

June 19, 1923.

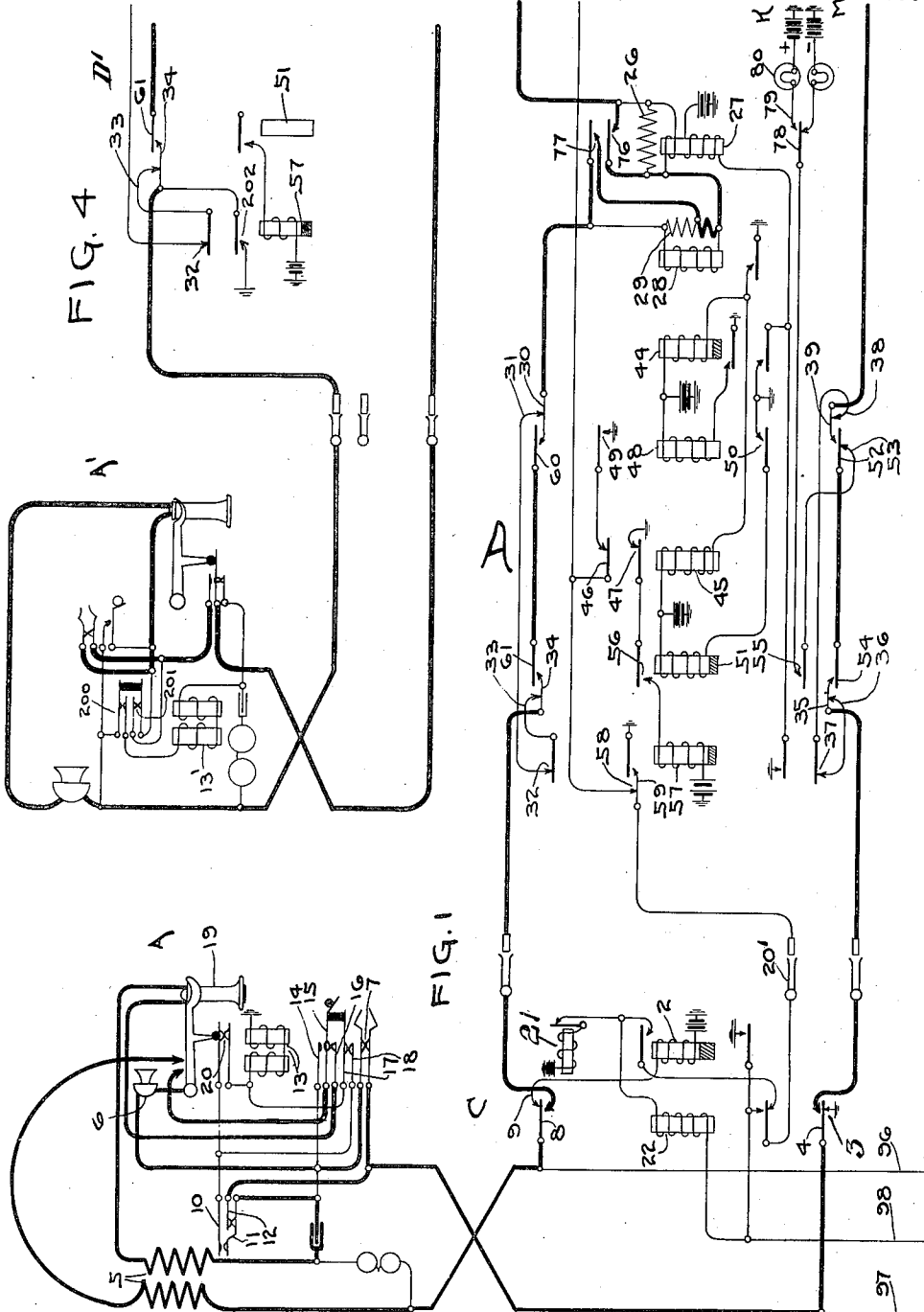
1,459,229

T. G. MARTIN

MEASURED SERVICE AUTOMATIC TELEPHONE SYSTEM

Filed May 15, 1919

3 Sheets—Sheet 1



— Inventor —
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1,459,229

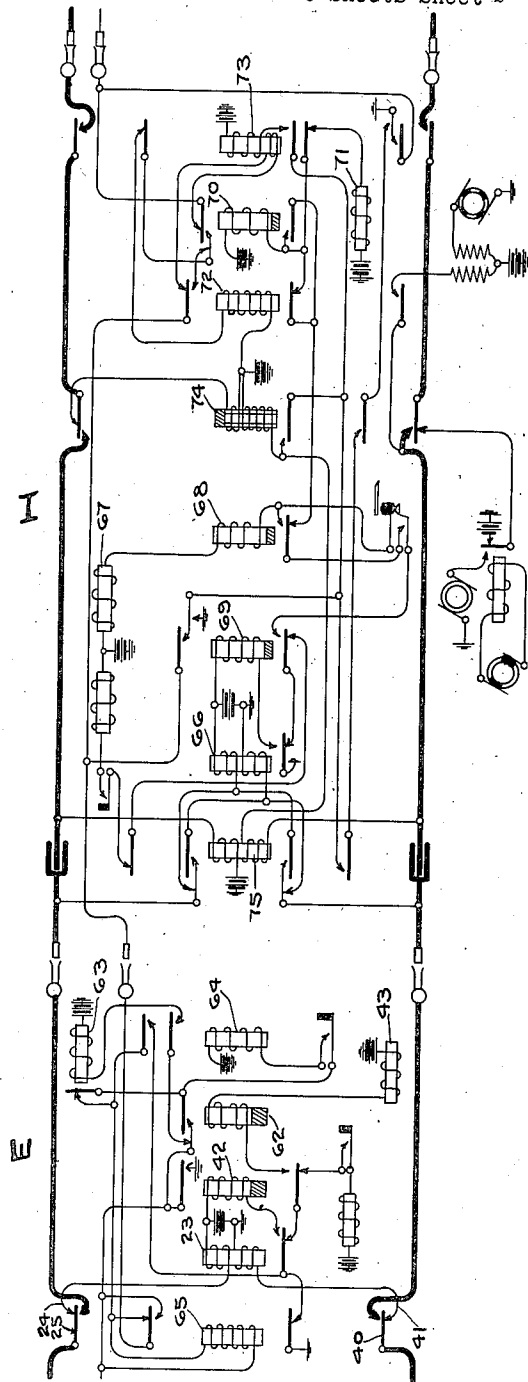
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3 Sheets-Sheet 2

