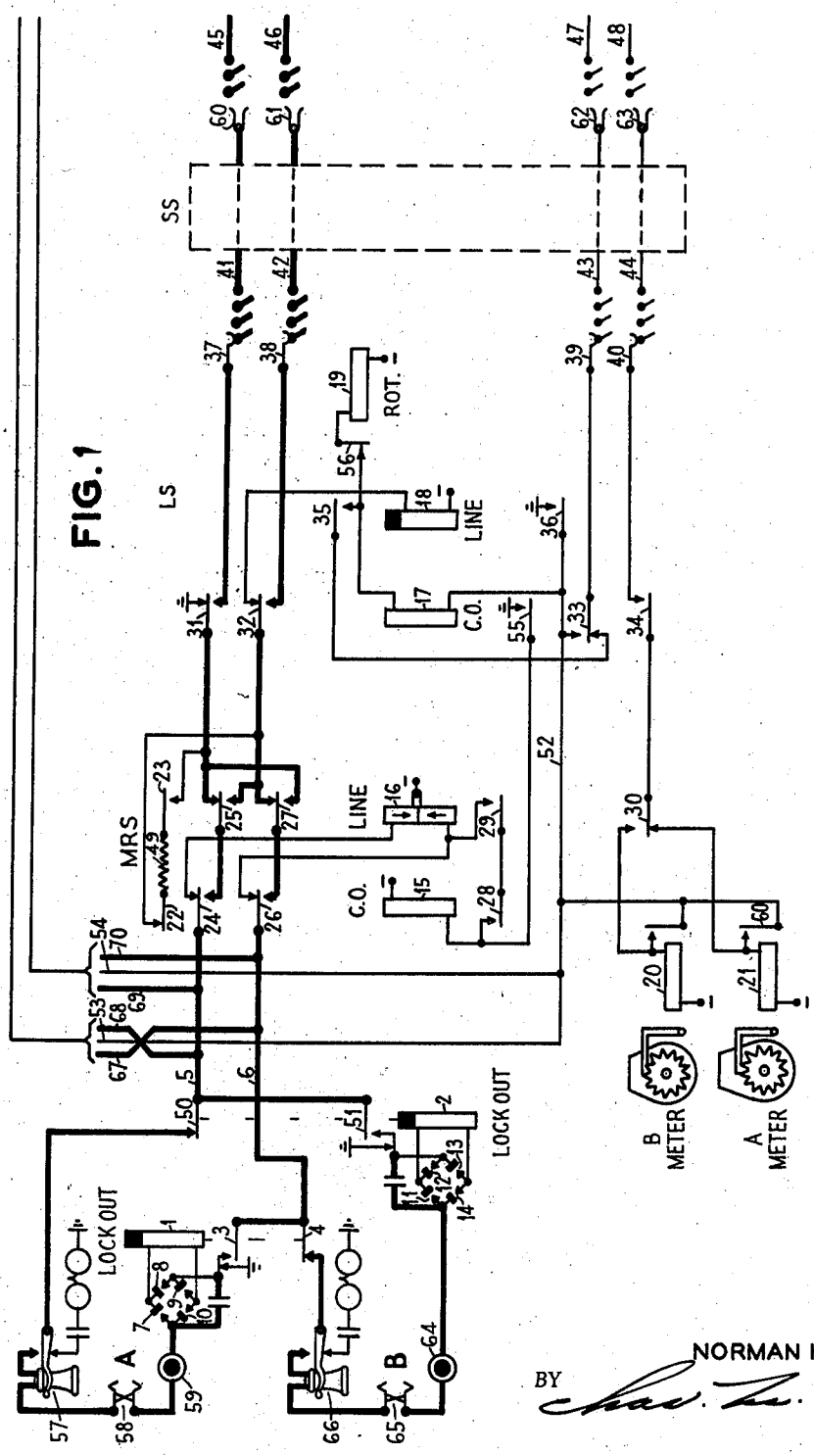
Jan. 3, 1939. N. H. SAUNDERS 2,142,658

TELEPHONE SYSTEM

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FIG. 1



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TELEPHONE SYSTEM

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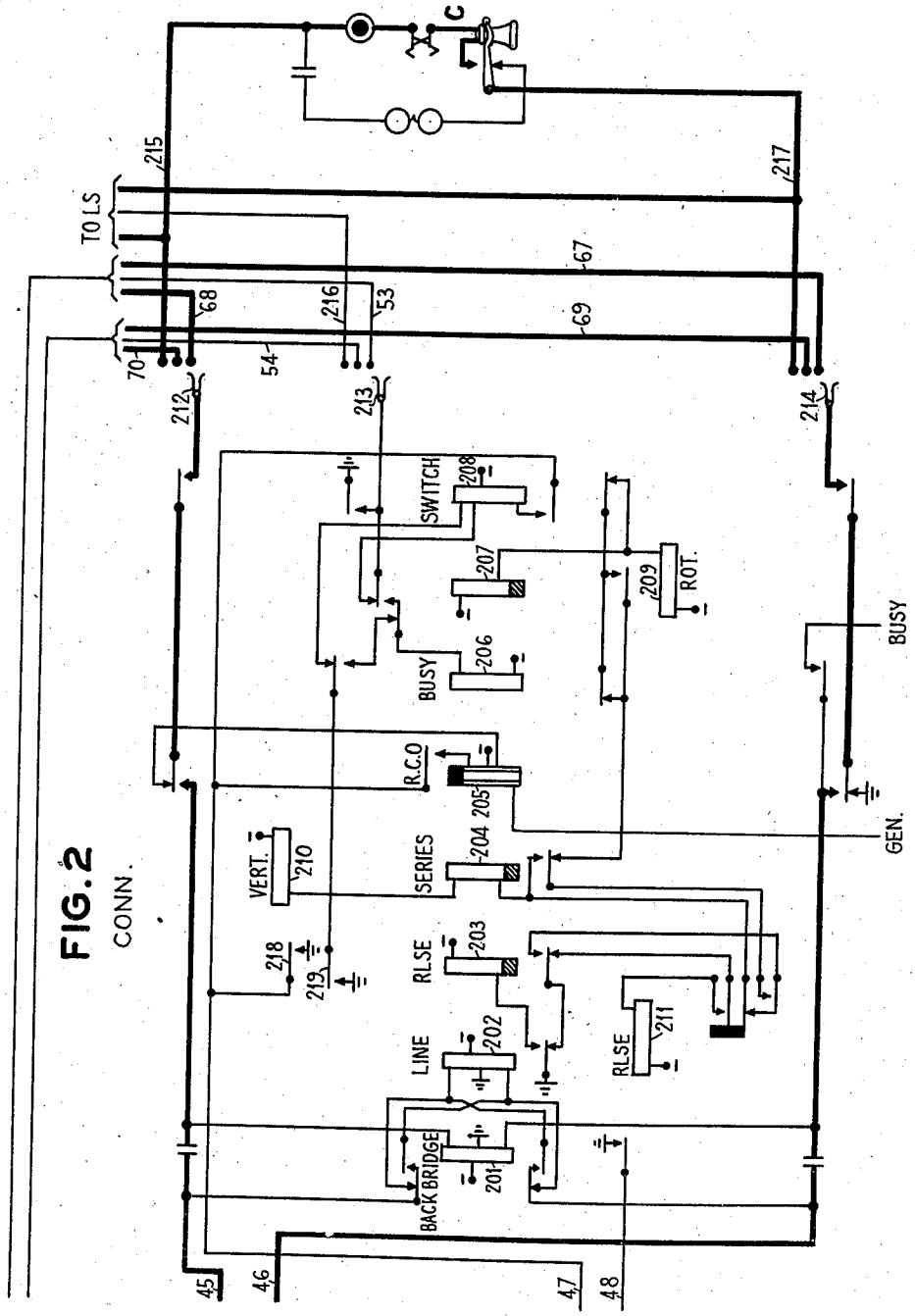


FIG. 2

CONN.

