

1,115,324.

T. G. MARTIN.
TELEPHONE RELEASE INSURING MEANS.
APPLICATION FILED JULY 6, 1908.

Patented Oct. 27, 1914.
2 SHEETS—SHEET 1.

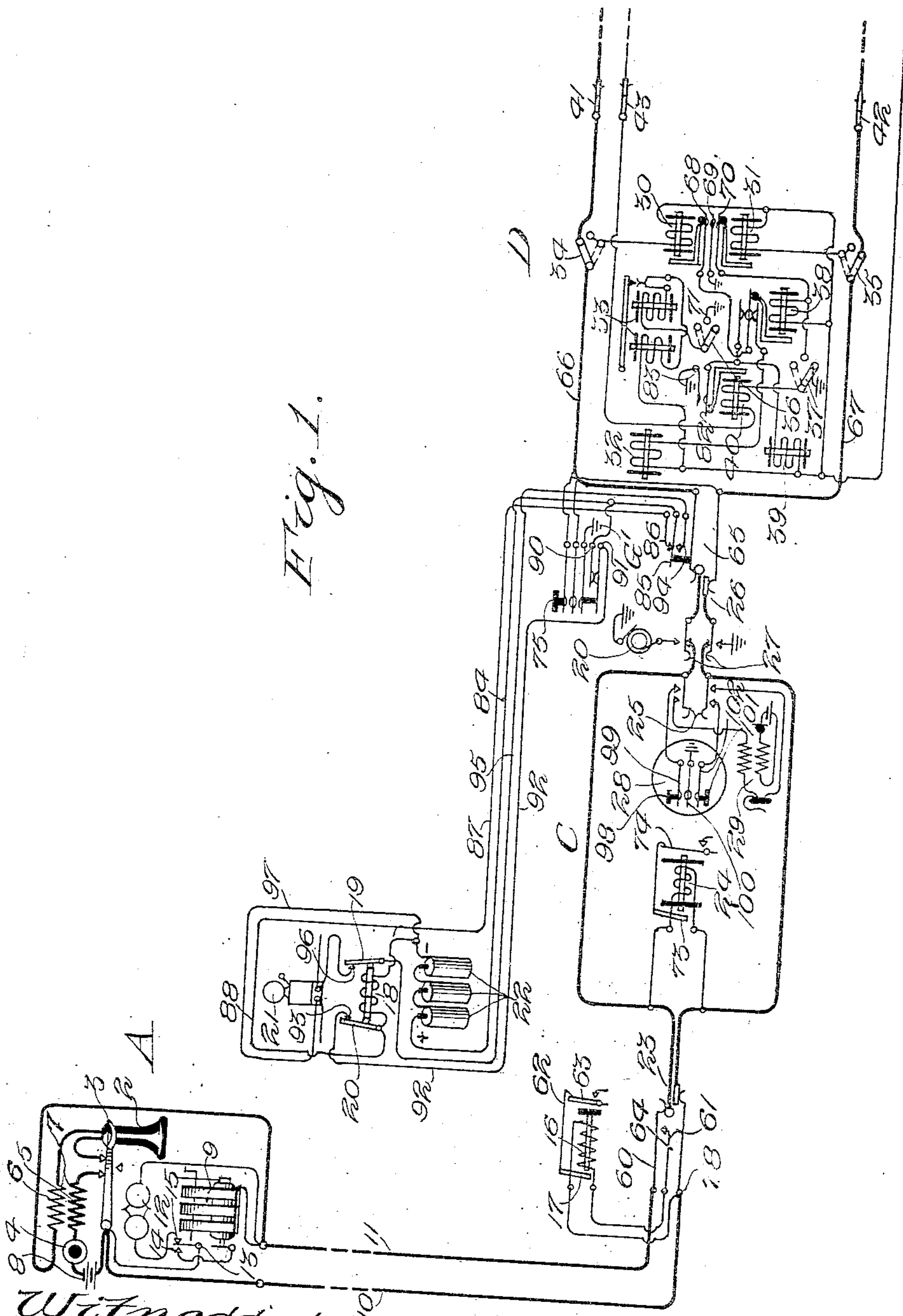


Fig. 1.

