

May 1, 1945.

J. G. WALSH

2,374,964

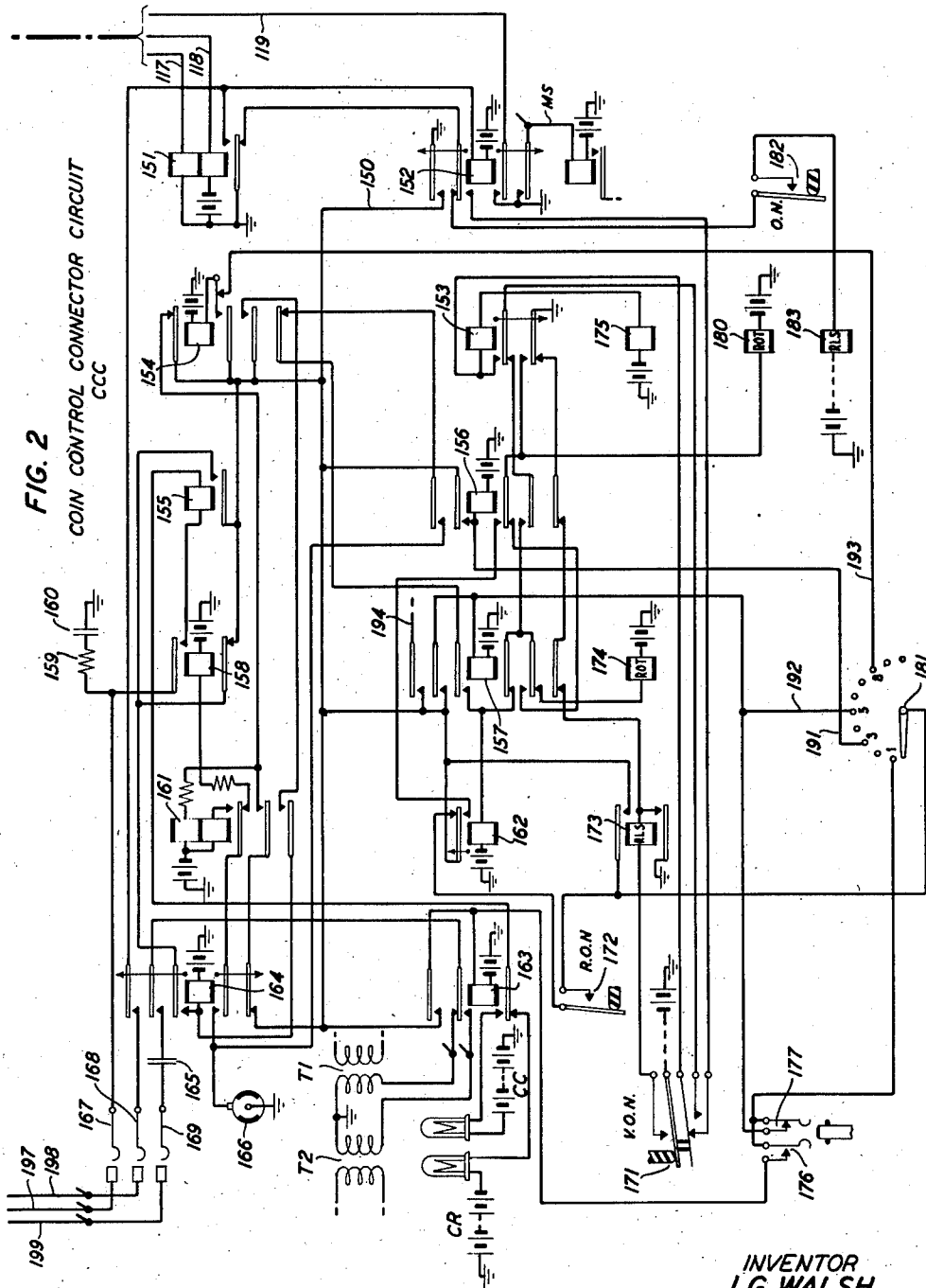
TELEPHONE SYSTEM

Filed Oct. 2, 1942

5 Sheets-Sheet 2

FIG. 2

COIN CONTROL CONNECTOR CIRCUIT
CCC



INVENTOR
J. G. WALSH
BY
R. O. Covell
ATTORNEY

May 1, 1945.

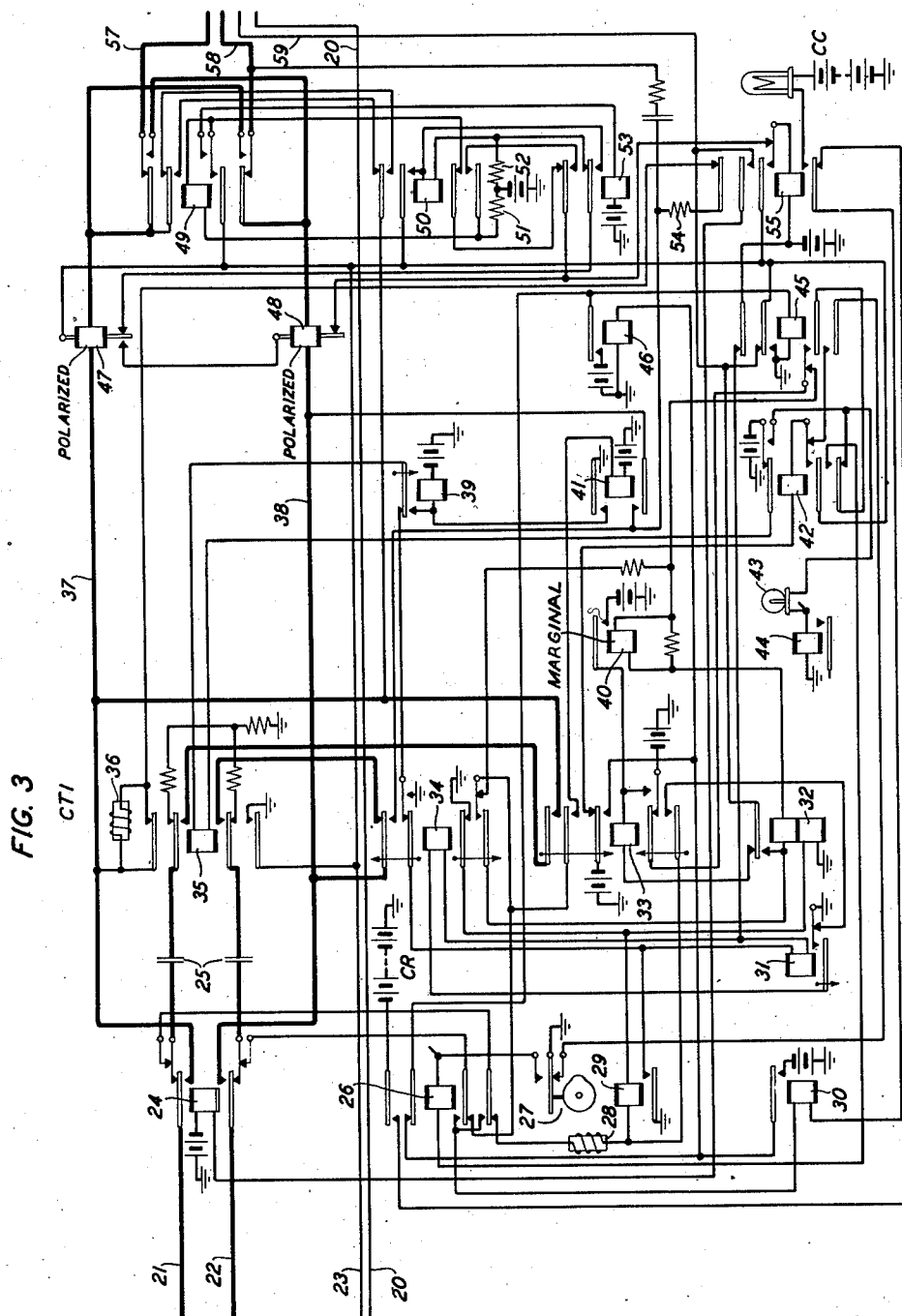
J. G. WALSH

2,374,964

TELEPHONE SYSTEM

Filed Oct. 2, 1942

5 Sheets-Sheet 3



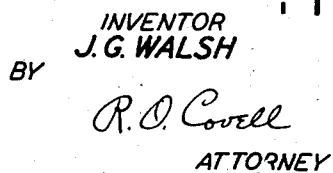
INVENTOR
J. G. WALSH
BY
R. O. Cowell
ATTORNEY

J. G. WALSH

TELEPHONE SYSTEM

Filed Oct. 2, 1942

5 Sheets-Sheet 4



May 1, 1945.

