

Dec. 18, 1928.

1,695,312

H. H. ABBOTT

TELEPHONE SYSTEM

Filed April 20, 1927

2 Sheets-Sheet 1

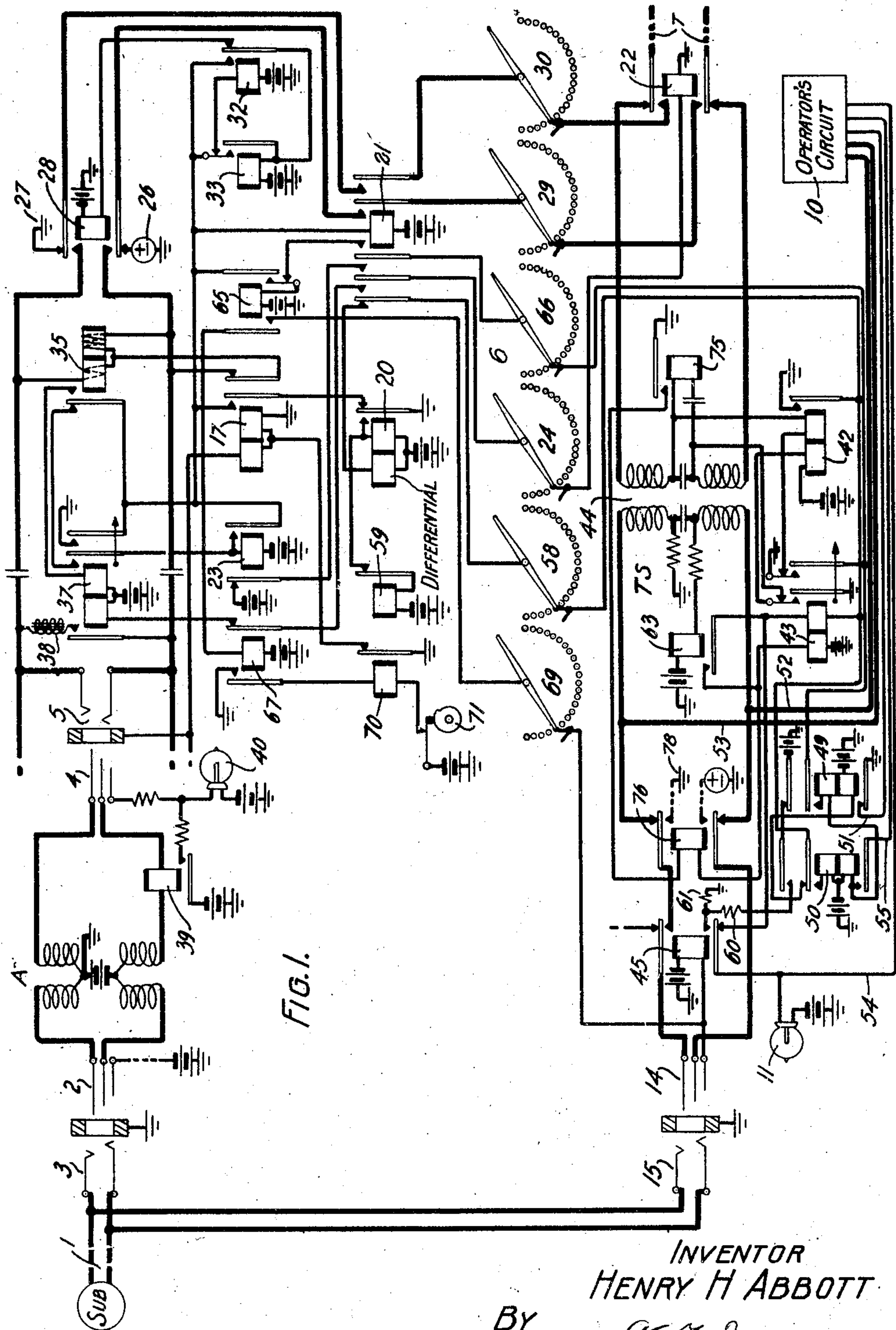


FIG. 1.