Witnesses
R. H. Burfield
Subscribed.

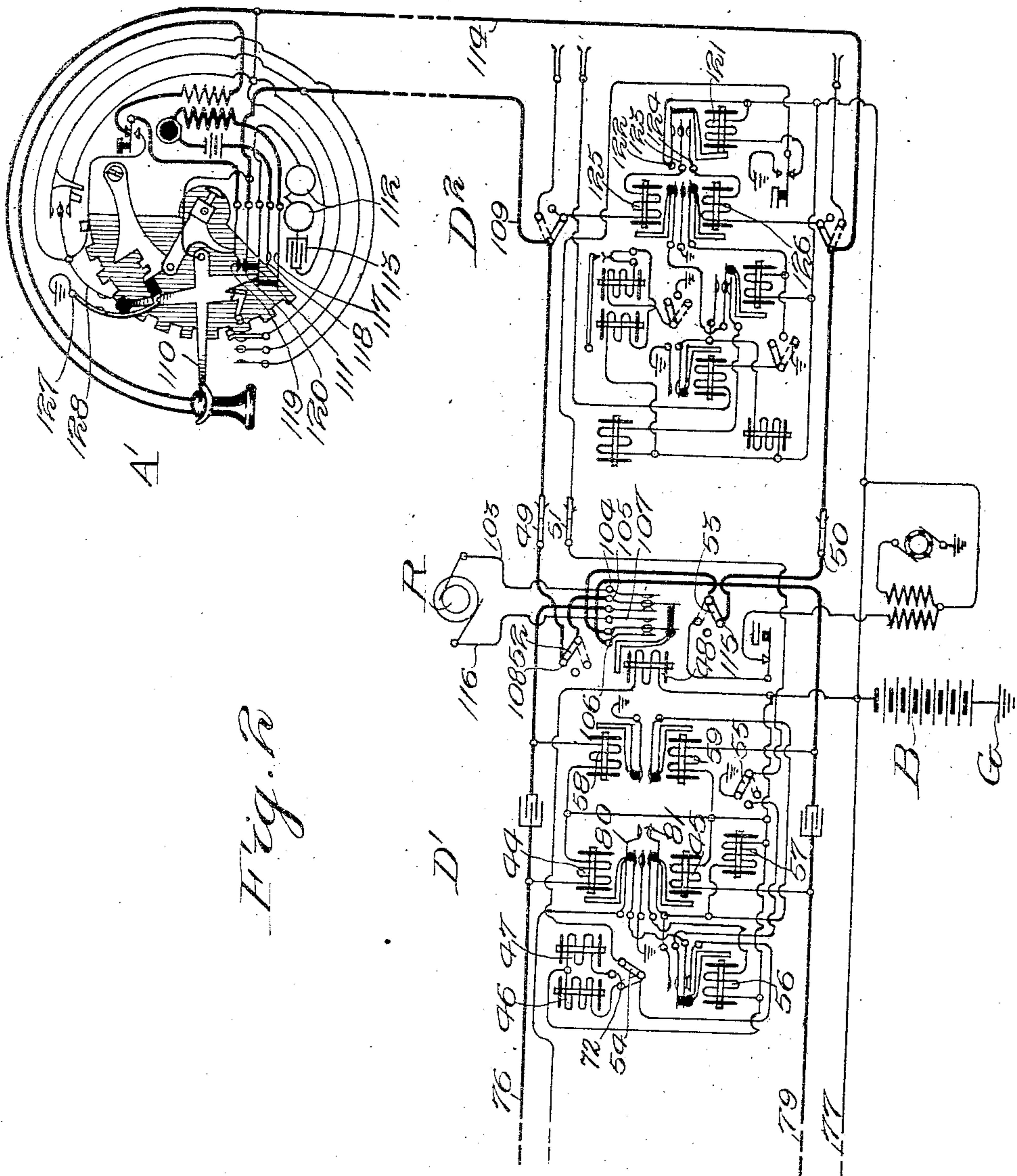
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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

TALBOT G. MARTIN, OF CHICAGO, ILLINOIS, ASSIGNOR TO AUTOMATIC ELECTRIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

TELEPHONE RELEASE-INSURING MEANS.