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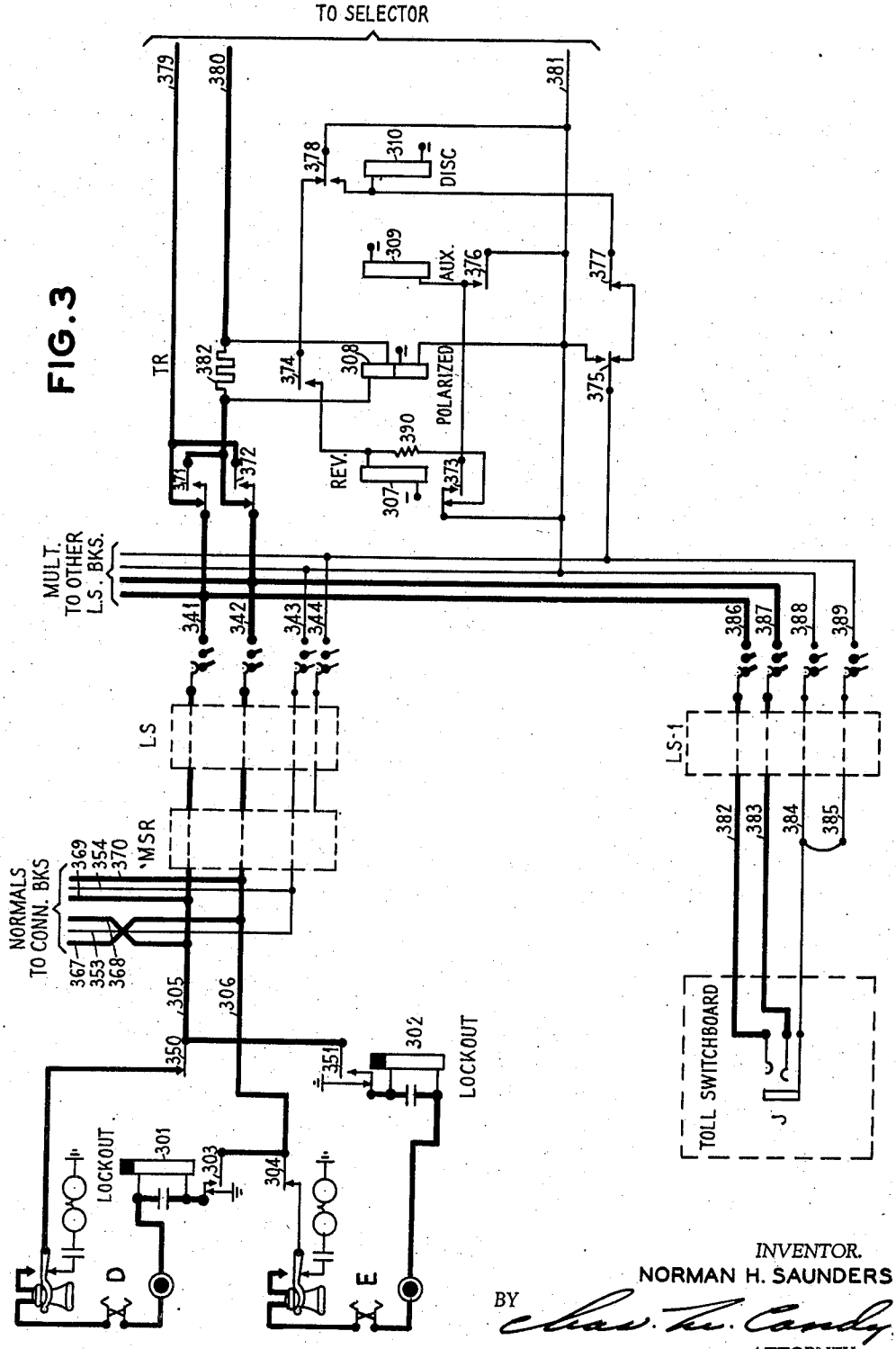
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TELEPHONE SYSTEM

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FIG. 3



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UNITED STATES PATENT OFFICE

2,142,658

TELEPHONE SYSTEM

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Application November 9, 1936, Serial No. 109,870

18 Claims. (Cl. 179—17)

The present invention relates in general to telephone systems, but more particularly to automatic telephone systems which are arranged to give party line service to the subscribers.

The object is to provide new and improved party line lockout equipment for systems of this type. More specifically, the object is to provide party line lockout equipment that is adapted to operate in conjunction with automatic switching apparatus of the type that reverses the direction of current flow over a line when a called subscriber answers.

One of the features of the invention relates to an arrangement for preventing the reversal of the direction of current flow over the talking conductors of a party line from affecting the party line lockout apparatus.

Another feature of the invention relates to the manner in which the direction of current flow over a calling subscriber's line is maintained in the same direction, regardless of the number of current reversals over the conductors of the trunk.

Another feature of the invention relates to a trunk relay group that is arranged to prevent the direction of current flow from being reversed over a calling subscriber's line, and permits the direction of current to be reversed over a manual operator's trunk, when an operator extends a connection.

A further feature relates to the manner in which the calling subscriber's meter is selected by the meter selecting relay group.

These and other features of the invention will be apparent from the following detailed description of the invention.

Referring now to the drawings, comprising Figs. 1 to 3, inclusive, there is shown by means of the usual circuit diagrams sufficient of the apparatus in an automatic telephone system to enable the invention to be readily understood.

Fig. 1 shows two subscribers' stations A and B together with their associated lockout relays 1 and 2, respectively, and their associated rectifying units. The line conductors 5 and 6, accessible to both subscribers' stations, terminate in the meter selecting relay group MSR. The lineswitch LS is a standard rotary lineswitch of the type disclosed in Patent 1,693,027, granted to John Erickson, November 27, 1928. This switch is of the step-by-step type in which the wipers move in a forward direction only, and in which the wipers are advanced when the stepping magnet retracts its armature rather than when it attracts its armature. The lineswitch LS is provided to extend a calling subscriber's line to a trunk line terminating in an idle selector switch SS. It should be understood that each two-party line in the system is equipped with a meter selecting relay group and a lineswitch such as meter selecting relay group MSR and lineswitch LS. The selector switch SS is of the well known Strowger type wherein the wipers are stepped up to the desired level under control of a calling subscriber's dial, and then automatically rotated to find an idle connector switch, such as connector switch Conn. shown in Fig. 2.

Fig. 2 shows a connector switch Conn., which is of the well known Strowger type and is controlled by the last two digits of a called subscriber's number transmitted by a calling subscriber. The wipers of the switch are raised to the desired level and then rotated to the set of bank contacts to which the called subscriber's station is connected. A called subscriber's station C is shown to the right of the connector.

Fig. 3 shows a modification of the invention. The subscribers' stations D and E and the party line lockout relays 301 and 302 are the same as the subscribers' stations A and B and party line lockout relays 1 and 2 shown in Fig. 1. However, the rectifying units connected to the windings of relays 1 and 2, in Fig. 1, are not used with the party line lockout relays 301 and 302. The dotted rectangles designated MSR and LS contain the meter selecting relays and lineswitch and since they are the same as those shown in Fig. 1 they have not been shown in detail. Below the subscriber's line equipment is shown a toll operator's position and jack J terminating in a lineswitch LS—1. The operator at the toll switchboard can extend a call from a distant manual exchange to a wanted subscriber in the automatic exchange. It should be understood, however, that the operator's cord at the toll switchboard is equipped with a calling device or dial to control the automatic switches when she plugs in at jack J. The trunk relays TR, which are accessible to lineswitches LS and LS—1, perform the same functions as the rectifying units individual to the subscribers' lockout relays shown in Fig. 1. Briefly, the trunk relays TR prevent the reversal in the direction of current flow over the talking conductors of a trunk from flowing over a calling subscriber's line. When a call is set up by the operator at the toll switchboard, the trunk relays TR permit the reversals of current in the talking conductors of the trunk so that the operator may receive the usual reverse battery supervision.