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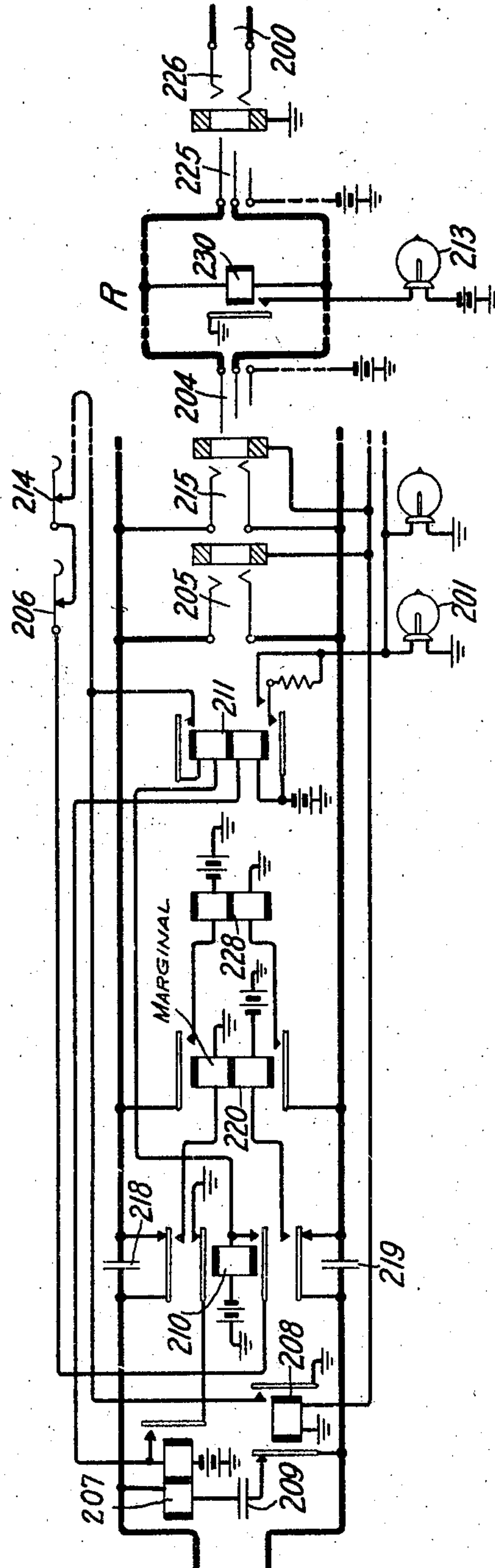
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2 Sheets-Sheet 2

FIG. 2.



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UNITED STATES PATENT OFFICE.

HENRY H. ABBOTT, OF NEW YORK, N. Y., ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK.

TELEPHONE SYSTEM.

Application filed April 20, 1927. Serial No. 185,242.

This invention relates to telephone systems and more particularly to improvements in trunking systems.

According to this invention, a trunking system comprising a plurality of trunks accessible at one end at a first and at a second position and at the other end at a third position is arranged for checking by the operator at the third position of connections over said trunks originating at the first position and completed through the second and third positions.

According to one feature of the invention, a plurality of jacks are arranged at the first position, a plurality of trunks terminating in plugs at the second position, and in jacks at the third position, with means whereby the seizure of a jack at the first position by a calling subscriber through a link circuit connects said jack through automatic switches to an idle trunk and actuates a signal associated with said trunk at the third position.

According to another feature, an operator's telephone set is automatically connected with a seized trunk at the second position in response to the actuation of a key associated with said trunk at the third position, after said trunk has been seized at the third position.

According to another feature, means is provided whereby when the plug at the second position is inserted in a multiple jack of the calling subscriber, a signal is transmitted through the jack at the first position to the link circuit for the disconnection of the calling subscriber's line from this jack.

The invention may be applied to a so-called recording and completing trunking system in which the recording and completing trunks terminate at one end in the multiple banks of switches associated with recording jacks located at A operators' positions and in plugs at toll switching operators' positions, while at the other end these trunks terminate in jacks at the recording and completing operators' positions. With the invention applied to such a system, connections from calling subscribers that are originated through the recording jacks may be checked and completed over the trunks from the recording and completing operators' positions to the calling subscriber by way of the toll switching operators' positions.

The invention has been illustrated in the accompanying drawings as applied to a system of the above mentioned type. Figure 1 shows a calling subscriber's line terminating in jacks at an A operator's position and at a toll switching operator's position. It also shows a recording and completing trunk system arranged in accordance with this invention accessible from the A operator's position and the toll switching operator's position, and an A operator's cord for connecting the calling subscriber at the A operator's position with said trunk system. One recording and completing trunk only has been shown in Fig. 1 and in Fig. 2 is shown the opposite end of this trunk terminating at a recording and completing operator's position. A recording and completing operator's cord and the incoming end of a toll line has also been shown in Fig. 2 whereby connections may be completed to wanted subscribers' lines.