FIG. 2



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1,459,229

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MEASURED SERVICE AUTOMATIC TELEPHONE SYSTEM

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3 Sheets-Sheet 3

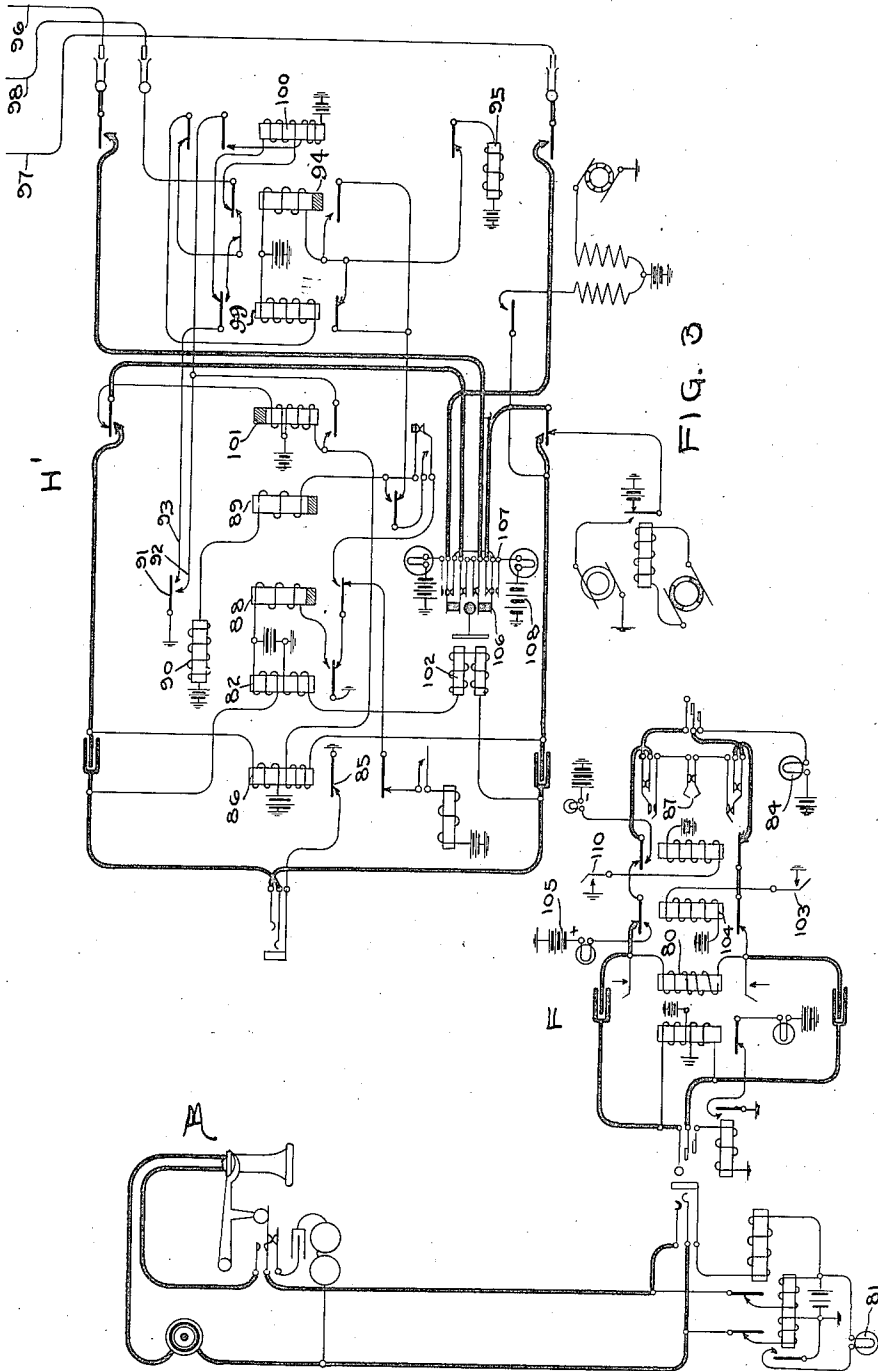


FIG. 3

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UNITED STATES PATENT OFFICE.

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

MEASURED-SERVICE AUTOMATIC TELEPHONE SYSTEM.

Application filed May 15, 1919. Serial No. 297,332.

To all whom it may concern:

Be it known that I, TALBOT G. MARTIN, a citizen of the United States of America, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Measured-Service Automatic Telephone Systems.

My invention relates in general to an improved means for automatically controlling a measured service device, and more particularly to improved circuits and devices for automatically controlling a pay station or coin collector in an automatic telephone system.

The main object of this invention is to provide an improved means for operating a coin collector of the coin first type, when calls are made from an automatic telephone through automatic switches, or by an operator through an automatic switch to such an automatic telephone.

Other objects are to provide reliable and accurate means for collecting or refunding a coin with such efficiency and accuracy that there will be no chance for a subscriber to either inadvertently or maliciously make a call for which a charge is required without being properly charged for such call.

It is to be understood that any standard type of coin collector or pay station device, such as that shown in U. S. Letters Patent No. 1,043,219 granted November 5, 1912 to O. F. Forsberg, may be used with this invention which is adapted to receive a coin deposited before a call is initiated and having a chute for returning the coin if the call is unsuccessful, and for collecting the coin if the call is successful. I have shown a chute and other parts only diagrammatically as my invention has to do principally with the circuits and method of controlling the collecting and refunding.

The feature of my invention which relates to the collection or refunding of the coin by an operator through an automatic switch is not claimed herein, but is claimed in a divisional application, Serial No. 604,755, filed December 4, 1922.

In the accompanying drawings:

Fig. 1 shows a calling station A of automatic type being a pay station and having access by means of the line switch C to trunk lines leading to first selectors. Inserted in