Throughout the drawings numerous types of relays, well known in the automatic telephone art, are shown. Slow-to-operate relays are shown having a full black upper section, and slow-to-release relays are shown having a cross-hatched lower section.

A detailed description of the apparatus involved in the invention will now be given. It will be assumed for the purpose, that the subscriber at station A desires to call a subscriber at station C. When the subscriber at station A removes his receiver, a circuit is completed for line relay 16 of the meter selecting relays MRS over the following path: ground at the normally closed contacts controlled by armature 3 of the lockout relay 1, rectifier 8, winding of lockout relay 1, rectifier 10, transmitter 59, impulse springs 58, receiver and switchhook 57, armature 50, conductor 5 of the common line, armature 24, upper winding winding of line relay 16 to battery. Line relay 16 operates over this circuit, but due to the high resistance of relay 16, relay 1 does not operate. Line relay 16 completes a circuit for line relay 18 of the lineswitch LS at armature 23 and prepares a circuit for its lower winding at armature 29. The closing of the contacts at armatures 25, 27, and 30 by relay 16 are of no importance at this time. The operating circuit of line relay 18 is as follows: ground, armature 31 of the cut-off relay 17, armature 23, resistance 49, armature 22, armature 32, winding of slow-to-operate line relay 18 to battery. Line relay 18, upon operating, places a ground potential on the private normal conductors 53 and 54, by way of conductor 52 and armature 36, to busy the test contacts in the banks of the connector switch, thereby making the line busy to incoming calls.

It will be assumed that the first trunk to the selector switches such as SS is busy and that the test wiper 39 encounters a ground thereon. A circuit is then closed for the rotary magnet 19 from the grounded test conductor encountered by wiper 39, armature 33 and its resting contact, armature 35 and its front contact, self interrupting contacts 56 of the rotary magnet, winding of the rotary magnet 19, to battery. It will be noted that the cut-off relay 17 is short circuited by the ground at armature 35 and its front contact and ground at armature 36 of the line relay. The rotary magnet 19 operates over the above circuit and at its self interrupting contacts 56 opens its initial energizing circuit, thereby advancing the wipers 37–40, inclusive, to the next set of bank contacts. It will be assumed that the trunk comprising conductors 41–44, inclusive, is the first idle trunk found by the lineswitch, and therefore, the test wiper 39 does not encounter ground on the test conductor 43, and the shunt around the winding of the cut-off relay 17 is accordingly removed. A circuit is now completed for the cut-off relay 17 in series with the rotary magnet 19, from ground at armature 36 of the line relay 18, winding of cut-off relay 17, self interrupting contacts 56 of the rotary magnet, winding of rotary magnet 19, to battery. The cut-off relay 17 operates over this circuit, but due to the high resistance of the cut-off relay, rotary magnet 19 does not operate. Cut-off relay 17 upon operating transfers the loop circuit for operating line relay 18 to the line relay of the selector switch SS at armatures 31 and 32.

Since the selector switch SS is shown in skeleton form, it should be understood that the upper winding of the line relay of the selector switch is in series with trunk conductor 41 and is connected to battery, and the lower winding of the line relay is in series with the trunk conductor 42 and is connected to ground. Therefore, a circuit may be traced from battery, upper winding of the line relay of the selector (not shown), trunk conductor 41, wiper 37 of the lineswitch, armature 31 and its front contact, armature 23 and its front contact, resistance 49, armature 22 and its resting contact, armature 32 and its front contact, wiper 38, conductor 42, through the lower winding of line relay of the selector (not shown) to ground. The selector SS is prepared for operation in the usual way and ground is returned over the release trunk conductor 43 to maintain the cut-off relay 17 operated after slow-releasing line relay restores to normal.

Referring again to the operation of cut-off relay 17, a locking circuit is completed for itself from the grounded release trunk conductor 43, wiper 39 of the rotary lineswitch LS, armature 33 and its front contact, winding of cut-off relay 17, self interrupting contacts 56 of the rotary magnet, winding of rotary magnet 19, to battery. In addition, the conductor 52 is grounded to maintain the busy condition on the private normal conductors 53 and 54, and at armature 55 an obvious circuit is completed for the cut-off relay 15 of the meter selecting relay group MSR. Cut-off relay 15, upon operating, completes a circuit for the lower winding of line relay 16, from ground at armature 55, armature 28, armature 29, lower winding of line relay 16, to battery. The windings of line relay 16 oppose each other thereby causing the relay to fall back. At armatures 24 and 26, cut-off relay 15 connects the line relay (not shown) of the selector switch SS through to the calling subscriber's line conductors 5 and 6. The lockout relay 1 now operates in series with the upper winding of the line relay of the selector and at armature 3 completes the loop circuit to both windings of the line relay of the selector SS by way of conductors 5 and 6. At armature 4, lockout relay 1 disconnects the subscriber at station B from the line conductor 6, thereby eliminating the possibility of the subscriber at station B from interfering with the call being extended by the subscriber at station A.

It should be noted that with line relay 16 of the meter selecting relay MSR deenergized, and with the cut-off relay 17 of the lineswitch LS energized, a circuit is prepared for the meter 21 in order that the meter assigned to the subscriber at station A may be operated when the wanted subscriber answers the call.

The calling subscriber at station A now dials the first digit of the wanted subscriber's number and the wipers 60–63 of the selector are raised to the level in which the group of trunks extending to the proper hundred group of connectors are accessible. The selector rotates in the usual manner and selects an idle trunk, which for convenience will be assumed to be the trunk comprising conductors 45–48 which terminate in connector Conn. of Fig. 2.

The loop circuit including the calling subscriber's station is now extended over the wipers 60 and 61 of the selector SS, conductors 45 and 46 of the seized local connector trunk, upper and lower normally closed contacts on the back bridge relay 201, upper and lower windings of line relay 202, to battery and ground, respectively.

The detailed operation of a connector is well known to those familiar with automatic telephone systems and only a brief description will be given of its operation. The line relay, upon operating

over the above described circuit, closes a circuit for release relay 203, thereby preparing the connector circuit for further operation in response to the impulses dialled by the calling subscriber. At armature 218, release relay 203 grounds conductor 47 to maintain the cut-off relay 17 of the line switch LS and cut-off relay 15 of the meter selecting relay group MSR energized and also maintain the busy condition of the private normals 53 and 54. In response to the dialling of the second digit by the calling subscriber, the vertical magnet 210 is operated in series with series relay 204 to step the wipers 212–214 of the connector Conn. to the level on which the contacts of the called subscriber's line are located. After this second digit has been dialled the series relay 204 falls back and prepares the impulsing circuit for the rotary magnet 209 and relay 207. Line relay 204 follows the impulses of the final digit of the wanted subscriber's number, thereby controlling the rotary magnet 209 to rotate the wipers 212–214 to the desired line. Relay 207 remains energized a short time after the wipers of the switch have been positioned to the called subscriber's line.

It will be assumed that the wipers 212–214 have been raised to the proper level and rotated to the called subscriber's line which, in this case, is the subscriber at station B. Therefore, the wipers are in engagement with the conductors 215–217, respectively. If the calling line is busy when the wipers engage the conductors 215–217 a ground potential will be encountered on conductor 216 by wiper 213. A circuit is then completed for the busy test relay 206 by way of the front contacts of the slow-to-release relay 207 and the test wiper 213. When the slow-to-release relay 207 finally restores to normal a locking circuit is completed for the busy test relay 206 by way of its upper armature and front contact and ground at armature 219 of release relay 203. At its lower armature busy test relay 206 connects the busy tone from the busy conductor to the calling subscriber's line to indicate that the wanted subscriber's line is busy. The calling subscriber will hang up his receiver and the entire connection will automatically restore to normal.