Referring now to the drawings, a connection may be established from the subscriber of line 1 to the toll line 200 or from subscribers having access to line 200 to the subscriber of line 1. In establishing a connection from the subscriber of line 1 through toll line 200 to a wanted subscriber, the procedure in general is as follows: The subscriber of line 1 calls the operator at A in the usual manner, and this operator inserts her answering plug 2 of the cord A into jack 3 of line 1 and determines the type of connection desired. That is, whether a local subscriber is wanted or a subscriber that may only be reached through a toll connection. If a toll connection is desired the A operator tests a multiple recording jack in the usual manner and if jack 5, for example, is idle, she inserts calling plug 4 into this jack. This connection causes a connection to be established through switches 6 with an idle recording and completing trunk T. Switches 6 are of the ordinarily standard step-by-step continuously rotating type well known in the art. The arrangement is such that a plurality of recording jacks like 5 and their associated circuits are normally associated with individual switches like 6 which have their brushes normally resting on the terminals of an idle recording and completing trunk multiplied to said switches. A plurality of such trunks may be connected to

these switches of a number larger than the number of switches and their corresponding recording jacks.

When this connection between an A operator's cord and an idle trunk is completed, an impulse of ringing current is transmitted to the distant end of the trunk and this impulse causes a signal 201 to be lighted to indicate to the recording and completing operator of cord R that a connection is desired over this trunk. The recording and completing operator answers this call by inserting plug 204 of the cord R into jack 205 of trunk T. This causes the usual supervisory signaling in the A operator's cord A to be extinguished, indicating to the A operator that the recording and completing operator is connected to the trunk and ready to receive the information for the completion of the connection.

The recording and completing operator now asks the calling subscriber for his own number and the number of the wanted subscriber. This information is then recorded in the usual manner and the connection extended by means of cord R to the wanted subscriber through toll line 200. The recording and completing operator will now check the number of the calling subscriber by initiating a connection by way of the toll switching operator's position at TS to the calling subscriber's line 1. To this end she operates key 206 and this operation causes various actions to follow. First, the toll switching operator's lamp 11 is lighted, second, the toll switching operator's telephone set, not shown but indicated as being connected at 10, will be associated with the trunk T, third, a tone, for example, of the "double zip" type, is transmitted to the recording and completing operator as an indication that the toll switching operator is ready to receive the information, and fourth, the toll switching operator's lamp 11 is caused to flash. The flashing of lamp 11 indicates to the toll switching operator that her telephone set is connected to the recording and completing operator's telephone through the trunk T.

The recording and completing operator will now pass the number of the calling subscriber's line to the toll switching operator, whereupon the toll switching operator causes her telephone set to be removed from the trunk T and inserts plug 14 of this trunk into the multiple jack 15 of the calling subscriber's line 1. When this connection is made, the supervisory signal of the A operator's calling cord is caused to flash to indicate to this operator that the connection has been completed and that she should remove her cord from the connection. When this is accomplished, switch 6 will advance its brushes to the next idle trunk.

It should be noted that when the connection is completed from the recording and completing operator's position to the toll switch-

ing operator's position, the automatic switches associated with other recording jacks and corresponding to switches 6 will be actuated to advance their brushes to the next idle trunk. A connection is now therefore completed to the subscriber of line 1 and the wanted subscriber by way of the toll line 200 trunk T and the toll switching operator's position. This arrangement permits the recording and completing operator to check and complete toll connections.

This recording and completing trunk T may also be employed as an ordinary toll switching trunk for calls from the recording and completing operator's position to a wanted subscriber through the toll switching operator's position. In this case, the toll switching operator will be called by the recording and completing operator directly and the recording jacks and their associated circuits and apparatus are not involved. It should be understood that when a connection of this type is made, the moment trunk T is taken for use, the switch 6 and all other switches associated with the recording jacks will be advanced to connect with the next idle recording and completing trunk. These switches will therefore always be ready to connect their respective recording jacks with an idle trunk.

A more detailed description will now be made of a connection from the calling subscriber of line 1 to a wanted subscriber by way of toll line 200 and a connection in the opposite direction. When a toll connection is desired from the subscriber of line 1 and the A operator of cord A has inserted plug 4 into jack 5, an obvious circuit is completed for the operation of relay 17. The operation of this relay causes the operation of relay 21 over a circuit from battery, through the winding of relay 21, inner right hand armature and front contact of relay 17, armature and back contact of relay 20, to ground. The operation of relay 21 closes a circuit for the operation of relay 22 from battery, through the left hand armature and back contact of relay 23, middle left hand armature and front contact of relay 21, terminal bank 24, winding of relay 22, to ground.