these trunk lines are groups of controlling relays D, one group for each trunk for controlling the coin collector of a calling line.

Fig. 2 shows the selector switch E in which one of the trunk lines accessible to the line switch C terminates, and a connector switch H accessible to the selector E.

Fig. 3 shows a manual calling line B. A cord circuit F for handling calls therefrom, and a special connector switch H' which is accessible to the cord circuit F for calls from manual lines such as B to any of the automatic lines such as A (Fig. 1), and having means for reversing the charge to assess the toll upon the called subscriber when desired.

Fig. 4 shows a modification of the invention.

I will first explain the operation of the system when a call is set up from a pay station line such as A (Fig. 1) to a line similar to A, accessible to the switch H (Fig. 2) which may or may not be provided with a pay station also. When the subscriber at A removes his receiver to initiate a call the circuit of the line relay 2 is closed as follows: ground through springs 3 and 4, calling device springs 7, transmitter 6, switch hook springs, primary of induction coil 5, springs 8 and 9, and relay 2 to battery. The pay station with which I have elected to illustrate my invention is of the prepay or coin first type and as may be seen in said prior patent the spring 10 is controlled by the coin when deposited to open the springs 11 and 12 and to close contact of the springs 10 and 11. The springs 10, 11 and 12 are also controlled by the operation of the magnet 13 in either direction in the same manner, that is, these springs are locked in operated position by a coin and are unlocked by the operation of the magnet 13. The springs 20 are opened when the receiver is removed to open one point in the circuit of magnet 13. The springs 14 to 18 inclusive, are controlled by a bushing on the calling device in such a manner that as the dial is moved off normal the springs 15 and 17 move to their alternate positions and are restored when the dial returns to normal. The calling device may be of the type disclosed in Patent No. 1,279,352, issued to A. E. Keith, September 17, 1918. The coin being deposited closes the springs

10 and 11 in contact thereby connecting the magnet 13, through springs 17 and 18 and springs 10 and 11 to the talking circuit and also removing a shunt from around the impulse springs 7 at springs 11 and 12, so as to render said springs 7 effective to interrupt the line circuit when the calling device is turned subsequently.