1,115,324.

Specification of Letters Patent.

Patented Oct. 27, 1914.

Application filed July 6, 1908. Serial No. 442,212.

To all whom it may concern:

Be it known that I, TALBOT G. MARTIN, a citizen of the United States of America, and resident of Chicago, Cook county, Illinois, have invented a certain new and useful Improvement in Telephone Release-Insuring Means, of which the following is a specification.

My invention relates to telephone systems in which a manual switchboard operator is given control of automatic trunk selectors and connectors, or other automatic switching machines, for extending connection in the direction of the called subscriber in response to the request of the calling subscriber. In systems of this kind the operators are provided with cord plugs for insertion in the jacks of the trunk-lines leading to the automatic switching apparatus, and also with means for releasing said switching apparatus after the subscribers are through using the connection. With this arrangement it has been found that the operators occasionally remove the plugs or pull down the connections and forget to release the automatic switches, thereby leaving the same off normal. Obviously, this is undesirable, as in order to obtain the full efficiency of apparatus of this kind, the automatic switches should be returned to normal as soon as they are no longer needed for maintaining the connection between calling and called subscribers.

The object of my invention is, therefore, the provision of an alarm apparatus which will tend to prevent the operators from taking down the connections without releasing the automatic switches—that is to say, which will prompt them to release the automatic switches each time that a connection is taken down at the manual board from which the said switches are controllable.

The nature and advantages of my invention will, however, hereinafter more fully appear.

In the accompanying drawings Figure 1 represents diagrammatically the equipment comprised in a manual central station, in a system embodying the principles of my invention. The line conductors of the subscriber's substation A terminate in a drop and jack. An operator's trunk cord-circuit is shown at C. By means of this cord-circuit

the operator is able to extend connection from a manual subscriber's line to trunk-line conductors which lead to an automatic central station and terminate in the first-selector switch D. Also, in connection with the trunk-line jack there is shown an alarm circuit for signaling the operator in the event that the plug is removed from the trunk-line jack without releasing the automatic exchange connection. Fig. 2 represents diagrammatically a connector switch D'. At D' there is represented a first-selector switch allotted to the line of the substation A'.

A represents a well-known type of manual substation consisting of the receiver 2, switch-hook 3, transmitter 4, primary and secondary windings 5 and 6, respectively, of the induction coil 7, and a local battery 8.

At C (Fig. 1) is shown the operator's answering plug 23, the clearing-out drop relay 24, listening key 25, calling plug 26, ringing key 27, automatic calling device 28 and the operator's telephone set 29.

At D is shown a modified form of a selector switch of the type disclosed in United States Letters Patent No. 815,321, granted March 13, 1906, to Keith, Erickson & Erickson. Said switch is equipped with the usual coils and relays, such as the vertical and rotary line relays 30 and 31, respectively, the vertical magnet 32 and the rotary magnet 33. As is customary, the rotary line relay controls the side switch wipers 34, 35, 36 and 37 by the operation of the private magnet 38, which latter in turn controls the release magnet 39, under certain conditions, by the action of its armature upon the private magnet springs. A back-release relay 40 enables the switch to be released after the side switch has passed to the third position. The vertical magnet operates to raise the shaft line wipers 41 and 42 and the private wiper 43, while the rotary magnet operates to place said wipers in contact with an unoccupied trunk-line leading to another selector, or to a connector switch as here shown at D' (Fig. 2). The trunk line leading from the jack to the selector D is provided with an individual alarm coil 18, and with operating armatures 19 and 20 which, when attracted, close a circuit through an alarm bell 21 common to

a number of trunks. A small battery 22 is provided for furnishing operating current for the relays and alarm signals of a group of trunks. Said connector is of the general type of local battery connector disclosed in United States Letters Patent No. 815,176, granted March 13, 1906, to Keith, Erickson & Erickson. It is also equipped, for operating, with vertical and rotary line relays 44 and 45. The vertical line relay controls at different times the vertical magnet 46, the rotary magnet 47 and the ringer relay 48. The vertical magnet operates to raise the shaft wipers 49, 50 and 51, the rotary magnet to place them in contact with the normal lines of the called subscriber, and the ringer relay to throw ringing current from the generator R upon the called line. The rotary relay controls the side switch wipers 52, 53, 54 and 55 through the medium of the private magnet 56. The two line relays controlled by the calling operator control the release magnet 57 through the action of the front release springs. Said magnet is likewise controlled, under certain conditions, by the called subscriber through the medium of the back-release coils 58 and 59.