It will now be assumed that the wanted subscriber's line is idle when the wipers 212–214 of the connector Conn. engage the conductors 215–217. When the called subscriber's line is idle, the slow-to-release relay 207 subsequently falls back and a circuit is completed from ground at armature 219 of the release relay 203, upper armature and resting contact of busy relay 206, upper winding of switching relay 208, upper armature and resting contact of relay 207, wiper 213, conductor 216, to battery by way of the cut-off relay and rotary magnet of the called subscriber's lineswitch, similar to the lineswitch LS of Fig. 1. Switching relay 208 and the cut-off relay operate in series. The cut-off relay clears the talking conductors of the called line of attachments. The switching relay 208, upon operating, completes a locking circuit for its lower winding from ground at armature 218. At its lower armature switching relay 208 prepares the circuit for the ring cut-off relay 205, and at its upper armature connects the ringing generator through the lower winding of relay 205 to the called subscriber's line. The ringer at the station B responds to the ringing current transmitted over the line conductor 215, thereby signalling the wanted subscriber. When the called subscriber at station B removes his receiver ring-cut-off relay 205 operates and locks itself by way of its inner upper armature to the ground at armature 218. At its upper and lower armatures, ring-cut-off relay 205 connects the called subscriber's line through to the upper and lower windings of back bridge relay 201. Back bridge relay 201 operates and completes a circuit from ground at its lower armature, conductor 48, wiper 63, conductor 44, wiper 40, armature 34, armature 30 and its resting contact, winding of the meter 21, to battery. The meter at 21 operates and at armature 60 completes a locking circuit for itself from the grounded conductor 52.

It is the usual practice in automatic telephone systems to reverse the battery over the calling subscriber's line when the called subscriber answers the call. When a manual operator extends a connection to a subscriber in an automatic system, the reversal of battery is provided for supervision, to indicate to an operator when a called subscriber answers and disconnects. When a local subscriber in an automatic telephone system completes a connection the reversal of battery is transmitted back over his line either to operate the coin collect mechanism when the line is a pay station line, or to operate a meter when the calling line is to be metered for each call. In the present system, however, we do not want the reversal of battery over the calling subscriber's line to disconnect the operated lockout relay. Therefore, the rectifying units are provided in the circuit of the lockout relay so that regardless of the direction of current flow in the calling subscriber's line, the current flow through the operated lockout relay remains in the proper direction to maintain the relay operated.

Attention is called to the fact that battery was connected by way of the upper winding of the line relay 202 and the normally closed contacts of the back bridge relay 201 to the trunk line conductor 45 and that ground was connected by way of the lower winding of line relay 202 and the normally closed contacts of back bridge relay 201 to the trunk line conductor 46. Lockout relay 1 of the calling subscriber's station was operated over the loop circuit including both windings of line relay 202. Referring again to the operation of the back bridge relay 201. It will be noted that at its inner lower armature and front contact relay 201 connects battery through the winding of line relay 202 to conductor 46, and that ground is connected from the lower winding of relay 202 through the upper make contact of back bridge relay 201 to conductor 45. The loop circuit will now be traced and will include the winding of lockout relay 1. The loop circuit is as follows: ground, lower winding of line relay 202, upper armature and make contact of back bridge relay 201, conductor 45, wiper 69, conductor 41, wiper 37, armature 31, armature 25, armature 24, conductor 5, armature 50, receiver and switch-hook 57, impulse springs 58, transmitter 59, rectifying unit 7, winding of lockout relay 1, rectifying unit 9, armature 3, conductor 6, armature 26, armature 27, armature 32, wipers 38, conductor 42, wipers 61, conductor 46, inner armature and make contact of the back bridge relay 201, upper winding of line relay 202, to battery. The lockout relay 1 is maintained energized over this circuit since the direction of current flow through its windings is in the same direction as its initial energizing circuit. Due to the arrangement of the rectifying units 7–10 the current flow over the sub-

scriber's line conductors 5 and 6 can be in either direction but the direction of current flow through the winding of the lockout relay 1 remains the same.

As a further result of the operation of relay 201, a circuit is completed from ground at its lower armature, conductor 48, wiper 63 of the selector SS, conductor 44, wiper 40 of the line switch LS, armature 34, armature 30 and its resting contact, winding of the meter 21 to battery. The meter 21 operates over the above-traced circuit and locks itself up by way of armature 60 to the grounded conductor 52. The locking circuit for the meter is provided to prevent reoperation of the meter during the time the connection is established, in the event that the called subscriber has momentarily operated his switchhook and caused the deenergization of back-bridge relay 201. The operation of the meter individual to the subscriber at substation A, thereby records the connection.

The required connection has now been completed. The calling line is supplied with talking current through the windings of relay 202 and the called line is supplied with talking current through the windings of relay 201. The talking circuit has been drawn in by means of heavy lines and will therefore be readily traced.

After the conversation between the called and calling subscribers is completed they hang up their receivers. It will be assumed that the subscriber at station C hangs up first. Therefore, back bridge relay 201 restores to normal. The current flow over the trunk conductors 45 and 46 is again reversed back to its normal direction. The battery through the upper winding of line relay 202 is now connected to conductor 45 and ground through the lower winding of line relay 201 is connected to conductor 46. When the subscriber at station A hangs up his receiver the loop circuit for the line relay 202 is opened and it accordingly restores to normal. Shortly thereafter release relay 203 falls back and a circuit is then completed for the release magnet 211 which restores the entire switch to normal. Selector switch SS restores to normal in the usual manner and since ground is removed from the test wiper 39 of the lineswitch LS cut-off relay 17 and cut-off relay 15 both restore to normal and the meter 21 falls back when ground is removed from conductor 52. Lockout relay 1 also falls back and at armature 4 again connects the line conductor 6 through to the subscriber at station B.

A description will now be given of the operation that takes place when a subscriber at station B, connected to the same line as the subscriber at station A, desires to extend a connection to the subscriber at station C. When the subscriber at station B removes his receiver, a circuit is completed for line relay 16 over the following path: ground at the normally closed contacts controlled by armature 51 of the lockout relay 2, rectifying unit 12, winding of lockout relay 2, rectifying unit 14, transmitter 64, impulse springs 65, receiver and switchhook 66, armature 4, conductor 6, armature 26, lower winding of line relay 16 to battery. Line relay 16 operates over this circuit, but due to the high resistance of line relay 16, lockout relay 2 does not operate at this time. At armature 23 and its front contact, line relay 16 again completes the loop circuit for operating the line relay 18 of lineswitch LS. The operation of the lineswitch LS has been previously described and it will be sufficient to state that the rotary magnet advances its wipers step by step to the first idle trunk extending to a selector switch.

It will be assumed for the purpose of this description that the first idle trunk encountered by the test wiper 39 is the trunk comprising conductors 41–44, inclusive, extending to selector switch SS. The cut-off relay 17 operates as before, when the idle trunk is encountered, and at armature 55 completes a circuit for the cut-off relay 15 of the meter selecting relays MSR. Cut-off relay 15 operates over this circuit and at armature 28 completes a holding circuit for line relay 16 by way of armature 29 and the lower winding of relay 16 to battery. Cut-off relay 15 also disconnects both windings of line relay 16 from the line conductors 5 and 6 at armatures 24 and 26 and their resting contacts, opens the loop circuit including resistance 49 at armature 22, and at the front contacts of armatures 24 and 26 connects the line relay (not shown), of the selector switch SS through to the calling line conductors 5 and 6.

As has been mentioned before, the upper winding of the line relay of the selector switch is connected in series with battery and the trunk conductor 41. Therefore, a circuit is completed for lockout relay 2 from ground at the normally closed contacts controlled by armature 51, rectifier 12, winding of lockout relay 2, rectifier 14, transmitter 64, impulse springs 65, receiver and siwtchhook 66, armature 4, conductor 6, armature 26, armature 27 of operated relay 16, armature 31, wiper 37, conductor 41, upper winding of the line relay (not shown) of selector SS. Lockout relay 2 energizes over this circuit and at armature 51 and its front contact completes the loop circuit by way of conductor 5, armature 24 and its front contact, armature 25 and its front contact, armature 32 and its front contact, wiper 38, conductor 42, through the lower winding of the line relay (not shown) in the selector switch SS, to ground. The line relay of the selector is operated over this loop circuit and prepares the selector for operation in the usual way, ground is returned over the release trunk conductor 43 and test wiper 39 to maintain the cut-off relay 17 operated after the line relay 18 restores, and conductor 52 is grounded to busy the private normal conductors 53 and 54.