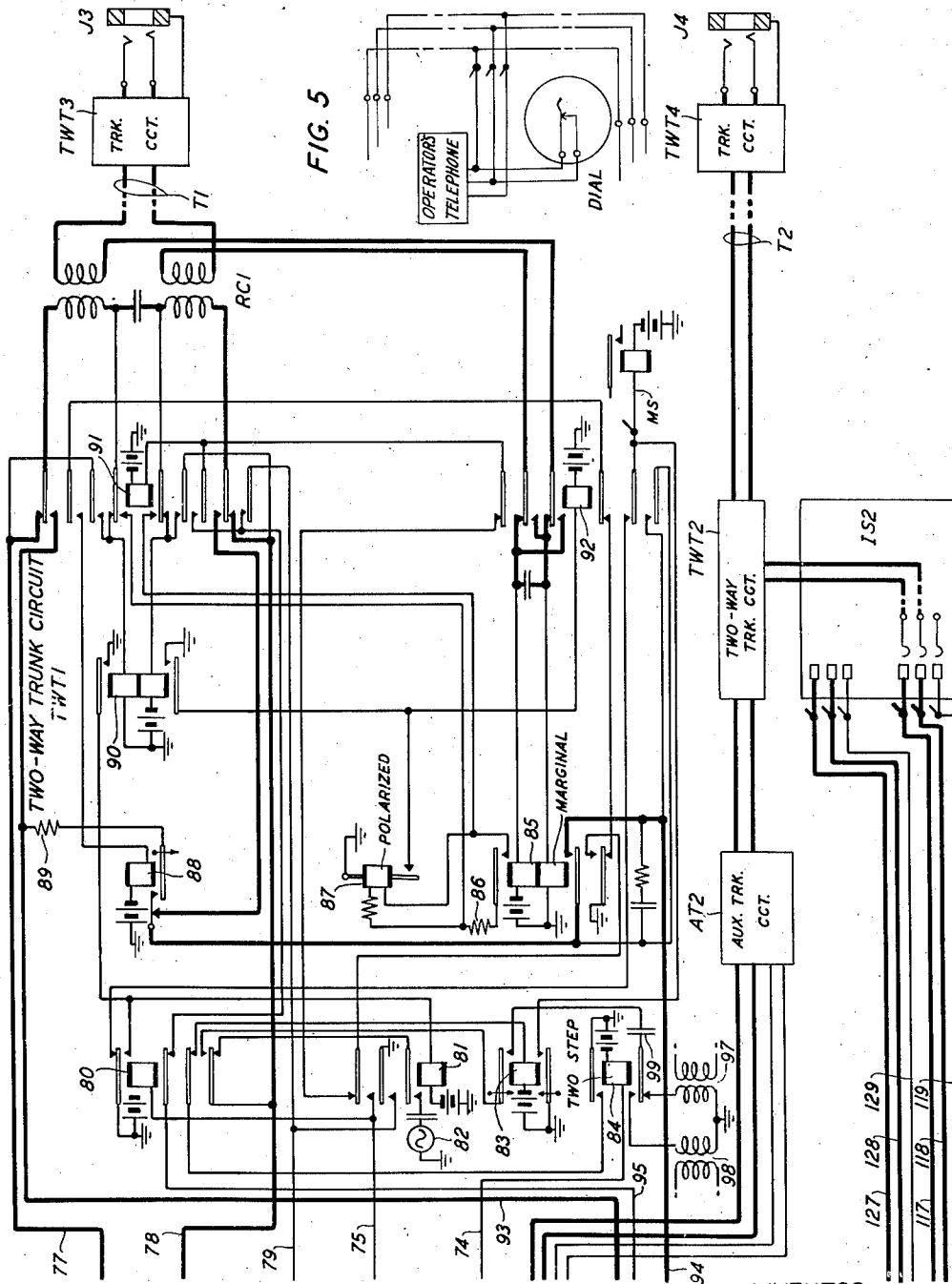
J. G. WALSH

2,374,964

TELEPHONE SYSTEM

Filed Oct. 2, 1942

5 Sheets-Sheet 5



INVENTOR
J. G. WALSH
BY

R. O. Covell
ATTORNEY

UNITED STATES PATENT OFFICE

2,374,964

TELEPHONE SYSTEM

John G. Walsh, Newark, N. J., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

Application October 2, 1942, Serial No. 460,527

13 Claims. (Cl. 179—6.3)

This invention relates to telephone systems and particularly to automatic telephone systems comprising subscribers' stations of the coin prepayment type.

Objects of the invention are an increase in the efficiency of disposing of coins deposited at prepayment coin stations in automatic telephone systems and the improvement of circuit means provided in such systems for disposing of coins on calls completed through an operator's position.

According to the invention means are provided in an automatic telephone system comprising subscribers' stations of the coin prepayment type whereby a connection is established with a calling line and either coin collect or coin return battery is connected to the line under the control of the dial or other impulse sender at an operator's position, through which a call from said station has been completed, to dispose of the coin deposited at the calling station.

One feature of the invention is the provision of means including a coin control connector for establishing a connection with the line of a calling station of the coin prepayment type under the control of a dial or other impulse sender at a toll operator's position through which a call from said station has been completed, the collection or return of the deposited coin being effected by a selective operation of the operator's impulse sender.

Another feature of the invention is the provision of means including means individual to the line of a subscriber's station of the coin prepayment type for opening the talking connection on a call established through an operator's position and for applying coin collect or coin return battery to the line without releasing the talking connection, the coin control connection being established and the coin disposal operation being effected under the selective control of a dial or other impulse sender at the operator's position.

A clear and complete understanding of the invention will be facilitated by describing a system in which the various features of the invention are embodied, such a system being represented schematically in the drawings which form a part of this specification. The invention is, however, not limited in its application to the system disclosed in the drawings but is generally applicable to automatic telephone systems comprising subscriber stations of the coin prepayment type.

Referring to the drawings:

Fig. 1 shows a coin subscriber's station A, line L1, auxiliary line circuit ALC1, and line circuit

LC1, a line finder LF1 and a connector C1; Fig. 1 also shows a second selector S2, a connector C2, a line L2 and a called subscriber's station B;

Fig. 2 shows a coin control connector circuit CCC;

Fig. 3 shows a coin control trunk circuit CT1;

Fig. 4 shows a first selector S1 individual to the coin control trunk circuit CT1 of Fig. 3 and line finder LF1 of Fig. 1; Fig. 4 further shows an auxiliary trunk circuit AT1 and an incoming selector IS1;

Fig. 5 shows a two-way trunk circuit TWT1 connecting the trunk circuit AT1 and selector IS1 of Fig. 3 with an interoffice trunk T1; Fig. 5 also shows an auxiliary trunk circuit AT2, incoming selector IS2 and two-way trunk circuit TWT2 associated with an interoffice trunk T2; and shows trunk circuits TWT3 and TWT4 terminating trunks T1 and T2 at a manual switchboard; and

Fig. 6 shows the relative positions in which Figs. 1 to 5 are to be placed to form an operative arrangement.