At D² is shown the individual first-selector of the called subscriber, a modified form of the selector shown at D.

My invention has special reference to the signaling mechanism, with circuits, as represented in Fig. 1. The signal is designed to operate as soon as the operator withdraws the answering plug from the jack 65, and continues in operation until the automatic central station switches employed in establishing a connection from the manual board are released. The method of operation is best shown by the process of making a call. Upon taking the receiver 2 from the hook 3 and operating the generator 9, the subscriber at station A sends an energizing current through the line drop relay 16 over the following path: Starting from contact point 14 said circuit passes through the generator 9 over the upper side of the line 11, through the spring 60, contact point 61, through the line drop relay 16, over the sleeve side of the line 10 to the armature 13 and back to the contact point 14. The line drop relay 16 energizing for a moment pulls up the armature 17 which, acting on catch spring 62, releases the drop 63. This drop in turn closes an alarm circuit (not fully shown), notifying the operator that a connection is desired. The operator immediately inserts the plug 23 in the line jack 64 and throws in the listening key 25. Upon learning the connection desired, the calling plug 26 is inserted into the line jack 65, which is connected with the trunk-line leading to a first-selector, as shown at D. By

means of the calling device 28 the operator then automatically makes connection with the line of the desired subscriber, and by grounding the vertical line throws ringing current on the called line.

Assuming that the number of the automatic station called is 220, and that the calling plug 26 is connected with a trunk-line leading to a first-selector, the operator, after throwing the key 25, grounds the vertical line twice for the first digit of the called number by pressing the push-button 98, thereby causing the spring 99 to make contact with the ground spring 100. Following this, one impulse is imparted to the rotary line by pressing the push-button 101 once, thus causing the spring 102 in like manner to make momentary contact with the ground spring 100. In this way two ground impulses are sent over the vertical line 66, followed by one impulse over the rotary line 67, these lines normally leading to the vertical and rotary line relays 30 and 31, respectively, of the selector D. The vertical relay, energized once for each impulse over the vertical line, causes the same number of impulses to be imparted to the vertical magnet 32 by the action of the spring 68 being carried into contact with the ground spring 69 by the armature of the line relay 30. The vertical magnet raises the shaft wipers 41, 42 and 43 two steps, corresponding to the number of impulses (2). The single rotary impulse which follows every series of vertical impulses then energizes the rotary relay 31. This relay, closing contact between the spring 70 and the ground spring 69, energizes the private magnet 38 which in turn releases the side switch to second position. As soon as the side switch wiper 36 passes to the contact point 71, an energizing circuit is closed through the rotary magnet 33, resulting in the rotation of the shaft wipers 41, 42 and 43 to the first contact or trunk-line leading to a connector, and in the release of the side switch to third position. Should the first trunk leading to a connector be occupied, the shaft wiper will be rotated to the next contact, and so on until an unoccupied trunk is found. This is owing to the fact that a ground potential is thrown upon a private trunk-line which is occupied. Consequently, when the private wiper as, for instance, 43 of the selector D strikes a grounded contact while the side switch is in second position, an energizing circuit is closed through the private magnet through the side switch wiper 37. The private magnet 38 (which we have seen is energized in the process of bringing the rotary magnet into operation) is immediately reenergized by the new energizing circuit arising from a busy trunk-line, and consequently retains the side switch in second position, thereby