The operation of the line relay 2 causes the operation of the line switch C to automatically select an idle trunk line leading to a selector E (Fig. 2) in the usual manner by closing a circuit direct from private wiper 20' to magnet 21 and also preparing a series circuit for switching relay 22 in series with magnet 21 so that when an idle trunk line is reached relay 22 will energize to disconnect the relay 2 from the line circuit and extend the line of substation A to the selected idle trunk. Associated with each trunk leading to the selectors E is a group of relays such as D, the function of which is to control the collection or refunding of the coin at the calling station. As relay 22 energizes a circuit is completed for the line relay 23 of the selector E as follows: battery through the upper winding of said relay, springs 24 and 25, upper winding of relay 27 and resistance 26 in multiple, relay 28 and resistance 29 in multiple, springs 30 and 31, springs 32, springs 33 and 34, to and through the substation A, and back over the other side of the line through springs 35 and 36, springs 37, springs 38 and 39, springs 40 and 41, and lower winding of relay 23 to ground. Relay 23 energizes and closes the circuit of slow relay 42 to ground the release trunk and prepare the circuit for the vertical magnet 43. The circuits of the selector E and connector H are of well known standard type and only a general description will be given of their operation.

It will be noticed that relays 27 and 28 were included in the above traced circuit with the relay 23. Relay 27 does not energize in this circuit as it is an electro polarized relay which requires the energization of both windings in the same direction to assist each other. Relay 28, however, energizes and closes the circuit of slow relay 44 and relay 45. Relay 45 operates to open the springs 46 and 47 and relay 44 operates to close the circuit of relay 48 which closes the springs 49 and 50, thereby energizing relay 51. Relay 44 also closes the circuit of the lower polarizing winding of relay 27. Relay 48 opens the springs 52 and 53, closes springs 52 and 39, opens springs 39 and 38, opens springs 30 and 31, and closes springs 30 and 60. Relay 51 at the same time opens the springs 35 and 36, closes springs 35 and 54, closes springs 55, closes springs 56 in the circuit of relay 57, which relay does not, however, energize at this time, due to its circuit being open at the springs 47, and also

opens springs 33 and 34 and closes springs 34 and 61. The line circuit it will be seen now passes through the springs 34 and 61, springs 60 and 30, relay 28 and resistance 29 in multiple, and relay 27 and resistance 26 in multiple in the upper trunk conductor and through springs 35 and 54 and springs 52 and 39 of the lower trunk conductor.

The subscriber now operates his calling device for the first digit of the called number to operate the selector E (Fig. 2). As soon as the calling device is moved off normal the springs 14 and 15 make contact, springs 15 and 16 are opened, and springs 17 and 18 in the circuit of magnet 13 are opened. The coin having been deposited to remove the short circuit as pointed out before, the calling device will control the line relay 23 of selector E to operate magnet 43 to step the wipers of the selector E to some level of the selector bank, after which relay 62 falls back to start the joint operation of magnet 63 and interrupter relay 64 to step the wipers of selector E to an idle trunk leading to a connector H. As soon as such idle trunk is found, relay 65 energizes and is locked energized to cut off the line relay 23 and cut the extended line circuit through to the line relay 66 of connector H.

The calling device is now operated for the next digit of the called number. Relay 66 is operated in accordance with this digit to control the vertical magnet 67 and slow relays 68 and 69. Relay 69 holds ground on the release trunk and prepares the circuit of the vertical magnet which in turn steps the wipers of the switch to a level of the bank in which the contacts of the called line are located. As soon as the impulses of this digit cease relay 68 falls back and prepares the circuit of relay 70 and rotary magnet 71, so that as the calling device is again operated the line relay 66 controls the circuit of the rotary magnet 71 to step the wipers into engagement with the called line. Relay 70 remains energized for a short interval after the rotary impulses cease to hold the private wiper connected to busy relay 72 so that this relay may operate to give a busy signal if the called line is busy. When relay 70 falls back the circuit of the lower winding of wiper cut on relay 73 is closed in series with the bridge cut off relay of the called line switch. Relay 73 energizes to start the ringing of the called line. When the called subscriber answers the ring cut off relay 74 energizes to connect the called line to the windings of back bridge relay 75 which energizes in series with the called line. The energization of relay 75 causes the connections of the line relay 66 to the talking circuit to be reversed, thereby reversing the direction of the current flow in the trunk and line circuit to the calling subscriber. The reversal of current in the trunk circuit

to the calling subscriber causes both windings of the relay 27 to assist each other and relay 27 therefore energizes and is held energized by its lower winding alone, the upper winding and the resistance 26 being shorted out by the springs 76. The springs 77 also short out a part of resistance 29 to allow a better path for voice currents. The energization of relay 27 closes the springs 78 and 79 to connect the high voltage positive battery K in series with the lamp 80 through springs 55 to the spring 53 which is now disengaged from the spring 52. Relay 28 remains energized to hold the various relays energized and conversation may now proceed over the heavy conductors shown.