The subscriber's stations A and B are of the usual type provided in common battery, automatic exchanges. Station A includes a dial 8 for use in establishing desired connections and a coin box mechanism including the coin control magnet 7 and coin actuated contacts 6. Reference may be had to the patent to O. F. Forsberg No. 1,043,219 of November 5, 1912, for a complete disclosure of the coin box mechanism.

The line finder LF1, connectors C1 and C2, selectors S1, S2, IS1 and IS2 and coin control connector CCC each comprises a two-motion step-by-step switch, each of which is represented in the drawings by a set of brushes and one, two or three sets of terminals. Reference may be had to pages 53 to 65, inclusive, of the second edition of Automatic Telephony by Smith and Campbell for a detailed description of the structure of switches of this type and their operation when used as selectors and connectors. Reference may be had to the patent to R. L. Stokely No. 1,779,654 of April 7, 1931 for a description of the operation of a switch of this type when used as a line finder. The line circuits ALC1 and LC1, coin control connector CCC, coin control trunk circuit CT1, auxiliary trunk circuit AT1, two-way trunk circuit TWT1 and incoming selector IS1 are shown in detail; and the auxiliary trunk circuit AT2, two-way trunk circuit TWT2 and incoming selector IS2 are similar to the trunk circuits AT1, TWT1 and selector IS1, respectively. The trunk circuits TWT3 and TWT4

may be similar to the trunk circuit TC4 disclosed in detail in the patent to R. B. Buchanan et al. No. 2,233,282 of February 25, 1941. The cord circuit and position equipment of the operator's position may be similar to that disclosed in the patent to R. E. King et al. No. 2,209,777 of July 30, 1940.

Calls between stations A and other stations in the same dial office are completed through a line finder LF1, coin control trunk circuit CT1, first selector S1, second selector S2, additional selectors, if any (none being shown), and a connector. Calls to an operator are completed through a line finder LF1, coin control trunk circuit CT1, first selector S1, trunk circuits such as AT1 and TWT1 and the associated interoffice trunk T1 to an operator's position in a master office. If a call from station A is completed on a delayed call basis by an operator in the master office, a cord is connected to an idle trunk circuit such as TWT3 and the connection is completed through the trunk T1, an incoming selector IS1, second selector S2 and a connector C1. To dispose of the coins at a calling station A the operator establishes a coin control connection through an idle trunk T1 or T2, the associated incoming selector IS1 or IS2, coin control connector CCC and auxiliary line circuit ALC1 to the line L1. The coin control connector includes an auxiliary rotary selector consisting of a rotary stepping magnet 180, brush 181 and associated bank of terminals, off-normal springs 182, and a release magnet 183. The connector switch comprises brushes 167, 168 and 169 and includes normal post springs 176, which are actuated when the brushes are on the second level of the bank, and normal post springs 177 which are actuated when the brushes are on the seventh level of the bank. It is assumed that there are not more than one hundred lines arranged for coin box service in the dial office, so that each coin control connector has access to all coin lines.

Further description will be facilitated by describing the operation of the various circuits in detail. Assume that a call is initiated at station A, removal of the receiver from the receiver hook closing a circuit through the windings of line relay 16 of line circuit LC1 in series with the conductors of line L1. Relay 16 is thereby energized sufficiently to effect the closure of its outer front contact, without actuating its other contacts, to connect ground potential to start conductor ST to start an idle line finder LF1 in the group of finders having access to the calling line in usual and well-known manner. When the brushes of a line finder LF1 engage the terminals to which conductors 13, 14 and 15 of line circuit LC1 are connected, the line L1 is connected to the coin control trunk circuit CT1 and a circuit is closed through the brush and terminal, to which conductor 15 is connected, for energizing the middle winding of relay 16 sufficiently to effect the actuation of all of the contacts of this relay. The complete operation of relay 16 disconnects the windings of relay 16 from conductors 13 and 14 and disconnects ground from start conductor ST. Relay 29 of coin trunk CT1 is operatively energized in a circuit traced from battery through the inner lower back contact of relay 33, lower back contact of relay 45, outer lower back contact of relay 34, inner lower back contact of relay 26, lower back contacts of relay 24, conductor 22, middle brush of line finder LF1, conductor 14, a back contact of relay 11, lower conductor of line L1, left winding of coil 10 at station A,

contact of the receiver-hook switch, transmitter 9, lower contact of dial 3, upper conductor of line L1, a back contact of relay 11, conductor 13, upper brush of line finder LF1, conductor 21, upper back contacts of relay 24, outer lower back contact of relay 26, retard coil 28, winding of relay 29, to ground at the inner lower back contact of relay 34. The operation of relay 29 closes a circuit for operatively energizing the winding of relay 31. The operation of relay 29 also closes a circuit including the inner upper back contact of relay 34, back contact of relay 39, winding of relay 35, and the upper back contact of relay 42 for causing the operation of relay 35. The operation of relay 35 connects ground to sleeve conductor 23 to hold the line finder LF1 and opens the short circuit across retard coil 36. The operation of relay 31 closes a circuit, including the uppermost back contact of relay 45, for operating relay 34. The operation of relay 34 closes a holding circuit for relay 35, independent of relay 29 and opens a normally closed short circuit across the lower winding of relay 32, thereby including this winding in series with the winding of relay 29 and the conductors of line L1. The operation of relay 34 further changes the operating circuit of relay 29 to include the upper winding of relay 32, the winding of relay 40, lower back contact of relay 45 and the lower back contact of relay 33. Relay 40 is marginal and does not operate until a coin is deposited at the calling station. The operation of relay 34 also closes a bridge across conductors 57 and 58 to effect the operation of the line relay (not shown) of selector S1. This bridge is traced from conductor 57, through the outer upper back contact of relay 49, winding of relay 47, conductor 37, retard coil 36, outer upper back contact of relay 55, resistor 54, outer upper front contact of relay 34, conductor 38, winding of relay 48, lower back contact of relay 49, to conductor 58. The operation of the line relay of selector S1 effects the connection of a holding ground potential to the sleeve conductor 59 in usual and well-known manner, this ground potential being further extended through the inner upper back contact of relay 45, to sleeve conductor 23 to hold the line finder LF1. Relays 47 and 48 are oppositely polarized so that relay 48 operates in series with the line relay of selector S1 but relay 47 does not operate. When the subscriber at station A deposits a coin, the contacts 6 are actuated thereby connecting ground potential through the winding of coin control magnet 7 to the conductors of line L1, thereby increasing the current through the winding of relay 40 sufficiently to effect the operation of this relay. The operation of relay 40 closes a circuit from battery through its front contact, winding of relay 33, back contact of relay 32 and sleeve conductor 59 to holding ground potential, thereby effecting the operation of relay 33. Relay 33 locks, independent of relay 40 under the control of relay 32, and closes circuits for operating relays 45 and 46. The circuit for operating relay 45 includes the inner upper front contact of relay 33 and the upper back contact of relay 26. The operation of relay 33 connects the winding of impulse relay 41 to the lower conductor of line L1 and opens the circuit through the winding of relay 40. The operation of relay 46 closes a circuit for holding relay 45 independent of relay 33 and for maintaining the energization of its own winding under the control of relay 26 but independent of relay 33. The operation of relay 45 causes the release of relays 31 and 34,

opens the connection between conductors 23 and 59, and connects ground directly to conductor 23. The release of relay 31 closes a short circuit across the winding of relay 29 and lower winding of relay 32; so that relay 29 releases, if not already released due to the deposit of a coin at the calling station. Relay 41 operates in series with the impulse contact of the dial 8 at station A, closing a circuit for operating relay 39. Relay 39 closes a circuit for holding relay 35 operated under the control of relay 41. At its lower front contact, relay 41 maintains the bridge across conductors 57 and 58 after the release of relay 34. Relays 31 and 34 are slow in releasing in order to insure that relay 41 is fully operated before relay 34 releases.