maintaining the energizing circuit through the rotary magnet. The intermittent operation of said rotary magnet, due to the action of the rotary armature in separating two springs and momentarily breaking the energizing circuit, continues to operate the shaft wipers until the circuit through the private magnet is broken, when the private wiper passes to a vacant trunk. When this occurs the side switch immediately passes to third position, and the trunk-line conductors are joined to a connector switch shown at D' in Fig. 2. The operator now, on pushing the buttons for the second digit of the called number, operates the vertical and rotary line relays of the connector, which results in raising the shaft wipers 49, 50 and 51 two steps, and in releasing the side switch to second position. In the case of the connector, however, after the shaft wipers have been raised by the action of the line relay 44 in closing the circuit through the vertical magnet 46, the side switch is released to second position only. As before, the side switch is controlled by the action of the rotary line relay 45 in closing the energizing circuit through the private magnet 56. When the side switch wiper 54 passes to the contact point 72 the rotary magnet 47 is brought under the control of the operator through the medium of the vertical line relay 44. Consequently, on pushing the calling button for the last digit, a corresponding number of impulses is imparted to the rotary magnet, after which the succeeding impulse over the rotary line results in releasing the side switch to third position. In case, however, that the called line is busy, the so-called busy-release is accomplished in the usual manner while the side switch is still in second position. When the side switch wipers 52 and 53 pass to third position, the connection of the calling line with the called line is completed. The operator, then grounding the vertical line by operating the push-button 98, energizes the ringing relay 48 and throws ringing current from the generator R out on the called line. This ringing current passes from one side of the generator R over the conductor 103 through the springs 104 and 105, through the side switch wiper 52, contact point 108, line wiper 49, over the conductor 109 to the switch-hook 110, through the switch-hook to the spring 111, through the calling bell 112, condenser 113, over the conductor 114, line wiper 50, contact point 115, side switch wiper 53, through the springs 106 and 107, over the conductor 116 to the other side of the generator. The called subscriber in response removes the receiver from the switch-hook, thereby causing the spring 117 to make contact with the spring 118, and the spring 119 with the spring 120, thus completing the

usual local battery circuit necessary for conversation.

When the private wiper 51 of the connector D' engages the private normal trunk, a circuit is closed in a well-known manner through the bridge-cut-off relay 121 of the called selector. This relay, upon energizing, causes the springs 122, 123 and 124 to separate, thus depriving the line relays 125 and 126 of battery current, and making it impossible for the subscriber at substation A' to operate his selector until the connector D' has been released. Should the subscriber at substation A' desire to release the connector D' he can do so, in the well-known manner, by first turning his dial, thus causing the co-operating ground springs 127 and 128 to make contact, and then, by hanging up his receiver, ground both line conductors simultaneously. In this manner the back-release relays 58 and 59 hereinbefore mentioned are energized, and an energizing circuit is in turn closed through the release magnet 57, releasing the connector D' in the well-known manner. The bridge-cut-off relay 121 immediately deenergizes, placing the springs 122, 123 and 124 in contact, thereby restoring battery connections to the vertical and rotary relays 125 and 126. The substation A (Fig. 1) having been connected with substation A' in the manner described, conversation may be carried on over the conductors shown by the heavy lines in Figs. 1 and 2.

After the completion of a call the release is effected by the operator in the following manner: The calling subscriber hangs up the receiver, and by operating the generator causes current to pass through the clearing-out relay 24. This circuit starting at contact point 14 passes through the generator 9, tip side of the line 11 to the spring 60 of the line jack 64, to the tip side of the answering plug 23, through the clearing-out relay 24 back over the sleeve side of said answering plug to the line conductor 10, and through the armature 13 to the contact 14. The clearing-out relay thus energized by the operation of the generator pulls up the armature 73, thereby releasing the drop 74 and signaling the operator that the conversation is completed. The operator then withdraws the calling plug 26, presses the release button 75 and grounds both sides of the line, effecting the release of all of the automatic switches and their restoration to normal.

