit incoming to one of said positions and terminating in a plug, a jack, a trunk signal, means at each operator's position operable by the operator thereat in response to said signal, a telephone set at each operator's position, a relay in said trunk circuit allotted to each operator's position responsive to the operation of the responsive means of such position and to the insertion of said plug into said jack for disconnecting the talking conductors of said trunk circuit and for connecting said plug to the telephone set of such operator's position, a key at each position, and means responsive only to the key of the connected position to disconnect the connected operator's set and to reestablish the continuity of said trunk circuit.

8. In a telephone system, an operator's position, a trunk circuit incoming to said position and terminating in a plug, a jack, a control relay for said trunk, means controlled by the operator to operate said relay, a second relay, a locking circuit for said first relay controlled by said second relay, a release key, and means for operating said second relay to transfer the locking circuit

of said first relay to the control of said release key following the insertion of said plug into said jack.

5 9. In a telephone system, an operator's position, a trunk circuit incoming to said position and terminating in a plug, a jack, an indicating device at said position, a control relay for said trunk for causing the association of said device with said trunk, a key for
10 operating said relay, a second relay, a locking

circuit for said first relay extending to ground through normal contacts of said second relay, a release key and means responsive to the insertion of said plug into said jack for operating said second relay to transfer 15 said holding circuit to the control of said release key.

In witness whereof, I hereunto subscribe my name this 29 day of April, A. D. 1927.

JACK F. DAHL.