It is the purpose of relay 32 to block the operation of the trunk circuit CTI in case ground is connected directly to the line at the calling station without the deposit of a coin. The operation of relay 32 in such a case prevents the operation of relay 33. If relay 32 operates, it locks in series with relay 40 to the grounded sleeve conductor 59, prevents the operation of relay 33, and causes the release of relay 29 by connecting grounded sleeve conductor 59 to conductor 22, the line loop and winding of relay 29 being thereby short-circuited. The release of relay 29 in such a case causes the release of relays 31 and 34. The release of relay 34 causes the release of relay 35 and opens the bridge across conductors 57 and 58. The release of the line relay of the selector S1, when the bridge across conductors 57 and 58 is opened, causes the disconnection of holding ground potential from conductor 59, thereby effecting the release of relays 32 and 40 and the return of the line finder LFI to normal in usual manner.

A coin having been deposited at station A, the operation of relay 41 and release of relay 34 effects the closure of a dial tone transmitting connection between conductors 21 and 22, through condensers 25, inner front contacts of relay 35, a front contact of relay 33 and a back contact of relay 34, to conductors 57 and 58. The bridge across conductors 57 and 58 for control of the line relay of selector S1 is now traced from conductor 57 through the outer upper back contact of relay 49, winding of relay 47, conductor 31, retard coil 36, outer upper back contact of relay 55, resistor 54, lower front contact of relay 41, winding of relay 48, lower back contact of relay 49 to conductor 58. When the subscriber at station A dials the first digit of the number of a subscriber's station with which a talking connection is desired, relay 41 is alternately released and reoperated in response to each impulse created by the impulse contact of dial 8, each release of relay 41 being effective to repeat the impulse to the line relay of selector S1. The brushes of selector S1 are thereby advanced to select the level corresponding to the digit dialed; and the brushes of selector S1 are thereupon automatically advanced in the selected level to seize a set of terminals connected to an idle intermediate selector or to a connector if the number of subscribers in the dial office is not large enough to require the use of such selectors. As shown in the drawings the terminals 60 represent a level in which the terminals are connected to second selectors, the terminals 60 being connected to a selector S2. When the calling subscriber dials the second digit, the selector S2 is operated to select a set of terminals connected to an idle connector C2 having access to the

called line, and when the calling subscriber dials the last two digits of the called subscriber's number, the dial impulses effect the operation of the connector C2 to establish connection with the called line L2. The called line is tested and, if the line is idle, a source of ringing current is connected to the line. When the call is answered at station B, the current through conductors 57 and 58 is reversed in the usual manner to effect the operation of polarized relay 47 and effect the release of polarized relay 48. The operation of relay 48 and release of relay 47 closes a circuit from battery through the winding and continuity back contact of relay 55, in parallel with battery through resistor 51, winding of relay 49, inner lower back contact of relay 50 and outer upper back contact of relay 53, thence through the back contact of relay 48, and front contact of relay 47 to grounded conductor 59. Each of relays 49 and 55 locks to ground at the inner upper front contact of relay 45. The operation of relay 55 closes a circuit for operating relay 24 thereby to close a connection between conductors 21 and 22 and conductors 57 and 58 for conversation between stations A and B. Relays 39 and 35 release, so as to short-circuit retard coil 36, during the repeating of each train of dial impulses. The operation of relay 49 closes a circuit for operating relay 53, short-circuits the winding of relay 47 and interchanges the connections between conductors 21 and 22 and conductors 57 and 58, so that relay 47 releases and relay 48 reoperates. With relay 53 operated and relay 47 released, a circuit is closed from battery through resistor 52, winding of relay 50, inner upper front contact of relay 53 and back contact of relay 47, for operating relay 50. Relay 50 locks through its inner upper front contact and opens the short circuit across the winding of relay 47. The aforementioned operation of relay 24 causes the release of relay 41; and the release of relay 41 causes the release of relays 39 and 35.

When the subscriber at station A replaces the receiver to release the connection, the opening of the loop circuit over line L1 effects the release of the line relay (not shown) of the connector C2, whereby holding ground potential is disconnected from conductor 59, causing the release of relays 24 and 33. The connector C2, selector S2 and selector S1 are restored to normal in usual manner; but the line finder LFI is held operated due to the connection of sleeve conductor 23 to ground at the inner upper front contact of relay 45. The upper and lower contacts of interrupter 27 are alternately closed for half-second intervals, and as soon after relay 33 releases as ground is next connected to the lower contact of interrupter 27, relay 42 is operated in a circuit traced from battery at the upper back contact of relay 33, through the winding and lower continuity back contact of relay 42 and outer lower front contact of relay 45 to ground at the lower contact of interrupter 27. Relay 42 locks to ground at the front contact of relay 45, disconnects battery from the winding of relay 35 and connects battery to lamp 43 in series with alarm relay 44. As soon after the operation of relay 42 as the upper contact of interrupter 27 is next closed, a circuit is closed from ground through this contact, winding of relay 26, outer lower front contact of relay 42 and inner lower front contact of relay 45, to battery at the inner lower back contact of relay 33, thereby operating relay 26. The operation of relay 26 closes a circuit for operating the coin collect magnet 7 at the call-

ing subscriber's station, this circuit being traced from coin collect battery CC through the lower front contact of relay 55, winding of relay 30, lower front contacts of relay 26, back contacts of relay 24, conductors 21 and 22, brushes of line finder LF1, conductors 13 and 14, back contacts of relay 11, to the conductors of line L1, thence to ground through the winding of coin collect magnet 7 and coin actuated contact 6. The coin collect magnet 7 is thereby operated to effect the collection of the coin. Relay 30 of coin trunk circuit CT1 is operated by the current in this circuit, thereby closing a holding circuit for relay 46. When the upper contact of interrupter 27 is next opened, relay 26 releases, disconnecting the coin collect battery CC from conductors 21 and 22. When the upper contact of interrupter 27 is next closed, relay 26 is reoperated again closing the connection between coin collect battery CC and the conductors of the line L1. The coin having been collected by the first application of coin collect battery, the coin actuated contacts 6 are open so that relay 30 of coin trunk CT1 does not operate and relay 46 releases. The release of relay 46 causes the release of relay 45 and the release of relay 45 disconnects ground potential from conductor 23 thereby causing the line finder LF1 to be restored to normal and effecting the return of the coin trunk CT1 to normal.

If the called subscriber replaces the receiver before the calling subscriber, relay 47 reoperates and relay 48 releases due to the reversal of the current through the windings of these relays. The winding of relay 49 is thereby short-circuited and relay 49 releases. The release of relay 49 causes the release of relay 53 and again interchanges the connections between conductors 47 and 48 and conductors 57 and 58, so that relay 47 releases and relay 48 reoperates. The release of relay 47 short-circuits the winding and causes the release of relay 50. When the connection is released at the calling station A, the coin is collected as above described.

If the call to station B is not answered, the current through conductors 57 and 58 is not reversed so that relays 49, 50, 53, 55 and 24 are not operated. In this case, release of the connection causes the coin deposited at station A to be returned, coin return battery CR being connected to the conductors of line L1 under the control of relays 26 and 42 and interrupter 27.