It should be noted that line relay 16 is locked up in an energized position from ground at armature 55, and at armature 30 and its front contact has prepared a circuit for the meter 20 assigned to the subscriber at station B. Furthermore, attention is called to the fact that lockout relay 2 has now disconnected the subscriber at station A from the common line conductors 5 and 6 at armature 50. It will now be assumed that the subscriber at station B has dialled the first digit and the wipers of the selector switch SS are in engagement with the trunk conductors 45–48, inclusive, extending to the connector switch Conn. shown in Fig. 2. Since the operation of the connector has been described more or less in detail hereinbefore, it will further be assumed that the calling subscriber has dialled the second and third digits of the wanted subscriber's number and that the wipers 212–214, inclusive, of the connector switch Conn., have been positioned into engagement with the called subscriber's line, which in this case is assumed to be the subscriber at station C. The called subscriber at station C removes his receiver when he hears his bell ring and consequently causes the operation of the

ring-cut-off relay 205. Relay 205 locks up as before and causes the operation of back-bridge relay 201. In response to the operation of the back bridge relay 201, a circuit is completed from ground at its lower armature, conductor 48, wiper 63, conductor 64, wiper 40, armature 34, armature 30 and its front contact, winding of the meter 20, to battery. Meter 20 operates and at its right-hand armature completes a locking circuit for itself from the grounded conductor 52. In addition, back-bridge relay 201 causes the reversal in the direction of current flow over the talking conductors 45 and 46. The circuit for maintaining line relay 202 of the connector and lockout relay 2 of the calling subscriber's line energized may now be traced over the following path: ground, lower winding of line relay 202, upper armature and front contact of back bridge relay 201, conductor 45, wiper 50, conductor 41, wiper 37, armature 31, armature 27, armature 26, conductor 6, armature 4, receiver and switchhook 66, impulse springs 65, transmitter 64, rectifier unit 11, winding of lockout relay 2, rectifier unit 13, armature 51, conductor 5, armature 24, armature 25, armature 32, wiper 38, conductor 42, wiper 61, conductor 46, inner lower armature and front contact of back-bridge relay 201, upper winding of line relay 202, to battery. It will be noted that the direction of current flow over the common line conductors 5 and 6 has been reversed but that the direction of current flow through the lockout relay 2 remains the same. The conversation between the subscriber at station B and the subscriber at station C may now take place, and when the conversation is completed both subscribers hang up their receivers. The equipment is accordingly restored to normal in the same manner as has been described hereinbefore.

A description has been given of the operation of the equipment when the subscribers on a two-party line extend connections to other subscribers in the telephone exchange. A description will now be given of the operation of the equipment when another subscriber in the telephone exchange extends a connection to the subscriber at station A. It will be further assumed, that the subscriber has removed his receiver, thereby causing the operation of his lineswitch to seize a selector similar to selector switch SS, that the selector has been stepped by the dialling of the first digit into engagement with the trunk conductors 45–48, extending to connector Conn. It will also be assumed that the subscriber has dialled the last two digits of the number of the subscriber at station A and has thereby positioned the connector so that the wipers 212–214 are now in engagement with the bank contacts to which conductors 68, 53, and 67 are connected. Therefore, the connection has been completed to the wanted subscriber's line, and the connector switch Conn. is in a position to transmit ringing current to the wanted subscriber's line. It should be noted that when the switching relay 208 operates, ground is forwarded by way of wiper 213, conductor 53, conductor 52, winding of cut-off relay 17, interrupter contacts 56, winding of rotary magnet, to battery. Relay 17 operates, but due to a mechanical interlock pulls up its armatures half way. However, armature 55 is adjusted to close its contact and completes a circuit for operating cut-off relay 15. Relay 15 operates, but it also is equipped with a mechanical interlock and pulls up its armatures half way. The mechanical interlock of relays 15 and 17 are effective only when the lockout relay is operated before the associated line relay has not been operated first. The armatures on the interlock relays are adjusted so that the back contacts open and the front contacts do not close.

The ringing current for signalling the subscriber at station A is transmitted from the battery connected generator conductor designated Gen. through the lower winding of ring-cut-off relay 205, upper armature and resting contact of relay 205, upper armature of switching relay 208, wiper 212, conductor 68, conductor 5, armature 50, through the condenser and ringer at station A, to ground. The ringer at station A responds over this circuit and when the subscriber thereat answers the call, the circuit is extended by way of the switch-hook and receiver 57, impulse springs 58, transmitter 59, through the condenser shunted around the rectifying units, to ground at the normally closed contacts controlled by armature 3 of lockout relay 1. Another path of the circuit includes ground at the normally closed contacts controlled by armature 3, rectifying unit 8, winding of lockout relay 1, rectifying unit 10, to battery superimposed on the ringing current. When this circuit is completed, the winding of the lockout relay 1 and the lower winding of the ring-cut-off relay 205 are in series, therefore, the ring-cut-off relay 205 is immediately operated. Ring-cut-off relay 205 locks itself to the ground at armature 218, and at its upper and lower armatures connects the called subscriber's line through to the upper and lower winding of the back-bridge relay 201.

If the lockout relay 1 fails to energize in series with the ring-cut-off relay 205, a circuit is now completed from ground at the normally closed contacts controlled by armature 3 of the lockout relay 1, rectifying unit 8, winding of lockout relay 1, rectifying unit 10, transmitter 59, interrupter springs 58, receiver and switchhook at 57, armature 50, conductor 5, conductor 68, wiper 212, upper armature of switching relay 208, upper armature and front contact of ring-cut-off relay 205, upper winding of back bridge relay 201, to battery. Lockout relay 1 operates over this circuit and at armature 3 and its front contacts completes a loop circuit by way of conductor 6, conductor 67, wiper 214, lower armature and front contact of switching relay 208, lower armature and front contact of ring-cut-off relay 205, lower winding of back-bridge relay 201, to ground. The loop circuit for maintaining the back-bridge relay 201 operated now includes the called subscriber's line, the equipment at the called subscriber's station, and the winding of lockout relay 1. At armature 4 lockout relay 1 disconnects the subscriber's station B from the common line conductor 6. The functions of the back-bridge relay 201 are the same as have been described hereinbefore. After the conversation has been completed both subscribers hang up their receivers and the equipment is automatically restored to normal in the same manner as has been described.

A description will now be given of the operation of the equipment when the subscriber at station B is wanted by another subscriber in the system. The operation of the equipment is exactly the same as described when a call was extended to the subscriber at substation A with the exception that the wipers of the connector switch are now positioned into engagement with the bank contacts terminating conductors 70.

54, and 69, respectively. After the last digit is dialled and the wipers have engaged the above-mentioned contacts, ringing current is now transmitted from the battery connected generator Gen., lower winding of ring-cut-off relay 205, upper armature and resting contact of ring-cut-off relay 205, upper armature of switching relay 208, wiper 212, conductor 70, conductor 6, armature 4, condenser and ringer at station B, to ground.

It may be well to mention at this time that conductors 67, 53, and 68, which terminate in the banks of the connector and are used for extending a connection to a subscriber at station A, are connected to one set of bank contacts and are selected by the wipers 212–214 of the connector Conn. when a predetermined number is dialled by the calling subscriber. The conductors 69, 54, and 70, which are used to establish connection with the subscriber at station B also terminate in the banks of the connector Conn., and are accessible to wipers 212–214 when another predetermined number is dialled by a calling subscriber. Both sets of conductors are connected to the common line conductors 5 and 6, but one set of the talking conductors is reversed. Therefore, the ringing current is transmitted over common line conductor 5 when station A is wanted and is transmitted over common conductor 6 when station B is wanted.