The operation of relays 21 and 22 close connections from the ringing source and ground at 26 and 27 through the armatures and back contacts of relay 28, right hand armatures and front contacts of relay 21, terminal banks 29 and 30, armatures and front contacts of relay 22, tip and ring conductors of trunk T, through the left hand winding of ringing relay 207, condenser 209 and outer left hand armature and back contact of relay 208. The operation of relay 17 also closes an obvious circuit for the operation of relay 32 and this relay in operating closes a circuit for the operation of the relay 33 as follows: battery, winding of relay 33,

armature and front contact of relay 32, inner right hand armature and front contact of relay 17 to ground at the armature and back contact of relay 20. Relay 33 in operating
 5 opens the circuit for relay 32 and closes a locking circuit for itself through its armature and front contact. When relay 32 releases, a circuit is completed for relay 28 from battery, winding of relay 28, armature and
 10 back contact of relay 32, armature and front contact of relay 33, to ground at the armature and back contact of relay 20. The operation of relay 28 is therefore delayed for a short interval after the operation of relay
 15 21 to permit the ringing current to be applied to the trunk for the operation of relay 207 for the corresponding interval. When relay 28 does operate the ringing current is removed and the tip and ring conductors are
 20 extended through armatures and front contacts of this relay to the relay 35 bridged across the tip and ring conductors.

Ringing relay 207 in operating provides a locking circuit for itself controlled by the
 25 ground at the inner upper armature and back contact of relay 210. Relay 207 in operating completes a circuit for the operation of relay 211 as follows: battery, lower winding of relay 211, armature and front contact of
 30 relay 207, inner upper armature and back contact of relay 210, to ground. Relay 211 in operating closes an obvious circuit for the lighting of lamp 201. The lighting of this lamp indicates to the recording and complet-
 35 ing operator that a connection is desired over this trunk.

The recording and completing operator now answers this call by inserting plug 204 into jack 205 and thereby completes a circuit
 40 for the operation of relay 208. Relay 208 in operating opens the original energizing circuit for relay 207 and also closes a circuit for the operation of relay 210 as follows: battery, winding of relay 210, upper winding
 45 and upper armature and front contact of relay 211 to ground at the armature and front contact of relay 208. The operation of relay 210 opens the locking circuit for relay 207 and the original energizing circuit for relay 211. Relay 207 releases and
 50 it will be noted that on the operation of relay 210 the circuit through the upper winding of relay 211 will be short-circuited by the locking circuit for relay 210 which may now
 55 be traced from battery, through the winding of relay 210, inner lower armature and front contact of this relay, the loop through the keys 206 and 214 and other similar keys to ground at the right hand armature and front
 60 contact of relay 208. Key 206 is associated with multiple jack 205 and key 214 is associated with multiple jack 215 while other similar keys in this loop circuit are associated with other corresponding multiple
 65 jacks at other positions. Relay 211 is there-

fore now released and lamp 201 extinguished. The operation of relay 210 removes the short circuit around condensers 218 and 219 and connects battery to the ring conductor and ground to the tip conductor of trunk T at
 70 the upper and lower outer armatures and front contacts of this relay through the windings of relay 220. This battery and ground connection causes the operation of relay 35. The circuit through the tip and ring conduc-
 75 tors of trunk T extending through both the left and right hand windings of relay 35, and as the resistance of the right hand winding is high and relay 220 marginal, this latter relay will not operate at this time. It will
 80 be noted that the operation of relay 17 has caused the normal short-circuit for the high resistance winding of relay 35 to become opened at the outer right hand armature and back contact of this relay. The operation
 85 of relay 35 closes a circuit for the operation of relay 37 as follows: battery, right hand winding of relay 37, armature and front contact of relay 35, inner right hand armature and front contact of relay 17 to ground at
 90 the armature and back contact of relay 20. Relay 37, in operating closes a bridge through the retardation coil 38 for the tip and ring conductors leading to the cord A. This loop circuit causes the operation of the
 95 supervisory relay 39 in the cord circuit A and consequently the extinguishing of the supervisory lamp 40. The extinguishing of this lamp indicates to the A operator that a recording and completing operator's cord
 100 is connected to the trunk T.