The circuit closed by the push-button 75 extends on one side from ground G' over the conductor 66, side switch wiper 34, through the vertical line wiper 41, over the conductor 76 to the vertical line relay 44, through said relay to the battery lead 77, thence through battery B to ground G. The

circuit on the other side extends from ground G' over the conductor 67, through the side switch wiper 35, rotary line wiper 42, over the conductor 79 to the rotary line relay 45, through said relay to the battery lead 77, thence through battery B to ground G. The vertical and rotary line relays, upon energizing simultaneously, close the front-release springs 80 and 81 in contact. The spring 81 is connected with battery through the release magnet 57, and the spring 80 is connected with ground through the back-release relay 40 of the selector D. The connector release magnet 57 operates to restore the connector switch to normal position. At the same time the back-release relay 40 of the selector D throws the spring 82 into contact with the ground spring 83, thus closing a circuit, energizing the release magnet 39, and accomplishing the release of said selector and its restoration to normal. When the calling plug 26 enters the jack 65, preparatory to making a call by the operator, a circuit is closed through the alarm relay 18. The circuit extends from the positive main side of the battery 22 over the conductor 84, through the springs 85 and 86, over the conductor 87, over the conductor 88 and through the winding of alarm relay 18 to the negative side of the battery 22. This alarm relay in energizing attracts the armatures 19 and 20, and another circuit is thereby closed through the alarm relay. This circuit extends from the positive side of the battery 22 over the conductor 84, through the contact springs 90 and 91, over the conductor 92, through the contact 93 to the alarm relay armature 20, through the winding of said relay to the negative side of the battery 22. The first circuit through the alarm relay 18 is destroyed and a new circuit is completed through the alarm bell 21 as soon as the calling plug is withdrawn. The alarm relay continues energized by the second circuit through it, just traced, and maintains the armatures 19 and 20 in their attracted positions.

The circuit through the alarm bell 21 extends from the positive side of the battery 22 over the conductor 84, through the spring contacts 85 and 94, over the conductor 95 to the armature 19, through the contact point 96, through the alarm bell 21, over the conductor 97 to the negative side of the battery 22. Thus, as soon as the calling plug 26 is withdrawn the operator's attention is attracted by the ringing of the alarm bell 21, which continues until the release button has been pressed, and the circuit through the alarm relay is thereby broken by the separation of the contact springs 90 and 91. Upon the deenergization of the alarm relay 18 the armatures 19 and 20 drop back, thereby also causing another break

in said circuit through the relay. Consequently, upon the release button 75 being released, and the contact springs 90 and 91 again closing, no energizing circuit passes through the alarm relay 18. By the operation of this alarm system, therefore, the operator is prevented from leaving the automatic switches off normal, since upon withdrawing the calling plug the alarm bell will ring until the release push-button 75 is operated to release the automatic switching apparatus brought into service.

From the foregoing it will be seen that I provide an alarm whereby the operator will be given a signal whenever she takes down the connection without releasing—that is to say, whenever she withdraws the cord plug and leaves the automatic switches in their operated condition. The preferred method of operation is as follows: When the subscribers are through talking and the operator gets the disconnect signal, she then withdraws the plug from the trunk-line leading to the first-selector D, and at the same time presses the button 75, thus taking down the connection and releasing at the same time. In this way the two operations are accomplished without ringing the bell 21, which, of course, is desirable. On the other hand, when the operator hears the bell ring, then she understands that in taking down the connection she forgot to release the automatic switches. This she can do by pressing the button 75 in the manner previously explained.

What I claim as my invention is:—

1. In a telephone system, an automatic switch for extending connection in the direction of the called subscriber, means including a plug and jack by which a manual switchboard operator extends connection to said switch to control the same, a signal at said switchboard, automatic means for operating said signal if the plug is withdrawn from the jack and the automatic switch is not released, and means for releasing the switch in response to the said signal.

2. In a telephone system, an automatic trunking switch for extending connection in the direction of the called subscriber, means including a plug and jack for extending connection to said switch to control the same, means controlled by the manual switchboard operator for extending connection from said switch to the called subscriber's line, means by which the operator releases the said automatic switch and the means for extending connection therefrom, a signal at said switchboard, and automatic means for operating said signal if the plug is withdrawn from the jack without releasing.