When the conversation is completed the connection is released by the restoration of the receivers at the calling and called stations. Line relay 66 of the connector deenergizes, opens the circuit of slow relay 69 which removes ground at that point from the release trunk and closes a point in the circuit of the release magnet of the connector which is closed as soon as the called man hangs up. As soon as the calling subscriber hangs up it will be seen that the relay 28, which is in series with the line circuit, will fall back and open the circuit of relays 44 and 45. Relay 45 will fall back before relay 44 and close a circuit through springs 47 and 56 for slow relay 57. Relay 45 also applies ground to the release trunk conductor at spring 46 and its back contact and through springs 49 which are held closed by relay 48. This occurs, it will be understood, before the previously mentioned removal of ground from the release trunk conductor at the connector. Relay 57 holds ground direct on the release trunk at springs 58 and 59 to prevent the line switch C from releasing before the coin is collected and opens the springs 32 and 37 in the talking circuit to prevent any connection of the high voltage battery to the selector. The opening of these springs in the talking circuit also prevents any short circuit or shunt circuit around the magnet 13 of the coin collector and cuts off any leak of the operating current. Relay 57 also supplies an additional holding ground to the relay 27 to keep said relay energized. After a short interval relay 44 also falls back and opens the circuit of relay 48 which falls back to open the springs 60 and 30 and springs 52 and 39 in the talking circuit, and to remove ground from the release trunk conductor extending to the selector E, so as to allow the selector E to release. Relay 48 also closes the springs 52 and 53 in the high voltage battery circuit which now is completed for an instant and extends from battery K and lamp 80, through springs 79 and 78, springs 55, held closed by relay 51, springs 53 and 52, springs 54 and 35, to the

calling line and through springs 7 of the calling device, springs 11 and 10 of the coin controlled springs, springs 17 and 18 and springs 20 in multiple, and through the magnet 13 to ground. The battery K is of high potential and is of such polarity as to operate the magnet 13 to release the coin and direct it into the collect chute, and the springs 10, 11 and 12 are restored to normal. Relay 51, of course, deenergizes a short time after its circuit is opened by relay 48 and opens the circuit of relay 57 and also restores the line circuit to normal and opens the springs 55 in the high voltage battery circuit. Relay 57, upon deenergizing, opens the circuit of the winding of relay 27 and also removes ground from the release trunk to the line switch C to allow said switch to release in readiness for the next call. It will be seen that the springs 20, which are closed upon the receiver being replaced, place a shunt around springs 17 and 18, thereby preventing the subscriber from interfering with the operation of the coin collect magnet 13 by rotating his calling device off normal.

Assume now that the called subscriber's line was busy or that the called subscriber did not answer. In either case the only difference in the operation of the switches would be that the back bridge relay 75 in the connector would not pull up to reverse the battery to the calling line and therefore the relay 27 in the group of relays D would not be energized. In this case the relays 28, 44, 48, 45, 51 and 57 will all operate in exactly the same manner as in the case of the answered call except that when relay 48 falls back the impulse of current sent to the line circuit to operate the magnet 13 comes from the high voltage negative battery M instead of battery K. Battery M supplies current of such a direction as to cause magnet 13 of the coin collector to tilt its armature in the opposite direction to send the deposited coin down the refund chute to the calling subscriber and to restore the springs 10, 11 and 12 to their normal positions.

Referring now to Fig. 3 of the drawings I have shown a manual cord circuit F of a standard type which is for use with calls from manual lines such as B to other manual lines or through connector switches such as H' to subscribers such as A (Fig. 1) which may be in the same or in a different exchange. In a call of this last type, that is manual to automatic pay station, means must be provided for operating the coin collector on the called line in case it is desired to reverse the charges. Of course, the manual subscriber would be charged in the manner well known in manual practice if desired. I will now describe in general the method of extending a connection from the

subscriber B to the subscriber A through the cord circuit F and connector H', when the charge is reversed.