The recording and completing operator will now connect her telephone set (not shown) to the cord R and ask the calling sub-
 105 scriber for the number of the wanted subscriber and the calling subscriber's own number. When the recording operator receives these numbers she will record the call in the usual manner and proceed to check the num-
 110 ber of the calling subscriber by initiating the extension of a connection to the calling subscriber through the toll switching operator's position at TS. To accomplish this, she will actuate key 206 associated with jack 205 and
 115 thus open the holding circuit for relay 210. Relay 210 in releasing removes the battery and ground from the tip and ring conductors that were supplied through the windings of relay 220 and thus short circuits the con-
 120 densers 218 and 219 by closing a connection for the tip and ring conductors through the upper and outer lower armatures and back contacts of this relay. This is for the purpose of facilitating through supervision, as will
 125 hereinafter be described. The removal of this battery and ground from the tip and ring conductors causes relay 35 to release. As relay 37 is slow to release a circuit will be momentarily closed for the operation of re-
 130 lay 23. This circuit may be traced as fol-

lows: battery, winding of relay 23, inner right hand armature and front contact of relay 37, armature and back contact of relay 35, inner right hand armature and front contact of relay 17, armature and back contact of relay 20, to ground. Relay 23 in operating closes a locking circuit through its right hand armature and front contact to the ground at the armature and back contact of relay 20. This relay in operating also opens the circuit for relay 22 so that the connection from the trunk T will now be extended through the armatures and back contacts of relay 22 to battery and ground through the windings of relay 42. The circuit for relay 42 may be traced as follows: battery, left hand winding of relay 42, inner right hand make-before-break contacts of relay 43, lower right hand winding of repeating coil 44, lower armature and back contact of relay 22, ring conductor of trunk T, lower outer armature and back contact of relay 210, ring terminals of jack 205 and plug 204, through relay 230 and returning through the tip terminals of plug 204 and jack 205, upper outer armature and back contact of relay 210, tip conductor of trunk T, upper armature and back contact of relay 22, upper right hand winding of repeating coil 44, right hand winding of relay 42, to ground at the outer right hand make-before-break contacts of relay 43. The operation of relay 42 causes lamp 11 to be lighted and relay 43 to be energized over a circuit as follows: battery, lamp 11, lower armature and back contact of relay 45, right hand winding of relay 42, armature and front contact of relay 43 to ground. Relay 43 in operating opens the original energizing circuit for relay 42 and thus removes the battery and ground from the tip and ring conductors of trunk T. Relay 42 is, however, maintained operated over a circuit as follows: battery, left hand winding of relay 42, inner right hand armature and front contact of relay 43 to ground.

It should be noted that the ground at the armature and front contact of relay 42 is connected for the operation of relay 49 over a circuit as follows: battery, lower winding of relay 49, upper inner armature and back contact of relay 50, to ground at the armature and front contact of relay 42. Relay 49 in operating closes a circuit to ground for lead 51 at its lower armature and front contact. This connection to ground causes the toll switching operator's telephone set to be connected to leads 52 and 53 through the trunk T and causes an intermittent battery connection to be made through lead 54 for the flashing of lamp 11. A tone of the "double zip" type is also applied to the ring lead 52. The circuits for accomplishing these functions form no part of this invention but are illustrated completely in the patent to Wiley Whitney, No. 1,665,338. Leads 52, 53, 51, 54 and 55 of the present application correspond

respectively to leads 12, 13, 10, 9 and 11 in Fig. 1 of the Whitney application. The double zip tone applied to lead 42 is transmitted over the ring conductors through the repeating coil 44 over trunk T to the recording and completing operator's telephone set to indicate that the toll switching operator's telephone set has now been connected to the trunk; while the flashing of lamp 11 indicates to the toll switching operator that her telephone set is connected to this particular trunk and that a connection is desired thereover.

The operation of relay 43 applies a ground at its outer right hand armature and front contact to the upper inner armature and front contact of relay 49 so that a circuit will now be completed from battery through the lower winding of relay 50 and upper winding of relay 49 to this ground. This circuit causes the operation of relay 50 and maintains relays 50 and 49 in an operated condition as long as relay 43 is operated. The operation of relay 50 opens at its upper inner armature and front contact the original energizing circuit for relay 49 and prepares, by closing a connection at the upper outer armature and front contact, a circuit for the control of lamp 11 in a manner hereinafter to be described. A separate holding circuit is also completed for this relay from battery through the upper winding and inner upper armature and front contact of relay 50 to ground at the armature and front contact of relay 42. The purpose of this holding circuit will become apparent as the description proceeds.