3. In a telephone system, the combination of an automatic switch, a plug and jack by

which a manual switchboard operator extends connection to said switch to control the same, a relay, means for closing an energizing circuit through said relay by the insertion of the plug in the jack, an operator's key-switch for releasing said automatic switch, a locking circuit for said relay controlled and opened by the actuation of said key-switch, a signal having a circuit closed at one point by the energizing of said relay and closed at another point therein by the withdrawal of the plug from the jack, whereby the said signal is operated if the operator withdraws the plug from the jack without releasing the automatic switch.

4. In a telephone system having manual switchboards, the combination of an automatic switch, a trunk-line leading thereto, means for connecting a calling subscriber with said trunk-line, means by which a manual switchboard operator controls said automatic switch to extend the connection in the direction of the called subscriber, means by which the said operator may release the said automatic switch, a signal at said switchboard, and automatic means for operating said signal whenever the connection to the automatic switch is taken down or broken without releasing said switch.

5. In a telephone system, a calling and a called subscriber's line, means for establishing a connection between said lines, said means including a manual switchboard provided with an alarm signal, an automatic switch, means at said manual switchboard for controlling said automatic switch to extend connection in the direction of the called subscriber, means at said manual switchboard for releasing said switch after the subscribers are through talking, and automatic means at said manual switchboard for operating said signal whenever the operator disconnects the two subscribers without releasing said switch.

6. The combination, in a telephone exchange trunking system, of a calling and a called subscriber's line, means for establishing a connection between said lines, said means including an automatic switch for extending connection in the direction of the called subscriber's line, means by which a person may control said switch, said switch having one motion to select a group and another motion to find an idle line in the predetermined group, a signal, automatic means for operating said signal if the switch is not restored when the connection is broken between the two subscribers' lines, and means for releasing the switch in response to the said signal.

7. The combination, in a telephone exchange trunking system, of an automatic switch for extending connection in the direction of the called subscriber's line, means in-

cluding a plug and jack by which a manual switchboard operator extends connection to said switch to control the same, said switch having one motion to select a group and another motion to find an idle line in the predetermined group, a signal, automatic means for operating said signal if the plug is withdrawn from the jack and the automatic switch is not released, and means for releasing the switch in response to the said signal.

8. The combination, in a telephone exchange trunking system, of an automatic switch, a line circuit, means for controlling said switch over the line circuit, said switch having one motion to select a group and another motion to find an idle line in the predetermined group, means for initiating the release of said switch over the line circuit, and automatic means whereby the person who thus controls or releases said switch is given a signal if the said switch is not released after an attempt has been made to initiate the release over the line circuit.

9. The combination, in a telephone exchange trunking system, of an automatic switch, a trunk line leading thereto, means for connecting a calling subscriber's line with said trunk line, means by which the manual switchboard operator controls said automatic switch to extend the connection in the direction of the called subscriber's line, said switch having one motion to select a group and another motion to find an idle line in the predetermined group, means by which the said operator may release the said automatic switch, a signal at said switchboard, and automatic means for operating said signal whenever the connection to the automatic switch is taken down or broken without releasing said switch.

10. The combination, in a telephone exchange trunking system, of an automatic switch, means for extending a calling subscriber's line thereto, said switch having one motion to select a group and another motion to find an idle line in the predetermined group, means for releasing said switch, a signal, and automatic means for operating said signal whenever the subscriber's line is disconnected from said switch without releasing the same.

11. A telephone exchange trunking system comprising an automatic switch, a plug and jack by which a manual switchboard operator extends connection to said switch to control the same, a relay, means for closing an energizing circuit through said relay by the insertion of the plug in the jack, an operator's key-switch for releasing said automatic switch, a locking circuit for said relay controlled and opened by the actuation of said key-switch, a signal having a circuit closed at one point by the energizing of said relay

and closed at another point therein by the withdrawal of the plug from the jack, whereby the said signal is operated if the operator withdraws the plug from the jack
 5 without releasing the automatic switch, the said automatic switch having one motion to select a group and another motion to automatically select an idle trunk in the predetermined group.

Signed by me at Chicago, Cook county, 10 Illinois, this 2nd day of July, 1908.

TALBOT G. MARTIN.

Witnesses:

EDWARD D. FALES,
 ARTHUR B. SPERRY.