When the subscriber B lifts the receiver the operator is signaled in the usual manner by means of the lamp 81 which is extinguished when the operator inserts the plug into the jack of the calling line, the operator then throws her listening key, obtains the wanted number and inserts the calling plug into a jack leading to an idle connector switch such as H' which has access to the multiple normals of the line A (Fig. 1). The line relay 82 of the connector H' is energized in series with the coil 80 of the cord circuit and the lamp 84 of the cord circuit is lighted through the springs 85 of relay 86. The operator then throws her calling device key to bridge the calling device 87 across the cord circuit in series with the line relay 82. Relay 82 closes the circuit of relay 88 which prepares the circuit of slow relay 89 and vertical magnet 90 and closes the springs 91, 92 and 93 into contact. When the calling device is operated for the first digit of the called number the line relay 82 operates to close the circuit of magnet 90 and relay 89 in series to step the wipers of the switch to the desired level of the bank. Soon after the impulses of this digit cease relay 89 falls back to prepare the circuit of slow relay 94 and rotary magnet 95 in multiple and when relay 82 is operated for the next digit of the called number magnet 95 operates to step the wipers of the switch H' into engagement with the normals 96, 97 and 98 of the line A. Relay 94 remains energized for a short time after the rotary impulses cease to hold the private wiper in connection with the busy relay 99 so that if the called line is busy the relay 99 will operate to connect a busy tone to the operator. If the line is idle however, relay 94 upon falling back, closes a circuit for the upper winding of relay 100 from ground at springs 91 and 93 through said winding and through relay 22 and magnet 21 of the called line to battery. Relay 100 energizes and locks energized to cut the called line through to the ringing circuit and ring cut off relay 101. When the called subscriber answers relay 101 energizes and completes the circuit of the back bridge relay 86, which also energizes in series with the called line to open the springs 85 to extinguish the lamp 84 to inform the operator that the called man has answered.

The special relay 102 in series with the line relay is a polarized relay which does not operate with the usual battery potential, but only with a battery of 110 volts of either polarity. Now, when the called subscriber answers and the operator finds that the right party has answered the operator first informs him that the calling party has

asked to have the charges reversed and requests him to drop a coin of the proper denomination for the call. The called subscriber deposits the coin and the operator then throws her key 103 to energize the relay 104, thereby connecting the positive high voltage battery 105 out over the trunk line and through relay 102 to ground. Relay 82 is held energized and relay 102 operates to attract its armature in such a direction as to close the springs to connect the high voltage battery 108 out over the lower talking conductor to conductor 97 through springs 7 of the calling device of station A, springs 11 and 10, springs 17 and 18, and magnet 13 to ground, thus depositing the coin. The operator then restores the talking circuit and allows the two subscribers to converse in the usual manner.

Should the operator be unable to get the calling party after the called man has deposited the coin or for any other reason desire to refund the coin after it is deposited by the called man she may throw the key 110 to connect the reversed high voltage battery to relay 102 which in turn projects negative high voltage battery to the coin collect magnet of the called line to operate said magnet in a direction to refund the charge.

It will be understood also that this system readily adapts itself to free service calls, that is a connector such as that shown in U. S. Letters Patent #1,269,245, granted June 11, 1918, to Albert Andersen, may be used in place of the connector H, (Fig. 2), which connector when used to call certain subscribers will not reverse the battery and therefore in all such calls the coin will be refunded even when the called man answers.

In Fig. 4 I have shown a modification of my invention which may be used in purely automatic systems without departing from the spirit of my invention. At A' I have shown a standard common battery station having a pay-station the same as that described for station A, Fig. 1, except that the magnet 13' is bridged across the line after the receiver is hung up and when a coin is deposited, the springs 200 preparing the circuit of magnet 13' when the coin is deposited and springs 201 opening a shunt about the calling device. When the receiver is hung up the relays D' which are the same as the relays D, Fig. 1 operate to connect the booster battery in series with the line and to ground through springs 202 closed by relay 57. I have shown only a portion of the relays D' as the rest are exactly like the relays D, the only change being the addition of the springs 202. When the receiver is restored the magnet 13' which is of very high resistance allows the release of the switches and is operated in series with the line circuit from the high voltage batteries to either refund or collect.

It will be seen therefore that I have provided a very efficient means for controlling a coin collector of the coin first type in an automatic or semi-automatic system and one which is very reliable in its action.

Having fully described and ascertained the features and aspects of my invention, what I consider to be new and desire to have protected by Letters Patent will be pointed out in the appended claims.

What I claim as my invention is:

1. In a telephone system, a line, a pay-station for said line, automatic switches for establishing a connection from said line to another line, a battery of one voltage for controlling said switches, said pay-station non-responsive to current from said battery in either direction, two other batteries, automatic means for preparing circuits of two different characters from said other batteries for said pay station, the circuit prepared depending upon the completion or the non-completion of the call, and means controlled by a calling subscriber for completing the circuit prepared to either collect or refund the coin.

2. In a telephone system, a line, a pay-station for said line, automatic switches for switching a connection from said line to another line, a battery of one voltage for controlling said switches, said pay-station non-responsive to current from said battery, two other batteries, automatic means for preparing circuits of two different characters from said other batteries for said pay-station, the circuit prepared depending upon the completion or the non-completion of the call, and means controlled by a calling subscriber after the termination of the call for completing the circuit prepared to either collect or refund the coin.