Referring again to the signalling of the subscriber at station B, the ringer at station B responds over the previously traced signalling circuit and when the subscriber thereat answers the call, the circuit is extended by way of the switchhook and receiver 66, impulse springs 65, transmitter 64, through the condenser shunted around the rectifier units, to ground at the normally closed contacts controlled by armature 51 of lockout relay 2. Another path of the circuit includes ground at the normally closed contacts controlled by armature 51, rectifying unit 12, winding of lockout relay 2, rectifying unit 14, to battery superimposed on the ringing current. When this circuit is completed, the winding of the lockout relay 2 and the lower winding of ring-cut-off relay 205 are in series, therefore the ring-cut-off relay 205 is immediately operated. Ring-cut-off relay 205 locks itself to the ground at armature 218, and at its upper and lower armatures connects the called subscriber's line through to the upper and lower windings of the back-bridge relay 201.

If the lockout relay 2 fails to energize in series with the ring-cut-off relay 205, a circuit is now completed from ground at the normally closed contacts controlled by armature 51, rectifying unit 12, winding of lockout relay 2, rectifying unit 14, transmitter 64, impulse springs 65, receiver and switchhook 66, armature 41, conductor 6, conductor 70, wiper 212, upper armature of switching relay 208, upper armature and front contact of ring-cut-off relay 205, upper winding of back-bridge relay 201, to battery. Lockout relay 2 operates over this circuit and at armature 51 and its front contact completes a loop circuit by way of conductor 5, conductor 69, wiper 214, lower armature and front contact of switching relay 208, lower armature and front contact of ring-cut-off relay 205, lower winding of back-bridge relay 201, to ground. The loop circuit for maintaining the back-bridge-relay 201 operated now includes the called subscriber's line, the equipment at the called subscriber's station, and the winding of lockout relay 2. At armature 50 lockout relay 2 disconnects the subscriber's station A from the common conductor 5. The functions of the back-bridge relay 201 are the same as have been described. When the conversation is completed, both subscribers hang up their receivers and the equipment is automatically restored to normal in the same manner as has been described hereinbefore.

Referring now to Fig. 3 of the drawings, it will be noted that the lockout relays 301 and 302 are the same as lockout relays 1 and 2, respectively, shown in Fig. 1. However, the rectifier units which were shunted around the windings of the lockout relays are not required in the arrangement shown in Fig. 3. The functions of the rectifier units are now taken care of by the trunk relay group TR which is connected in the trunk line between the lineswitch LS and the selector switch SS. The trunk line comprising conductors 379–381 extends to a selector switch, similar to selector switch SS shown in Fig. 1, and from the selector switch to a connector switch, similar to connector switch Conn. shown in Fig. 2. In Figs. 1 and 2 the fourth wire extending between the selector and connector switches control the operation of the meter when the called subscriber answers. In Fig. 3, however, the operation of the meter in the meter selecting relay group MSR is controlled by the polarized relay 308 of the trunk relay group upon its operation when the called subscriber answers a call. Since the meter selecting relay group MSR and the lineswitch LS are exactly the same as those shown in Fig. 1, they have been represented on the drawings by means of dotted rectangles.

The operation of the equipment shown in Fig. 3 will now be described. When the subscriber at station D removes his receiver to initiate a call, a circuit is completed from the ground at the normally closed contacts controlled by armature 303, through the winding of the lockout relay 301, and subscriber's equipment at station D, armature 350, conductor 305 to the winding of the line relay of the meter selecting relay group MSR. The operation of the meter selecting relay group MSR and the lineswitch LS is the same as has been described hereinbefore and it will be understood that the lineswitch LS advances its wipers to find an idle trunk extending to an idle trunk relay group, similar to trunk relay group TR.

It will be assumed that the first idle trunk available is the trunk comprising conductors 341—344, and that the wipers of the lineswitch LS are in engagement with this trunk line. Since one winding of the line relay of the selector is connected in series with battery and conductor 379, and the other winding of the line relay is connected in series with ground and conductor 380, a circuit is now completed for lockout relay 301 from conductor 379, normally closed contacts controlled by armature 371, conductor 341, wipers of lineswitch LS, meter selecting relays MSR, conductor 305, armature 350, station D, winding of lockout relay 301 to ground. Lockout relay 301 operates over this circuit and at armature 303 and its front contact extends the above-traced circuit through to the lower winding of the line relay of the selector by way of conductor 306, meter selecting relays MSR, lineswitch LS and wiper thereon, conductor 342, normally closed contacts controlled by armature 372, non-inductive resistance 382 in parallel with the upper winding of the polarized relay 308, conductor 380,

to the lower winding of the line relay of the selector (not shown), to ground. The line relay of the selector and the lockout relay 301 of the calling subscriber's station remain energized over this loop circuit. The operation of the line relay of the selector causes ground to be returned on the release trunk conductor 381 to maintain the cut-off relays of the lineswitch LS and meter selecting relays MSR energized, and also to maintain a ground potential on the normal private conductors 353 and 354 to busy the line at the banks of the connector. In addition, the grounding of conductor 381 completes a circuit for the lower winding of polarized relay 308 and a priming circuit is completed through the normally closed contacts controlled by armature 373, resistance 390, winding of reversing relay 307, to battery. Due to the high resistance 390, relay 307 does not energize but the relay is primed sufficiently to enable it to operate very fast when the circuit is closed at armature 374. The polarized relay 308 does not operate because the current flow through the upper winding and the current flow through the lower winding oppose each other.

It will now be assumed that the subscriber at station D has dialled the wanted subscriber's number and that the selector and connector have extended the connection to the wanted subscriber's line and that the wanted subscriber has answered his telephone in response to the ringing of his bell. When this occurs, the back bridge relay of the connector, which is similar to back bridge relay 201 shown in Fig. 2, operates and reverses the direction of the current flow over the trunk conductor 379—380. The polarized relay 308 is so adjusted that it will not operate with current flowing in either winding alone, or when both windings have current flowing through them in opposite directions, but it does operate when the current flow through both windings assist each other.

Due to the reversal of battery and ground at the armatures of the back bridge relay the current flow through the upper winding of relay 308 will be in the same direction as the current flow through the circuit of its lower winding. Therefore, the windings assist each other and the relay will operate. At armature 374, polarized relay 308 completes a circuit for reversing relay 307 from the grounded conductor 381, armature 373 and its resting contact, armature 374, winding of reversing relay 307, to battery. Due to the previously described priming circuit reversing relay 307 snaps up immediately and reverses the talking conductors at armatures 371 and 372 so that the battery which is now connected through the line relay of the connector to conductor 380 is transferred to conductor 341 extending to the line switch, and ground connected through the line relay of the connector to conductor 379 is transferred to conductor 342 extending to the lineswitch. Therefore, the direction of the current flow through the winding of the lockout relay 301 of the calling subscriber's station remains in the same direction regardless of the fact that the back bridge relay of the connector has reversed the direction of current flow over conductors 379—380. At armature 373 and its front contact, reversing relay 307 completes a circuit from the grounded conductor 381 to the winding of relay 309, which operates, and locks itself to grounded conductor 381 at armature 376 and its front contact. Relay 309 disconnects relay 301 at armature 377. Polarized relay 308 also completes the following circuit to operate the calling subscriber's meter: grounded conductor 381, armature 375 and its front contact, conductor 344, wiper of the lineswitch LS, meter selecting relay MSR, to the meter assigned to the subscriber at station D.

If the called subscriber should accidentally depress his switchhook, the back-bridge relay of the connector deenergizes and again connects battery to the talking conductor 379 and ground to talking conductor 380 by way of the windings of the line relay of the connector. When this occurs the current flow through the polarized relay 308 will again reverse and the current flow through the upper winding of the relay will oppose the current flow through the lower winding, therefore, the relay restores to normal. Relay 308 opens the circuit of the reversing relay 307 at armature 374 which also restores to normal. The talking conductors 341—342 and 379—380, respectively, are again connected straight through the contacts of relay 307 so that the battery potential is still maintained on conductor 341. Therefore, the current flow through the lockout relay 301 remains in the proper direction.