The ground applied at the armature and front contact of relay 42 also causes all the switches, except switch 6, to be advanced to connect their brushes with the next idle trunk. The circuits for advancing these switches may be traced as follows: As the terminals of the banks of all the switches are multiplied together the circuits that will be completed extend from battery through the left hand windings of the relays corresponding to relay 20, outer left hand armatures and back contacts of the relay corresponding to relays 21, the brushes of the terminal banks corresponding to bank 58, and the left hand armature and front contact of relay 42 to ground. These circuits cause the relays corresponding to relay 20 to be operated and these relays in operating close obvious circuits through their right hand windings which are differentially wound in respect to the left hand windings and therefore serve to cause these relays to release quickly when the original energizing circuits are opened. The stepping magnets will therefore operate to advance the brushes of the respective switches to the terminals of the next idle trunk. If the next succeeding trunks are busy, the relays corresponding to relay 20 will again be operated and thus cause the stepping magnets to continue to act until an idle trunk is found. It is obvious

that the stepping magnet 59 will not operate to advance the brushes of switch 6 as the corresponding circuit for relay 20 will not be completed at this time, due to the operated condition of relay 21.

As the telephone set of the toll switching operator is now connected to the tip and ring conductors 52 and 53 and trunk T to the recording operator's telephone set, this latter operator will now pass the number of the calling subscriber to the toll switching operator. The toll switching operator on receiving this information inserts plug 14 into jack 15 of the calling subscriber's line 1. However, previous to the insertion of this plug into jack 15, she will operate a key associated with her telephone set to remove her telephone set from the trunk. In accordance with the above mentioned patent to Wiley Whitney, a ground will under these circumstances be connected to lead 55, which as stated, corresponds to lead 11 of the Whitney application. This ground short-circuits the upper winding of relay 49 so that this relay will now release to disconnect the telephone set, while relay 50 is maintained operated as hereinbefore described. On the release of relay 49 a circuit will be completed, as soon as plug 14 is inserted in jack 15 and relay 45 is energized through the sleeve circuit, to cause lamp 11 to be shunted. This circuit may be traced as follows: battery, upper outer armature and back contact of relay 49, upper outer armature and front contact of relay 50, low resistance 60, high resistance 61 to ground. If this circuit had not been closed due to the removal of the toll switching operator's telephone set, the lamp 11 would have been lighted steadily on the operation of relay 45 through the circuit established at its lower armature and front contact to ground through the high resistance 61. If the lamp 11 had lighted steadily it would have indicated to the toll switching operator that she had neglected to remove her telephone set from the trunk.

The operation of relay 45 opens the above mentioned circuit for maintaining relay 43 operated but as the relay 43 is slow to release and as the subscriber of line 1 has already removed the receiver from the hook, a circuit will be completed on the operation of relay 45 through the tip and ring conductors of the trunk and the left hand windings of repeating coil 44 and the winding of relay 63, so that relay 63 in operating will maintain relay 43 operated over a circuit from battery, left hand winding of relay 43, armature and front contact of relay 63, right hand winding of relay 43, to ground at the armature and front contact of relay 42.

It will be noted that when relay 43 first operated, a circuit was completed for the operation of relay 65 as follows: battery, winding of relay 65 and its make-before-break contacts, inner left hand armature and

front contact of relay 21, terminal bank 66, outer right hand armature and front contact of relay 43 to ground. Relay 65 in operating opens its energizing circuit but completes a locking circuit for itself through its right hand armature and front contact to the ground at the armature and back contact of relay 20. Relay 65 in operating thus prepared a path for the operation of relay 67 which is completed on the insertion of plug 14 into jack 15 as follows: battery, winding of relay 67, left hand armature and front contact of relay 65, terminal bank 69, sleeve terminals of plug 14 and jack 15, to ground. Relay 67 in operating closes an obvious circuit for the operation of relay 70 through an interrupter 71. Thus, relay 70 will be alternately operated and released under control of the interrupter 71. A circuit will therefore be alternately closed and opened for short-circuiting the right hand high resistance winding of relay 17. As relay 37 is now released, due to the operation of relay 67 supervisory relay 39 will also be released so that the supervisory lamp 40 will be under control of the circuits through relay 17 and will therefore be alternately lighted and extinguished. This flashing of lamp 40 indicates to the A operator that the connection from the calling subscriber's line has been completed to the recording and completing operator through the toll switching operator's position TS. The A operator will therefore remove plugs 2 and 4 from jacks 3 and 5, respectively, and in removing plug 4 from jack 5, relay 17 will be released. This relay in releasing opens the holding circuit completed at its right hand armature and front contact to the ground at the armature and back contact of relay 20 for the release of relays 21, 65, 33 and 28, and relay 65 in releasing opens the circuits for relays 67 and 70. Hence, all the relays in the circuit associated with recording jack 5 and switch 6 will be released.