3. In a telephone system, lines, coin collectors for said lines, a switch for each line, trunk lines common to said lines, means for operating said switch to extend a talking circuit from a line over one of said trunk lines to a called line, a magnet for said calling line for controlling the coin collector, a battery for controlling the automatic switches to extend the connection, said magnet non-responsive to current from said battery, a relay in said trunk line in series with the calling line for determining whether the coin is to be collected or refunded, and means controlled by the calling subscriber for connecting a positive or negative battery to said magnet to operate the same to either collect or refund the coin depending upon the relay.

4. In a telephone system, lines, coin collectors for said lines, a switch for each line, trunk lines common to said lines, means for operating said switch to extend a talking circuit from a line over one of said trunk lines to a called line, a magnet for said calling line for controlling the coin collector, a bat-

tery for controlling the automatic switches to extend the connection, said magnet non-responsive to current from said battery, a relay individual to said trunk line included in the battery supply circuit of the calling line for determining whether the coin is to be collected or refunded, and means controlled by the calling subscriber for connecting a positive or negative battery to said magnet to operate the same to either collect or refund the coin depending upon the relay.

5. In a telephone system, a line, a coin collector therefor, a magnet for controlling said coin collector, two booster batteries, means for extending a talking circuit from said line to a called subscriber, an electro-polarized relay controlled in one manner in a successful call to prepare a circuit for said magnet to one battery, and in another manner in an unsuccessful call to prepare a circuit for said magnet to the other of said batteries, and means controlled by the calling subscriber for completing whichever one of said circuits that is prepared to operate said magnet to either collect or refund the coin depending upon which battery is connected thereto.

6. In a telephone system, a line, a coin collector therefor, means for extending a talking circuit therefrom to a called subscriber, a relay in series with the transmitter circuit of the calling line for determining whether the coin is to be collected or refunded, and a magnet at the coin collector automatically controlled over the talking circuit by an increased flow of current to collect or refund the coin as determined by the said relay.

7. In a common battery telephone system, a pair of telephone lines, means for connecting the two and for establishing a flow of current through conductors in the connecting circuit, a toll assessing device for assessing toll for the connection, said device including an operating electromagnet, said magnet nonresponsive to said flow of current, means for causing an increased flow of current in the line in either of two directions to cause the operation of the magnet, and electromagnetic means in the battery supply circuit of the calling subscriber under the control of the called subscriber for rendering said last mentioned means effective in the proper direction to assess a toll.

8. In a telephone system, a calling telephone, a line therefor, automatic progressively movable switches for extending connections therefrom, another calling line having means for extending a connection to said first line, a coin controlled toll assessing device for assessing toll for calls to or from said first line, said toll assessing device having an operating magnet connected to said line, means in either connection for supplying talking current to said first line sufficient for talking purposes but insufficient for op-

eratively energizing said operating magnet, and means in either connection for increasing the flow of current through said magnet for assessing toll.

5 9. In a telephone system, a calling telephone, a line therefor, automatic progressively movable switches for extending connections therefrom, another calling line having means for extending a connection to said
10 first line, a toll assessing device for assessing toll for calls to or from said first line, said toll assessing device having an operating magnet connected to said line, means in
15 either connection for supplying talking current to said line sufficient for talking purposes but insufficient for operatively energizing said operating magnet, and means in one of said connections for automatically
20 increasing the flow of current through said magnet for refunding toll.

10. In a telephone system, a line, a coin collector therefor, means for extending a talking circuit therefrom to a called subscriber, a relay having one winding in said
25 talking circuit and a second winding in a holding circuit, said relay for determining whether the coin is to be collected or refunded, and a magnet at the coin collector automatically controlled over the talking
30 circuit by an increased flow of current to collect or refund the coin as determined by said relay.

11. In a telephone system, a line, a coin collector therefor, means for extending a talking
35 circuit therefrom to a called subscriber, a plurality of relays in series with the calling line, one of said relays for determining whether the coin is to be collected or refunded, and a magnet at the coin collector
40 automatically controlled by another of said relays by means of an increased flow of current to collect or refund the coin as determined by said first relay.

12. In a telephone system, a line provided
45 with a coin collector, a magnet for controlling said collector, a calling device for the line normally inoperative, means controlled by the coin when deposited for rendering the calling device operative, a relay
50 controlled by the completion of a call extended from the line by means of the calling device for determining whether the coin is to be collected or refunded, and a relay in series with said first relay controlled by the
55 calling subscriber when hanging up the receiver for causing the operation of said magnet as predetermined.