Assume now that the subscriber at station A dials the digit 0 or any other digit which effects the operation of selector S1 to route the connection through a trunk circuit to the master office. The terminals 61 and 62 represent a level in which the terminals are connected to trunks to the master office. Assuming the terminals 62 to be the selected set of terminals, a circuit is closed for operating line relay 90 of two-way trunk circuit TWT1. This circuit is traced from battery through the lower winding of relay 90, inner lower back contact of relay 91, lower left winding of repeating coil RC1, a lower back contact of relay 91, conductor 78, inner lower back contact of relay 76, conductor 68 of auxiliary trunk circuit AT1, inner upper back contact of relay 63, terminal and brush of selector S1, conductor 58 of trunk circuit CT1, lower back contact of relay 49, winding of relay 48, conductor 38, lower front contact of relay 41, resistor 54, a back contact of relay 55, retard coil 36, conductor 37, winding of relay 47, a back contact of relay 49, conductor 57, brush and terminal of selector S1, outer upper back contact of relay 63 of trunk circuit AT1, 75

conductor 67, upper back contact of relay 76, conductor 77, outer upper back contact of relay 91, upper left winding of repeating coil RC1, inner upper back contact of relay 91, and the upper winding of relay 90, to ground. The operation of relay 90 closes circuits for operating relays 81 and 92. Relay 81 connects ground to conductor 79, thence through the terminal engaged by the sleeve brush of selector S1 to hold selector S1, and through selector S1 to conductor 59 to hold relay 33 of coin trunk circuit CT1. The operation of relay 92 interchanges the connections between the windings of relay 85 and the conductors of trunk T1 thereby to reverse the current through these conductors to operate the line relay of trunk circuit TWT3 in the master office. Relay 85 is marginal and does not operate until the call is answered by an operator in the master office. The operation of relay 92 connects ground, at a back contact of relay 80, to conductor MS to start the operation of the ringing and interrupter machine if not already in operation. The operation of relay 81 closes a connection from ringing source 82, through the inner upper front contact of relay 81 and the lowermost back contact of relay 80, to conductor 78 to transmit a ringing tone to the calling subscriber to indicate that an operator is being signaled.

The class of service relay 72 of auxiliary trunk circuit AT1 is operatively energized, upon seizure of terminals 62, by the current in a circuit through the lowest brush of selector S1 and conductor 20, front contact of normal post springs 19 of line finder LF1 and resistor 18, to ground. The normal post springs 19 are actuated when the brushes of the line finder engage a set of terminals in a level in which coin box lines are terminated. The resistor 18 is low enough in resistance to effect the complete operation of relay 72; and relay 72 in turn connects ground to conductor 74 to cause the complete operation of relay 84 of trunk circuit TWT1. Two other classes of service may be provided, conductor 20 being connected through a set of normal post springs at the line finder to partially energize relay 72 on a call from one of these classes and conductor 20 not being connected to ground so that relay 72 remains normal on a call from a line of the other of these two classes. The complete operation of relay 84 connects tone source 98 to condenser 99 and closes a circuit for operating relay 83; the partial actuation of relay 84 closes the circuit for operating relay 83 but leaves the tone source 97 connected to condenser 99; and, if relay 84 remains normal, relay 83 is not operated. Relay 84 having operated completely on the call in question, relay 83 is operated and tone source 98 is connected to condenser 99. Relay 83 connects ground to the motor start conductor MS to maintain the operation of the ringing and interrupter machine while a class of service tone is being transmitted to the answering operator.

When an operator answers the call by inserting the plug of a cord in jack J3, the resistance bridged across the conductors of trunk T1 in the trunk circuit TWT3 is reduced sufficiently to effect the operation of relay 85. The operation of relay 85 closes a circuit for operating relay 80. Relay 80 opens the audible ringing tone connection, disconnects the ground at its upper back contact from the motor start conductor, closes a holding circuit for relay 81, and opens the operating circuit of relay 83. Relay 83 is slow in releasing; and the class of service tone source 98 is connected through the lower front contact of

relay 84, condenser 99, and front contacts of relays 83 and 80 to conductor 78 and repeating coil RC1 until relay 83 releases, thereby effecting the transmission of a short impulse of class of service tone to the answering operator to indicate that the call originated at a prepayment coin subscriber's station. The operation of relay 85 also connects ground to conductor 75 to effect the operation of relay 76 of auxiliary trunk circuit AT1 as soon as interrupter relay 71 operates, relay 71 being alternately operated and released under the control of a sixty impulse per minute interrupter. The circuit for operating relay 76 is traced from battery through its upper winding, upper back contact of relay 66, front contact of relay 71, upper front contact of relay 72, conductor 75, uppermost front contact of relay 81, to ground at a front contact of relay 85. Relay 76 locks through its lower winding and sleeve conductor 79, to ground at a front contact of relay 81. The operation of relay 76 interchanges the connections between conductors 67 and 68 and conductors 77 and 78, so as to reverse the current through conductors 57 and 58 and thereby effect the operation of relay 47 and the release of relay 48 of coin trunk circuit CT1. The operation of relay 47 and release of relay 48 causes the operation of relays 49, 55, 24, 50 and 53 as hereinbefore described, the operation of relay 24 being effective to connect conductors 21 and 22 directly to conductors 37 and 38 for conversation between station A and the answering operator. As soon after relay 76 operates as the interrupter relay 71 next releases, a circuit is closed for operating relay 69, from ground at the back contact of relay 71, lowermost front contact of relay 76, lower back contact of relay 66, continuity back contact of relay 69, outer upper front contact of relay 76, winding of relay 69, and resistor 70 to battery. Relay 63 does not operate since its winding is short-circuited at this time. Relay 69 locks to ground at a front contact of relay 76. As soon as interrupter relay 71 next reoperates, the short circuit across the winding of relay 63 is opened and the winding of relay 63 is operatively energized in a circuit traced from battery through resistor 65, winding of relay 63, lower front contact of relay 69, to ground at a front contact of relay 76. The operation of relay 63 first connects resistor 64 across conductors 67 and 68, to hold relay 90 operated; and then closes a connection from coin return battery CR, through the upper front contact of relay 69, front contacts of relay 63, the two upper terminals of terminal set 62, upper brushes of selector S1, to conductors 57 and 58 and thence to the conductors of line L1 to operate the coin control magnet 7 to return the coin. When interrupter relay 71 next releases, ground is connected through the back contact of this relay, lowermost front contact of relay 76, a front contact of relay 63 and a back contact of relay 66 in parallel, and through the lowermost front contact of relay 63 to resistor 70, thereby short-circuiting the winding of relay 69. Relay 69 releases thereby disconnecting coin return battery from line L1 and closing a circuit for operating relay 66. After relay 69 releases, relay 63 is held operated until interrupter relay 71 next reoperates, the circuit for holding relay 63 being traced from battery through resistor 65, winding of relay 63, continuity back contact of relay 69, middle lower front contact of relay 63, lowermost front contact of relay 76, to ground at a back contact of relay 71. After the coin return battery is disconnected, the line L1 is discharged while relay

63 is held operated. Relay 66 locks to ground at a front contact of relay 76 and opens the operating circuits of relays 76 and 69. When relay 71 next reoperates, relay 63 releases, first reestablishing the talking connection between station A and the answering operator and then opening the bridge through resistor 64 across conductors 67 and 68. Since relay 66 is locked operated under the control of relay 76, further operations of interrupter relay 71 are ineffective.