The switch 6 will now advance its brushes to the next idle trunk as the ground at the armature and front contact of relay 42 causes the operation of relay 20 and this relay in turn causes the operation of the stepping magnet 59. The connection being now completed between the calling subscriber's line 1 and the recording and completing operator at R, conversation may begin between the subscribers' line 1 and the wanted subscriber's line connected through toll line 200, that is after the recording operator has caused the connection to this subscriber to be completed in the usual manner over plug 225 and jack 226.

If trunk T is used as an ordinary toll switching trunk for calls originating at the recording and completing operator's position, the recording and completing operator will after having received a call from a sub-

scriber having access to toll line 200 insert plug 204 into jack 205 to extend the connection to the wanted subscriber. The immediate effect of this connection will be the operation of relay 208. The operation of relay 208 removes the ringing relay 207 from across the tip and ring conductors. A circuit is also completed through relay 230 for the operation of relay 42 as hereinbefore described. Relay 42 in operating applies ground at its armature and front contact for the advance of switch 6 and all other switches associated with other recording jacks to the next idle trunk. This ground at the armature and front contact of relay 42 also causes the operation of relay 43 and the lighting of lamp 11 as well as the automatic connection of the toll switching operator's telephone set to trunk T as hereinbefore described. The connection of this telephone set to trunk T causes, as hereinbefore described, a double zip tone to be applied to trunk T to indicate to the recording and completing operator that the toll switching operator's telephone set has been connected and also causes the flashing of lamp 11 to indicate to the toll switching operator that her telephone set has been connected to the trunk T.

The recording and completing operator will now pass the number of the wanted subscriber to the toll switching operator and the toll switching operator will then remove her telephone set from the trunk and insert plug 14 into jack 15 of the wanted subscriber's line 1. The connection to the wanted subscriber causes the operation of relay 45. Relay 45 in operating opens the circuit for relay 43 and this relay will now release to connect battery and ground through the windings of relay 42 to the tip and ring conductors of trunk T to cause the lamp 213 to be lighted by the operation of relay 230. On receiving this signal the recording and completing operator will apply ringing current to the cord R in the usual manner and thus cause the operation of relay 75, and relay 75 in operating causes the operation of relay 76 and relay 43. The operation of relay 43 maintains relay 42 operated during the ringing period and relay 76 applies ringing current from source 78 to the calling subscriber's line 1.

When the called subscriber answers, relay 63 is operated after ringing relay 76 is released due to the ceasing of the ringing and relay 42 is thus maintained operated as hereinbefore described. Relay 42 maintains this trunk busy by applying the ground at its armature and front contact to the bank 58. The purpose of operating relay 43 was, as stated, to maintain relay 42 operated during the ringing period as it is well known in the art, that when the ringing key is operated the direct current loop through the cord R is opened. When the ringing ceases and the

wanted subscriber answers relay 63 operates. This operates relay 43 which removes battery and ground from trunk T and then the supervisory signal 213 will be extinguished through the release of relay 230. Conversation between the calling subscriber and the called subscriber may now begin.

When the called subscriber hangs up his receiver on the hook, the relay 63 releases causing the release of relay 43 and thus causes the supervisory signal 213 to be lighted and the recording and completing operator may now take down the connection by removing plugs 204 and 225 and jacks 205 and 226, respectively. Upon the removal of plug 204, relays 208 and 41 will release. Relay 42 in releasing, releases relay 50, and the short circuit through lamp 11 is thus removed so that this lamp now lights to indicate to the toll switching operator that disconnection is desired. The toll switching operator, by removing plug 14 from jack 15 causes the return of the circuit at this end of the trunk, to normal.

It should be understood that the trunking system described in this specification is merely illustrative of one application of the invention and that the various features of the invention may readily be adapted to other systems having similar traffic conditions to meet without departing from the spirit of the invention.

What is claimed is:

1. In a telephone system, a trunk accessible at one end from a first operator's position and terminating at the same end at a second operator's position and at the other end at a third operator's position, a subscriber's line having connecting terminals at the first and second positions, a link circuit at the first position for connecting said subscriber's line to said trunk, a signal at the third position, means responsive to the connection of said link circuit to said trunk for actuating said signal, an operator's telephone set at the second position, means controlled from the third position for automatically connecting said telephone set to the trunk, means at the second position for connecting said trunk to said subscriber's line, a signal at the first position, and means responsive to such a connection at the second position for actuating the signal at the first position.