13. In a telephone system, a line, a coin collect device for said line, a trunk line, a
60 connector switch, a relay in said connector switch, means for extending a continuous metallic connection from said line to said connector switch, means for operating said connector switch to extend a connection
65 to a called line, a magnet for said de-

vice, a relay included in the said metallic connection controlled by the called subscriber to prepare an operating circuit for said magnet, and means in said trunk line controlled by the calling subscriber for causing
70 said circuit to be completed.

14. In a telephone system, a line, a pay station for said line, a series of automatic switches including a connector switch for
75 extending a connection from said line to a called line, a magnet for operating said pay station, said magnet non-responsive to battery currents used for operating said switches, high potential batteries for operating
80 said magnet, and a relay in the circuit of the calling line controlled by a relay in the connector switch for determining the manner in which said magnet is to be operated.

15. In a telephone system, a line equipped
85 with a pay-station device, a series of automatic switches including a connector switch for extending a connection to a called line, a magnet for said pay-station device non-responsive to a normal flow of current in
90 said connection, a battery of high potential, a relay in the calling line for closing one point in a circuit between said battery and said magnet, said relay controlled by said called line through the medium of another
95 relay in said connector switch, and means controlled by the calling line for closing said circuit to cause the operation of said magnet.

16. In a telephone system, a line, a coin collect device therefor, a trunk line, means for
100 extending a connection over said trunk line to a called line, a magnet for said device non-responsive to current used for establishing a connection, high potential positive and negative batteries for operating said
105 magnet, a relay in said trunk line controlled by the called line to prepare a circuit for said magnet including one or the other of said batteries, and another relay controlled by said calling line for causing the prepared
110 circuit to be completed to cause the operation of said magnet.

17. In a telephone system, a calling and
115 a called line, a train of automatic subscriber controlled switches for connecting said lines, a trunk line included in the connection between two of said switches, a coin collector at the station on the calling line having a magnet non-responsive to the battery used
120 for controlling said switches, a high voltage battery, a relay in one of said switches for reversing the direction of current flow in said trunk line when the called party answers, a polarized relay responsive to such
125 current reversal for preparing a control circuit for said magnet including said high voltage battery, and a relay individual to said trunk line responsive to the replacement
130 of the receiver at the calling station for com-

pleting said circuit to operate said magnet and collect a deposited coin.

18. In a telephone system, a calling and a called line, means including a line switch individual to the calling line, a trunk line accessible to said line switch, and a first selector in which said trunk line terminates for connecting said lines, a paystation at the station on the calling line, means responsive to the replacement of the receiver at the calling station for releasing said first selector and for completing a circuit over the calling line and a portion of said trunk line to control said paystation, and a holding circuit for maintaining said line switch in operated position to prevent the premature opening of said paystation control circuit.

19. In a telephone system, a calling and a called line, means including a line switch individual to the calling line, a trunk line accessible to said line switch, and a first selector in which said trunk line terminates for connecting said lines, a holding circuit extending back through the first selector over a conductor of said trunk line for maintaining the line switch and selector in operated position, a paystation at the station on the calling line, means responsive to the replacement of the receiver at the calling station for breaking said holding circuit to release the selector and for completing a circuit over the calling line and a portion of said trunk line to control said paystation, and another holding circuit for the said line switch for maintaining the same operated while said paystation is being controlled.

20. In a telephone system, a train of automatic switches for connecting a calling and called line, a coin collector at the station on the calling line having a control magnet, said magnet being nonresponsive to the battery used for operating said switches, a high voltage battery, a quick relay and a slow acting relay maintained energized during conversation, a circuit between the said mag-

net and high voltage battery including break contacts on said quick relay and make contacts on said slow relay, and means for de-energizing both relays when the calling party hangs up, thereby supplying operating current to said magnet for an interval after the release of the quick acting relay and before the release of the slow acting relay.

21. In a telephone system, a calling and a called line, a train of automatic switches for connecting said lines, a trunk line included in the connection between two of said switches, a coin collector at the station on the calling line having a magnet non-responsive to the battery used for controlling said switches, a high voltage battery, a relay individual to said trunk line controlled by the called subscriber to prepare a circuit for said magnet including said high voltage battery and the two talking conductors of the calling line in series, and a relay responsive to the replacement of the receiver at the calling station for completing said circuit to collect a deposited coin.

22. In a telephone system, a line, a paystation for said line, automatic switches for establishing a connection from said line to another line, a battery of one voltage for controlling said switches, said paystation nonresponsive to current from said battery in either direction, means for supplying positive and negative currents of higher voltage than the voltage of said battery, automatic means for preparing two different circuits for supplying said high voltage currents to said paystation, the circuit prepared depending upon the completion or the non-completion of the call, and means controlled by the calling subscriber for completing the circuit prepared to either collect or refund the coin.

Signed by me at Chicago, Cook County, Illinois, this 12th day of May, 1919.

TALBOT G. MARTIN.