When the switchhook of the called subscriber is raised again the back-bridge relay operates and the reversal in the direction of current flow over the trunk conductors 379—380 again takes place, causing the operation of polarized relay 308 and reversing relay 307, as has been described. The direction of current flow over the talking conductors 379—380 may be altered several times by the back-bridge relay of the connector, however, relays 307 and 308 of the trunk relay group TR prevent the alteration in the direction of current flow in the talking conductors 341—342 extending to the calling subscriber's line. Therefore, the direction of current flow through the lockout relay 301 remains the same throughout the entire connection.

When the subscribers have completed their conversation and hang up their receivers the loop circuit including the lockout relay 301 and the line relay of the connector is opened at the switchhook by subscriber at station D and the loop circuit for the back bridge relay of the connector is opened by the called subscriber. The connector restores to normal, thereby causing the restoration of the selector switch, and ground is accordingly removed from conductor 381 of the trunk relay group TR. When ground is removed from conductor 381, the locking circuit for relay 309 is opened, the circuit for the lower winding of the polarized relay 308 is opened, and the circuit for the reversing relay 307 is opened. These relays restore to normal. The lineswitch LS and the meter selecting relays MSR also restore to normal in the same manner as has been described hereinbefore.

When the subscriber at station E removes his receiver to make a call, lockout relay 302 operates when the selector is seized, in the same manner as was described in connection with the call being established by the subscriber at station B shown in Fig. 1 of the drawings. It should be remembered that the line relay of the meter selecting relay group MSR is locked in its energized position when the subscriber at station E calls in order to connect up the proper meter and to reverse the talking conductors. Therefore, conductors 306 and 305 are connected through the intervening lineswitch LS to conductors 341 and 342, respectively. The detailed operation of

the equipment is the same as described in connection with the call established by the subscriber at station D, with the following exception. When ground is returned on the release trunk conductor 381 through the front contact of armature 375 and conductor 344, the meter assigned to the subscriber at station E is operated. After the conversation between the subscriber at station E and the wanted subscriber has been completed they both replace their receivers on the switchhook and the entire connection is released.

A description will now be given of the operation of the equipment, particularly the trunk relays TR, when a toll call from a distant exchange is received by the toll operator in the automatic exchange. For the purpose of the explanation, it will be assumed that the operator at the toll switchboard has received such a call and desires to extend the connection to a subscriber in the automatic exchange. The operator will insert the calling plug of an idle cord circuit in the jack J. The cord circuit may be of the well known common battery type which is equipped with a dialling key to enable the operator to cut the dial from the talking conductors of the trunk when a connection is completed. When the operator inserts the plug in the jack J, a loop circuit for the line relay in the lineswitch LS—1 by way of conductors 382 and 383 is completed. The lineswitch LS—1 may be similar to lineswitch LS shown in Fig. 1. Due to the operation of the line relay, the wipers of the lineswitch LS—1 advance step by step in search of an idle trunk line extending to a trunk relay group, such as trunk relay group TR. It will be assumed for the purpose of this description that the first idle trunk line encountered by the wipers of the lineswitch LS—1 is the trunk line comprising conductors 386—389, inclusive, extending to trunk relay group TR. The cut-off relay of the lineswitch LS—1 operates and extends the loop circuit including conductors 382 and 383 through the wipers of the lineswitch, conductors 386 and 387, normally closed contacts controlled by armatures 371 and 372 of the trunk relay group TR, non-inductive resistance 382 in parallel with the upper winding of the polarized relay 308, conductors 379 and 380, through the upper and lower windings of the line relay of the selector to battery and ground, respectively. The line relay of the selector (not shown), operates to prepare the selector for further operation and grounds the release trunk conductor 381. A circuit is completed for the lower winding of the polarized relay 308, but the relay does not operate because the current flow through the upper and lower windings of the relays oppose each other. Ground is also forwarded by way of conductor 381, conductor 388, wiper of the lineswitch LS—1, conductor 384 jumpered to conductor 385, through the lineswitch LS—1 and lower wiper, conductor 389, armature 375, armature 377, winding of the disconnect relay 310 to battery. The disconnect relay operates, and at armature 378 closes a locking circuit for itself from the grounded conductor 381, and at the same time opens a point in the circuit for the reversing relay 307. It should be noted that the ground on conductor 381 is extended by the normally closed contact controlled by armature 373, resistance 390, the winding of reversing relay 307, to battery. Due to the high resistance of 390, reversing relay 307 does not operate over this circuit.

The operator at the toll switchboard now dials the number of the wanted subscriber at the automatic exchange. It will be assumed that the wipers of the selector (not shown) are positioned, in response to the first digit, into engagement with a trunk line extending to a connector similar to the connector Conn., that in response to the two final digits of the wanted subscriber's number, the wipers of the connector are positioned into engagement with the subscriber's line; and that the subscriber has been signalled. When the called subscriber removes his receiver the ring-cut-off relay is operated in the usual manner and cuts the calling subscriber's line through to the windings of the back-bridge relay, similar to back-bridge relay 201. The back-bridge relay, upon operating, reverses the direction of current flow over the trunk conductors, thereby causing the operation of a polarized relay in the cord circuit of the toll switchboard. Due to the operation of the polarized relay in the cord circuit, the supervisory lamp is extinguished. This informs the operator that the called subscriber has answered the call.

Conversation between the subscriber at a distant manual exchange and a subscriber in the automatic exchange may now take place in the usual manner. When the subscribers are through talking they hang up their receivers and the supervisory lamps are accordingly lighted at the operator's cord circuit. The called subscriber's supervisory lamp is lighted by the falling back of the polarized relay in the cord circuit, which is brought about by the reversal of current by the restoration of the back bridge relay of the connector. This latter relay is restored when the circuit for its upper and lower windings is opened when the called man hangs up his receiver. On observing the lighted supervisory lamp the operator will pull down the connection and the equipment in the automatic exchange is restored to normal in the same manner as has been described hereinbefore.

Referring again to the polarized relay 308 of the trunk relay group TR, it will be noted that the polarized relay 308 operates when the back-bridge relay of the connector reverses the direction of current flow over the trunk line conductors 379—380. However, the circuit for the reversing relay 307 is opened at armature 378 due to the operated condition of disconnect relay 310. The reversal in the direction of current flow in the trunk line, although controlling the operation of the polarized relay 308, has no affect on the reversing relay 307, therefore, the operator at the toll switchboard receives the reverse battery supervision in the usual manner.

The invention having been described, what is considered to be new will be pointed out in the appended claims.

What is claimed is:

1. In a telephone system, a pair of stations, a line for each of said stations, a common line, means responsive to the operation of the switchhook at either of said stations for connecting one of said stations and associated line to said common line and for disconnecting the other of said stations and associated line from said common line and for establishing a current flow over said common line and connected station, means for reversing the direction of said current flow, and means for preventing said connecting and disconnecting means from responding when said current flow is reversed.

2. In a telephone system, a common line, two

stations connected to said line, a relay for each of said stations, means responsive to the initiation of a call by a subscriber at one of said stations for operating the associated relay, contacts on said relay for disconnecting the other of said stations from said common line, means for establishing a connection with a called station, means operated when the subscriber at said called station answers for reversing the direction of current flow over said connection, and means associated with said connection for maintaining the current flow through said relay in one direction only.

3. In a telephone system, a line having a pair of stations, means controlled by the switchhook at either of said stations for closing a circuit including the two sides of the line in series and for disconnecting the remaining station from said line, and a current controlling device for each of said stations for allowing current to flow in either direction in said circuit and for maintaining the direction of current flow through said first mentioned means in one direction only.