2. In a telephone system, a first, a second and a third operator's position, a plurality of trunks, one end of said trunks terminating at the second position in individual connecting terminals and at the other end at the third position in individual connecting terminals, a plurality of sets of connecting terminals at the first position, an automatic switch associated with each of said sets of connecting terminals at the first position, a subscriber's line having connecting terminals at the first and second positions, a link circuit at the first

position for connecting said subscriber's line with any set of connecting terminals at this position, a signal associated with each of said trunks at the third position, means responsive to the connection of said link circuit with one of said sets of connecting terminals at the first position for automatically connecting said set of terminals with an idle trunk through the associated switch and for actuating the signal associated with said trunk at a third position, an operator's telephone set at the second position, means controlled from the third position through said trunk for automatically connecting said telephone set to said trunk, means at the second position for connecting said trunk to said subscriber's line, a signal at the first position, and means responsive to such a connection at the second position for actuating the signal at the first position.

3. In a telephone system, a first, a second and a third operator's position, a plurality of trunks, one end of said trunks terminating at the second position in individual connecting terminals and at the other end at the third position in individual connecting terminals, a plurality of sets of connecting terminals at the first position, an automatic switch associated with each of said sets of connecting terminals at the first position, a subscriber's line having connecting terminals at the first and second positions, a link circuit at the first position for connecting said subscriber's line with any set of connecting terminals at this position, a signal associated with each trunk at the third position, means responsive to the connection of said link circuit with one set of connecting terminals at the first position for automatically connecting said set of terminals with an idle trunk through the associated switch and for actuating the signal associated with said trunk at the third position, an operator's telephone set at the second position, means controlled from the third position through said trunk for telephonically disconnecting said set of connecting terminals at the first position from said trunk for automatically actuating all switches except the one associated with the seized set of terminals at the first position to associate their brushes with the next idle trunk and for automatically connecting said telephone set to said trunk, means at the second position for connecting said trunk to said subscriber's line, a signal at the first position, means responsive to such a connection at the second position for actuating said signal at the first position, and means responsive to the disconnection of the link circuit from the seized set of terminals at the first position for automatically actuating the associated switch to connect its brushes with the next idle trunk.

4. In a telephone system, a trunk accessible at one end from a first position and termi-

nating at the same end at a second position and at the other end at a third position, sets of connecting terminals at the first position, an automatic switch associated with each set of connecting terminals and having access to said trunk, a subscriber's line terminating at the first and at the second positions, a link circuit at the first position for connecting said subscriber's line to any set of connecting terminals thereat, a signal at the third position, means responsive to the seizure of a set of terminals by said link circuit for automatically connecting said set of terminals to the trunk through the associated switch and for actuating said signal, an operator's telephone set at the second position, means controlled from the third position for automatically connecting said telephone set to the trunk, means for connecting said subscriber's line to the trunk at the second position, a signal associated with said link circuit, and means responsive to the last mentioned connection for actuating said link circuit signal.

5. In a telephone system, a trunk accessible at one end from a first position and terminating at the same end at a second position, and at the other end at a third position, sets of connecting terminals at the first position, an automatic switch associated with each set of connecting terminals and having access to said trunk, a subscriber's line terminating at the first and at the second positions, a link circuit at the first position for connecting said subscriber's line to any set of connecting terminals thereat, a signal at the third position, means responsive to the seizure of a set of terminals by said link circuit for automatically connecting said set of terminals to the trunk through the associated switch and for actuating said signal, an operator's telephone set at the second position, a key at the third position, means responsive to the actuation of said key for automatically connecting said telephone set to the trunk and for telephonically disconnecting the seized set of terminals at the first position from the trunk, means for connecting said subscriber's line to the trunk at the second position, a signal associated with said link circuit, and means responsive to the last mentioned connection for actuating said link circuit signal.

6. In a telephone system, a trunk accessible at one end from a first position and terminating at the same end at a second position and at the other end at a third position, means for establishing a telephonic connection from the first position to the third position over said trunk, and means for establishing a telephonic connection from the third position to the second position over said trunk and for disabling said first mentioned telephonic connection.

7. In a telephone system, a plurality of trunks accessible at one end from a first po-

sition and terminating at the same end at a second position, and at the other end at a third position, a plurality of switches, means for establishing a telephonic connection over
5 any one of said switches from the first position to an idle trunk, and means for establishing a telephonic connection over said idle

trunk from the third position to the second position and for disabling the first mentioned telephonic connection.

In testimony whereof, I have signed my name to this specification this 19th day of April, 1927.

HENRY H. ABBOTT.