The coin having been returned at the calling station A and the class of service tone having informed the operator as to the character of the calling station, the operator inquires as to the connection desired by the calling subscriber, requests the deposit of coins in the proper amount for the call in question and completes the connection, if possible. In order to effect the collection or refund of the coins thus deposited at the request of the operator, a separate coin control connection with the line L1 is established by the operator by connecting another cord to a jack J4 of another trunk T2 in the group of trunks interconnecting the dial and master offices. Upon insertion of a plug in jack J4, the bridge in trunk circuit TWT4 which is normally connected across the conductors of trunk T2 is reduced in resistance sufficiently to cause the operation of the marginal line relay in trunk circuit TWT2 in the dial office, which relay corresponds to relay 85 of trunk circuit TWT1. Since trunk circuit TWT2 and selector IS2 are identical in arrangement with trunk circuit TWT1 and selector IS1, the establishment of the coin control connection with line L1 will be described as if effected through trunk circuit TWT1 and selector IS1, thereby making unnecessary to show the trunk circuit TWT2 and selector IS2 in detail. The operation of relay 85 closes a circuit including back contacts of relays 81 and 92 for operating relay 91 and connects resistor 86 in parallel with the winding of relay 87. The operation of relay 91 disconnects the left windings of repeating coil RC1 from conductors 77 and 78, connects the windings of relay 90 directly to conductors 77 and 78, and closes a circuit for operating the line relay 97 of the associated incoming selector IS1. The circuit for operating relay 97 is traced from battery through the lower winding of relay 97, inner lower back contact of relay 96, conductor 94, inner lower front contact of relay 85, back contact of relay 88, a front contact of relay 91, lower left winding of repeating coil RC1, inner lower front contact of relay 91, winding of relay 87 and resistor 86 in parallel, inner upper front contact of relay 91, upper left winding of repeating coil RC1, a front contact of relay 91, conductor 93, upper back contact of relay 96, upper winding of relay 97, to ground at a back contact of the eleventh rotary step springs 104. Relay 97 closes a circuit for operating the slow-to-release relay 98; and relay 98 connects a busy-marking ground potential to conductor 95, thence through a back contact of relay 80 and a front contact of relay 91 to conductor 79 to mark the trunk circuit TWT1 busy in the banks of selectors S1. In case a selector such as S1 seizes the trunk circuit TWT1 before relay 98 connects the busy ground to conductor 79, relay 90 operates and the outgoing call to the operator is given precedence over the incoming call from the operator, the operation of relay 80 as above described being effective to cause the release of relay 91. Assuming that ground is connected to conductor 79 before any selector S1 tests the busy

condition of trunk circuit TWTI, the operator now dials a particular digit to selectively operate the incoming selector TS1 to extend the connection to a coin control connector CCC, dials a coin disposal digit to selectively set the coin control connector for collecting or for refunding the coin deposited at the calling subscriber's station, and dials the directory-listed number of the calling subscriber's station to establish connection with the auxiliary line circuit ALC1 associated with the calling subscriber's line. To prepare the coin control connector for collection of the coin, the digit 2 is dialed preceding the directory-listed number; and, to prepare the coin control connector for refunding the coins, the digit 7 is dialed preceding the directory-listed number. When the operator dials the particular digit required for selection of a coin control connector, the line relay 85 alternately releases and reoperates as many times as there are units in the digit dialed, thereby repeating the dial impulses to relay 97 of selector IS1. The release of relay 85 in response to the first impulse of the train closes a circuit for operating relay 88. With relay 88 operated, the non-inductive resistor 89 is included in the circuit for operating relay 97 in place of the left windings of repeating coil RC1 and the winding of relay 87, thereby insuring the reoperation of relay 97 between impulses. Relay 88 is slow in releasing and remains operated until all of the impulses in the train have been received by relay 85. The release of relay 97 in response to the first impulse closes a circuit from ground at the middle lower back contact of relay 96, through the back contact of relay 97, lower front contact of relay 98, winding of relay 99, and winding of vertical stepping magnet 101 to battery. The stepping magnet 101 and relay 99 are both operatively energized, the operation of magnet 101 being effective to step the brushes of selector IS1 up to the first level of the bank. When the shaft of selector IS1 moves out of normal position, the vertical off-normal springs 105 are actuated, closing a circuit for operating relay 100. This circuit is traced from battery through the winding of relay 100, upper front contact of springs 105, front contact of relay 99 to ground at a front contact of relay 98. Relay 100 closes a locking circuit which includes the back contact of rotary stepping magnet 102, lower front contact of relay 100 and the middle lower back contact of relay 96. When relay 97 reoperates at the end of the first impulse, stepping magnet 101 releases. The release and reoperation of relay 97, in response to each succeeding impulse of the train created by the dialing of the digit which effects selection of a coin control connector, causes a corresponding operation and release of stepping magnet 101, thereby stepping the brushes up to the level corresponding to the digit dialed. Being slow in releasing, relay 98 remains operated, while relay 97 is responding to dial impulses. Relay 99 is also slow in releasing and remains operated until all of the impulses in the train have been received by relay 97. When relay 99 releases, it closes a circuit for operating the rotary stepping magnet 102, thereby advancing the brushes of selector IS1 into engagement with the first set of terminals in the selected level. The operation of stepping magnet 102 causes the release of relay 100 and the release of relay 100 causes the release of stepping magnet 102. If the first set of terminals is connected to a busy coin control connector, the sleeve brush of switch IS1 encounters a busy ground poten-

tial which effects the reoperation of relay 100. The circuit for reoperating relay 100 includes the upper front contact of springs 105, back contact of rotary stepping magnet 102, lower back contact of the eleventh rotary step springs 104, lowermost back contact of relay 96, through conductor 109 and the sleeve brush of switch IS1 to the busy-marking, ground potential. The reoperation of relay 100 causes the reoperation of stepping magnet 102 thereby advancing the brushes to the next set of terminals. The reoperation of stepping magnet 102 causes the release of relay 100 and the release of relay 100 causes the release of stepping magnet 102. Relay 100 and stepping magnet 102 thus cooperate to continue the advance of the brushes, step by step in the selected level, until an idle set of terminals is encountered; whereupon relay 96 is operated in a circuit traced from battery, through the winding of relay 100, upper front contact of springs 105, back contact of stepping magnet 102, lower back contact of springs 104, winding of relay 96, to ground at the upper contact of relay 98. Assuming the terminal set 111 to be the selected set of terminals, the operation of relay 96 connects conductors 93 and 94, through front contacts of relay 96, conductors 107 and 108, brushes of selector IS1 and conductors 117 and 118 to the windings of line relay 151 of a coin control connector CCC, thereby causing the operation of relay 151 under the control of relay 85 of trunk circuit TWTI. Relay 151 closes a circuit for operating slow-to-release relay 152. Relay 152 connects holding ground potential to conductor 119 to hold relay 96, connects ground to conductor 150, and connects ground to the motor start conductor MS to start the ringing and interrupter machine, if not already in operation. The aforementioned operation of relay 96 disconnects relay 97 from conductors 93 and 94, thereby causing the successive release of relays 97 and 98. Since relay 98 is slow in releasing, it does not disconnect ground from conductor 95 until after relay 152 of connector CCC has connected ground to conductor 119 to maintain the operation of relay 96, this ground being further extended through the outer lower front contact of relay 96 to conductor 95, thence to conductor 79 to maintain the busy marking of trunk circuit TWTI in the banks of selectors S1. When ground is connected to conductor 150, the upper winding of relay 161 is operatively energized in preparation for the application of coin collect or coin return battery to the calling line as hereinafter described. Relay 161 locks through its middle lower front contact and the lower back contact of relay 164 to conductor 150.

The operator now dials the coin disposal digit to selectively prepare the connector CCC for collection or return of the coins deposited at the calling station, the dial impulses thus created being repeated by relay 85 of trunk circuit TWTI to relay 151. The release of relay 151 in response to the first impulse closes a circuit from ground through its back contact, a front contact of relay 152, back contact of vertical off-normal springs 171, winding of relay 153, and winding of vertical stepping magnet 175, to battery. Stepping magnet 175 and relay 153 are thereby operatively energized, the operation of stepping magnet 175 being effective to step the brushes 167, 168 and 169 up to the first level of the bank. The vertical off-normal springs 171 are actuated when the brush shaft moves out of normal position, the circuit for operating stepping magnet