4. In a telephone system, a common line, two stations connected to said line, switches accessible to said line, a relay for each of said stations, means responsive to the initiation of a call at one of said stations for operating the associated relay, means responsive to the operation of one of said relays for connecting the station associated therewith to said line and for disconnecting the other of said stations and associated relay from said line, means at said connected station for operating said switches to extend a connection to a wanted subscriber, means in said switches operated when said wanted subscriber answers for reversing the direction of current flow over said common line, and means associated with said connected relay for maintaining the direction of current flow through the relay in the same direction regardless of the direction of current flow over said common line.

5. The combination in a telephone system of a subscriber's line, means for establishing connections therefrom over a circuit including two sides of said line in series, a relay included in said circuit, means for establishing a normal current flow over said circuit, means operated when a connection is established for reversing the direction of said current flow, and a device associated with said relay to permit the flow of current in said circuit in either direction and for maintaining a flow of current through said relay in one direction regardless of the direction of current flow in the circuit.

6. In a telephone system, a pair of stations and lines therefor, a relay for each of said lines, a line common to said station lines, means for reversing the direction of current flow over said common line, and a device associated with each of said station lines arranged to pass current through said relay in one direction regardless of the direction of current flow over said common line.

7. In a telephone system, two subscribers' stations and lines therefor, a line common to each of said subscribers' lines, means for connecting the line of a calling station to said common line and for disconnecting the line of the other of said stations from said common line when a call is initiated, a Wheatstone bridge network comprising rectifiers in each arm of said bridge, said bridge connected in series with one conductor of said connected line, said means connected across the midpoints of the arms of said bridge, the rectifiers in said bridge being so poled that the current flow through said means will be in one direction only while the current flow over said common line may flow in either direction.

8. In a telephone system, a pair of stations and a common line therefor, a relay having two windings, a first circuit including one winding of said relay and one conductor of said line for operating said relay when a subscriber at one of said stations initiates a call, a second circuit including the other winding of said relay and the other conductor of said line for operating said relay when a subscriber at the other of said stations initiates a call, and a third circuit for restoring said relay to normal or for maintaining said relay operated depending upon which subscriber initiates the call.

9. In a telephone system, a pair of stations, a line for each station, a common line, a relay for each of said station lines operated responsive to the initiation of a call by a subscriber at one of said stations for connecting the line of the calling station to said common line and disconnecting the line of the other station therefrom, means for extending a connection to a wanted subscriber's line, means for reversing the direction of current flow over the conductors of an established connection when a called subscriber answers, and means connected to said common line for always maintaining the current flow through the connected relay in one direction.

10. In a telephone system, two stations, a line common to said stations, a selecting relay connected to said common line, means controlled from said stations for operating said relay, and means for either maintaining said relay operated or for restoring said relay to normal dependent upon the station from which the relay is controlled to select a device individual to the station initiating the call.

11. In an automatic telephone system, a calling subscriber's line, a second line, a group of automatic switches accessible to either line, said switches operated from either line to establish a connection with a called subscriber's line, means for reversing the direction of current flow over the talking conductors of said connection when a called subscriber answers, and means for preventing said current reversals from changing the direction of current flow over said calling subscriber's line when the subscriber thereon establishes the connection and for permitting said current reversals to change the direction of current flow over said second line when the connection is established thereover.

12. In an automatic telephone system, a two-party line, a group of automatic switches accessible to a calling subscriber on said two-party line, means for seizing said switches to establish a connection with a called subscriber's line, means for disconnecting the second subscriber on said two-party line when said switches are seized, means for reversing the direction of current flow over the talking conductors of said connection when said called subscriber answers, and means for maintaining the direction of current flow through said disconnecting means in one direction only.

13. In a telephone system, a pair of subscribers' lines, a relay for each of said lines, a two-conductor line common to said subscribers' lines, a wanted subscriber's line, means operated responsive to the initiation of a call by a subscriber on one of said lines for extending a connection to said wanted subscriber's line and for op-

erating one of said relays, means responsive to the operation of said relay for connecting the calling subscriber's line to said common line and for disconnecting the other subscriber's line and associated relay from said common line, means operated when said wanted subscriber answers said call for reversing the direction of current flow over said common line, and means associated with said relay arranged to pass current through said relay in one direction only regardless of the direction of current flow over said common line.

14. In a telephone system, a pair of subscribers' lines, a relay associated with each of said subscribers' lines, a two-conductor line common to said subscribers' lines, one subscriber's line and associated relay normally connected to one conductor of said common line, the other of said subscriber's lines and associated relay normally connected to the other conductor of said common line, means for establishing a connection from a calling subscriber's line to a wanted subscriber's line, means operated responsive to the initiation of said connection by a subscriber on one of said subscriber's lines for operating one of said relays over a circuit including said one conductor of said common line, means responsive to the operation of said relay for connecting the relay and associated subscriber's line in series with both conductors of said common line and for disconnecting the other of said relays and associated subscriber's line from said one conductor of said common line, means operated when said wanted subscriber answers for reversing the direction of current flow over the conductors of said common line, and means connected to said relay for preventing the direction of current flow through said relay from being altered.

15. In a telephone system, a first and second station, a line for each of said stations, a relay individual to each of said stations, a two-conductor common line, said stations and associated relays normally disconnected from said common line, a relay bridging the conductors of said common line, means operated upon the initiation of a call at the first of said stations for connecting the station and associated relay in series with one conductor of said common line to operate said bridging relay, means operated upon the initiation of a call at the second of said stations for connecting the station and associated relay in series with the other conductor of said common line to operate said bridging relay, a rotary line switch, a pair of outgoing conductors accessible to said switch, one of said outgoing conductors connected to negative potential and the other of said outgoing conductors connected to positive potential, means controlled by the operation of the bridging relay for operating said line switch to connect with said outgoing conductors and to complete a circuit for maintaining said bridging relay operated or for restoring the same depending upon the station initiating the call, means controlled by the condition of said bridging relay for connecting the negative outgoing conductor to the one conductor of the common line to which the call initiating station is connected in order to operate the relay individual thereto, and means controlled responsive to the operation of the individual station relay for connecting the call initiating station to the other conductor of said common line and for disconnecting the line of the other station to prevent the initiation of a call therefrom.

16. In a telephone system, two stations, a line common to said stations, a line relay bridging said common line, means at said stations for operating said line relay, a rotary lineswitch, outgoing trunks, means controlled by the operation of said line relay for operating said rotary lineswitch to find an idle one of said outgoing trunks, means for disconnecting said line relay from said common line when said rotary switch finds an idle outgoing trunk conductor and for either maintaining said line relay operated or for restoring the same to normal, dependent upon the station controlling the line relay, a station relay at each of said stations for connecting its associated station to said common line and for disconnecting the other station from said common line when operated, and means controlled by the condition of the line relay after said lineswitch has operated for completing a circuit for operating one of said station relays.

17. In a telephone system, two stations, a line common to said stations, a line relay bridging said common line, means at said stations for operating said line relay, a rotary lineswitch, outgoing trunks, means controlled by the operation of said line relay for operating said rotary lineswitch to find an idle one of said outgoing trunks, means for disconnecting said line relay from said common line when said rotary lineswitch finds an idle outgoing trunk conductor and for either maintaining said line relay operated or for restoring the same to normal, dependent upon the station controlling the line relay, a station relay at each of said stations for connecting its associated station to said common line and for disconnecting the other station from said common line when operated, means controlled by the condition of the line relay after said lineswitch has operated for completing a circuit for operating one of said station relays, means at said stations for extending a call to a wanted subscriber, means operated responsive to the answering of a called subscriber for reversing the direction of current flow over said outgoing trunk, and means connected to said common line for preventing the associated station relays from responding to said current reversal.

18. In a telephone system, two stations, a line for each of said stations, a common line, two branches connected to said common line over which connections are extended from other subscribers to each of said stations, means for transmitting ringing current over either of said branch lines to signal either of said stations, the station signalled determined by the branch line over which the ringing current is transmitted, a station relay individual to each of said stations operated when the subscriber at its associated station answers a call, means controlled by the operation of said relay for disconnecting the non-associated station from said common line, and means associated with each of said relays for preventing current reversal over an established connection from altering the condition of an operated station relay.

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