175 and relay 153 being thereby modified to include the lower front contact of springs 171 and the inner front contact of relay 153 in place of the back contact of springs 171. The operation of relay 153 also closes a circuit for operating the rotary stepping magnet 180 of the auxiliary rotary selector, thereby advancing the brush 181 from normal into engagement with the first terminal of its bank. The reoperation of relay 151 at the end of the first impulse opens the circuit for energizing relay 153 and stepping magnet 175. Stepping magnet 175 releases but relay 153 is slow in releasing and remains operated until all of the impulses in the train have been received by relay 151. The release and reoperation of relay 151 in response to each succeeding impulse of the train causes the operation and release of stepping magnet 175 thereby advancing the brushes 167, 168 and 169 to the level corresponding to the digit dialed. If the operator wishes to collect the coins at the calling station, the dialing of the digit 2 effects the advance of the brushes of the coin control connector to the second level, thereby actuating both sets of normal post springs 176 and 177. If the operator wishes to return the coins, the dialing of the digit 1 effects the advance of the brushes to the seventh level, thereby actuating only the normal post springs 177. Relay 152 is slow in releasing so as to remain operated while relay 151 is responding to dial impulses. When relay 153 releases, after relay 151 has reoperated at the end of the last impulse in the train, it opens the circuit for energizing stepping magnet 175, opens the circuit for energizing stepping magnet 180, and closes a circuit for operatively energizing release magnet 173, this circuit being traced from battery, through the upper front contact of the vertical off-normal springs 171, winding of release magnet 173, lowermost back contact of relay 157, outer lower back contact of relay 156, to ground at the outer back contact of relay 153. The operation of release magnet 173 closes a locking circuit for its winding and effects the return of the brushes 167, 168 and 169 to normal. If the normal post springs 176 are actuated, the operation of release magnet 173 closes a circuit for operating relay 163, this circuit being traced from the winding of relay 163, through the contact of springs 176, terminal 1 and brush 181 of the auxiliary rotary selector, and the upper front contact of release magnet 173, to grounded conductor 150; in which case, relay 163 locks directly to conductor 150 and connects coin collect battery CC to the winding of relay 155. If the normal post springs 176 are not actuated, relay 163 is not operated and coin return battery CR remains connected to the winding of relay 155. The actuation of normal post springs 177 when the brushes of connector CCC are on either the second level or on the seventh level prevents the operation of relay 157 in response to the coin disposal digit. When the brush shaft of connector CCC reaches normal, the springs 171 are restored to normal, thereby causing the release of release magnet 173.

The operator now dials the directory-listed number of the calling station, the trains of impulses thus created being repeated by relay 85 of trunk circuit TWT to relay 151 of connector CCC. When the first of these digits is dialed, the brushes 167, 168 and 169 are advanced by the operation of stepping magnet 175 under the control of relay 151 to the level corresponding to this digit. The stepping magnet 180 of auxil-

ary rotary selector is operated by relay 153 to advance brush 181 to terminal 2; and, when relay 153 releases at the end of this train of impulses, the release magnet 173 is again operated to restore the brushes, thereby absorbing this digit. When the second digit is dialed the brushes of connector CCC are advanced to the level corresponding to this digit; and the brush 181 of the auxiliary selector is advanced to terminal 3. When relay 153 releases at the end of the train of impulses corresponding to the second digit of the calling subscriber's number, the release magnet 173 is again operated to effect the return of the brushes of connector CCC to normal and to close a circuit, including conductor 191, terminal 3 and brush 181 of the auxiliary selector, for operating relay 156. Relay 156 locks to conductor 150. When the third digit of the directory-listed number is dialed, the brushes of connector CCC are advanced to the level corresponding to this digit, and the brush 181 of the auxiliary selector is advanced to terminal 4. The release of relay 153 at the end of this train of impulses does not effect the operation of release magnet 173 since relay 156 is operated; and the brushes 167, 168 and 169 remain on the level corresponding to the tens digit of the calling subscriber's number. When the fourth digit of the directory-listed number is dialed, relay 151 controls the operation of relay 162 and the rotary stepping magnet 174, the windings of relay 162 and stepping magnet 174 being connected in parallel through back contacts of relay 157, thence through a front contact of relay 156, inner back contact of relay 153, lower front contact of springs 171, and a front contact of relay 152 to ground at the back contact of relay 151 in response to each impulse. Relay 162 closes a circuit for operating stepping magnet 180 to advance the brush 181 to terminal 5. Being slow in releasing, relay 162 remains operated during the response of relay 151 to this train of dial impulses. The rotary stepping magnet 174 is operated in response to each impulse, thereby rotating the brushes 167, 168 and 169 into engagement with the set of terminals to which the auxiliary line circuit ALC1 of the calling line is connected. The rotary off-normal springs 172 are actuated when the brushes are advanced to the first set of terminals in the selected level. When all of the impulses in the train have been received, the release of relay 162 closes a circuit for operating relay 157, this circuit including conductor 192, terminal 5 and brush 181 of the auxiliary selector, contact of springs 172, and back contact of relay 162. Relay 157 locks to conductor 150, disconnects the winding of relay 162 from the back contact of relay 151 and connects this winding, through the outer lower back contact of relay 154 and upper front contact of relay 156 to the 60-impulse per minute interrupter 166. Relay 162 is thereby operated once per second under the control of interrupter 166, each operation of relay 162 causing the operation of stepping magnet 180 of the auxiliary selector to advance brush 181 one step. If the dial office is one in which party lines are connected to a single set of terminals in the banks of connectors and code ringing is used to signal the various stations, the last digit of the directory-listed number of the calling station is a ringing code digit which the operator dials during the interval while the brush 181 is being advanced under control of interrupter 166 from terminal 5 to terminal 8. Relay 151 responds to this train of impulses when re-

ceived but no further response is thereby effected since relays 156 and 157 are both operated. As soon after brush 181 engages terminal 8 as relay 162 releases, a circuit is closed through terminal 8 and brush 181, contact of springs 172 and back contact of relay 162, for operating relay 154. Relay 154 locks to conductor 150, disconnects the winding of relay 162 from interrupter 166, and closes a circuit including the lowermost front contact of relay 161 for operating relay 154. Relay 164 locks through the back contact of relay 158 to conductor 150, and closes a circuit from ground at the front contact of relay 151, through the uppermost front contact of relay 164, brush 168 and conductor 198 for operating relay 11 of the auxiliary line circuit ALC1. The operation of relay 11 disconnects the conductors of line L1 from conductors 13 and 14, connects the conductors of line L1 to conductor 197, and connects resistor 12 across conductors 13 and 14 to hold relay 90 of the trunk circuit through which the talking connection between the station A and operator is established. With both of relays 154 and 164 operated, the upper winding of relay 161 is deenergized, but relay 161 is held operated by its lower winding and inner lower front contact of relay 164 until the brush of interrupter 166 is next disconnected from ground. When ground is next disconnected from the brush of interrupter 166, relay 161 releases. The release of relay 161 opens the operating circuit of relay 164, but relay 164 is held operated under control of relay 158. When ground is again connected to the brush of interrupter 166, relay 158 is operatively energized, thereby connecting either coin collect or coin return battery to the conductors of line L1. If the coins are to be collected, relay 163 has been operated as above described and coin collect battery CC is connected through the lower front contact of relay 163, winding of relay 155, front contact of relay 158, brush 167 and engaged terminal, conductor 197, front contacts of relay 11, both conductors of line L1, coin control magnet 7, to ground at the coin actuated contact 6. The coin control magnet 7 is thereby energized to effect collection of the coins and relay 155 is operated to close a holding circuit for relay 164. If the coins are to be returned, relay 163 is normal and coin return battery CR is connected to the line L1 to energize coin control magnet 7 to effect return of the coins. Being slow in releasing, relay 164 does not release during the interval after relay 158 operates and before relay 155 operates. While relay 164 is operated, a coin collect or a coin return tone is transmitted to the operator by connecting either the tone source T1 or the tone source T2, depending on whether relay 163 is normal or operated, through the middle upper front contact of relay 164, condenser 165, brush 169 and engaged terminal, conductor 199, and a front contact of relay 11 to conductor 14. When ground is next disconnected from the brush of interrupter 166, relay 158 releases, disconnecting the coin collect or coin return battery from the line L1. After relay 158 releases, the conductors of line L1 are discharged through resistor 159 and condenser 160. When relay 155 releases due to the opening of the coin actuated contacts 6, relay 164 releases thereby causing the release of relay 11 to reestablish the talking connection between the calling station and the operator or other called station. After disposing of the deposited coins, the operator releases the coin control connection by removing the plug from jack J4 there-

by releasing relay 85 of the trunk circuit TWT2. The release of relay 85 opens the bridge across conductors 93 and 94, releasing relay 151. The release of relay 151 releases relay 152, thereby disconnecting ground from conductors 119 and 150. The release of relay 152 closes a circuit for operating release magnet 183 to restore the auxiliary rotary selector to normal. The disconnection of ground from conductor 119 causes the release of selector IS2 in usual manner and the release of relay 91 of trunk circuit TWT2. The disconnection of ground from conductor 150 causes the release of relays 154, 156, 157 and 163, if operated. The release of relays 157 and 156 closes the circuit for operatively energizing release magnet 173 to effect the return of the brushes 167, 168 and 169 to normal.

The talking connection from the calling station, through the line finder LF1, coin trunk CT1, selector S1 and trunk T1 is maintained until both the calling subscriber and operator release the connection. When the calling subscriber replaces the receiver to normal, relay 90 of trunk circuit TWT1 releases, thereby causing the release of relay 92, whereby the current over trunk T1 is reversed to give the operator a disconnect signal. When the operator removes the plug from jack J3, the resistance of the bridge across the conductors of trunk T1 is increased to effect the release of relay 85. The release of relay 85 causes the release of relay 80 and with both of relays 80 and 90 released, relay 81 releases, thereby completing the restoration of trunk circuit TWT1 to normal. The release of relay 81 also disconnects ground from conductor 79 thereby effecting the release of relay 76 of trunk circuit AT1, the release of selector S1 and the release of relay 33 of coin trunk CT1. The release of relay 76 causes the release of 66 thus completing the restoration of trunk circuit AT1 to normal. The release of relay 33 causes the operation of the coin trunk CT1 to connect coin collect battery to the line L1 as above described. Since the coins have already been collected, relay 30 does not operate to hold relays 46 and 45; and the coin trunk CT is restored to normal as above described. When relay 45 releases, it disconnects ground from conductor 23 causing the line finder LF1 to be restored to normal and releasing relay 16 of line circuit LC1.

If an operator wishes to complete a delayed toll call from station A through trunk T1, a cord is connected to a jack J3 and the directory-listed number is dialed. The selector IS1 operates responsive to the train of impulses created by the dialing of the first digit to select an intermediate selector such as S2; and the dialing of the remaining digits effects the operation of the selector S2 and a connector C1 to complete a connection with line L1. The operator informs the subscriber that the toll call may now be completed and requests the deposit of coins. A coin control connection is then established over another trunk T2 as above described to dispose of the deposited coins. When disposal of the coins is completed, the coin control connection is released and the talking connection maintained until the plug of the cord is disconnected from jack J3, whereupon the trunk circuit TWT1, selectors IS1 and S2 and connector C1 are restored to normal in usual manner.

If there is a set of terminals in the banks of the connector switches in the dial office for each station on a party line, the directory-listed number does not include a ringing code digit, in

which case the delay provided by the advance of brush 184 of the auxiliary rotary selector from terminal 5 to terminal 8 may be eliminated by connecting conductor 193 to contact spring 194 of relay 157, so that the operation of relay 157 immediately causes the operation of relay 154. It is, of course, obvious that a different number of digits may be absorbed by connecting conductors 191 and 192 to any desired terminals of the bank of the auxiliary rotary selector. It is also to be noted that a trunk from the master office may be connected directly to the coin control connector instead of using one of the trunks over which talking connections are established.

What is claimed is:

1. In a telephone system, a dial office comprising a subscriber's line and station, said station including means for receiving coins and coin disposal means for collecting and refunding deposited coins, an operator's position including an impulse dial for use in establishing desired connections in said office, a coin control connector in said dial office, means connecting said coin line to a set of terminals in the bank of said coin control connector, means including a trunk between said dial office and said operator's position connecting said dial to said connector, means in said connector selectively responsive to current impulses created by the operation of said dial for operating said connector to select said set of terminals thereby to connect with said line, and means in said connector selectively responsive to current impulses created by the operation of said dial for effecting the actuation of said coin disposal means to collect or return deposited coins, as desired.

2. In a telephone system, a dial office comprising a subscriber's line and station, said station including means for receiving coins and coin disposal means for collecting and refunding deposited coins, an operator's position including an impulse dial for use in establishing desired connections in said office, a coin control connector in said dial office, a set of terminals in the bank of said connector individual to said line, means including a trunk between said dial office and said operator's position connecting said dial to said connector, means in said connector selectively responsive to current impulses created by the operation of said dial for operating said connector to select said set of terminals thereby to connect with said line, and means in said connector selectively responsive to current impulses created by the operation of said dial for effecting the actuation of said coin disposal means to collect or return deposited coins, as desired.

3. In a telephone system comprising a dial office, a toll operator's position and trunks between said office and said position, said dial office comprising subscribers' lines and stations including stations of the prepayment coin box type, impulse controlled switches for establishing connections between calling and called stations and between said stations and said trunks, a coin control connector having a set of terminals for each of the coin subscribers' lines, a coin collect battery and a coin return battery, each of said coin box stations comprising coin receiving means and a coin control magnet for selectively effecting the collection or return of a deposited coin, means including an impulse dial at said operator's position and any one of said trunks for extending a connection to said coin control con-

connector and for selectively operating said connector to seize the terminals of any desired one of said coin subscribers' lines, and means in said connector selectively controlled by said dial for effecting the connection of a desired one of said coin control batteries to operate the coin control magnet of said one of the coin subscribers' lines.

4. In a telephone system comprising a dial office, a toll operator's position, and trunks between said office and said position, said dial office comprising subscribers' lines and stations including stations of the prepayment coin box type, impulse controlled switches for establishing connections between calling and called stations and between said stations and said trunks, a coin control connector having a set of terminals for each of the coin subscribers' lines, a coin collect battery and a coin return battery, each of said coin box stations comprising coin receiving means and a coin control magnet for selectively effecting the collection or return of a deposited coin, means including an impulse dial at said operator's position and any one of said trunks for extending a connection to said coin control connector and for selectively operating said connector to seize the terminals of any desired one of said coin subscribers' lines, means including means in said connector effective in response to the dialing of a particular digit by said operator to connect coin collect battery to said desired one of the coin subscribers' lines, and means including means in said connector effective in response to the dialing of a different particular digit by said operator to connect coin return battery to said desired one of the coin subscribers' lines.

5. In a telephone system, a dial office comprising subscribers' lines and stations, each of some of said stations including coin receiving means and a coin control magnet for selectively effecting the collection or return of deposited coins, a toll operator's position, trunks between said dial office and operator's position, means including one of said trunks connecting one of said coin subscribers' lines to said position for conversation on a call completed by an operator at said position, a coin control connector in said dial office having a set of terminals individual to said one coin line, means including an impulse dial at said position for extending a connection over another of said trunks to said coin control connector, a coin collect battery and a coin return battery in said dial office, means in said connector responsive to the dialing of one of two particular digits by the operator for selecting the coin collect battery and responsive to the dialing of the other of said particular digits by said operator for selecting the coin return battery, means in said connector effective in response to impulses created by operation of the dial by the operator for selecting said set of terminals and for connecting the selected coin battery to said one line to effect the desired operation of the coin control magnet at the associated coin subscriber's station.

6. In a telephone system, a dial office comprising subscribers' lines and stations, each of some of said stations including coin receiving means and a coin control magnet for selectively effecting the collection or return of deposited coins, a toll operator's position, trunks between said dial office and operator's position, means including one of said trunks connecting one of said coin subscribers' lines to said position for conversation on a

call completed by an operator at said position, a coin control connector in said dial office having a set of terminals individual to said one coin line, means including an impulse dial at said position for extending a connection over another of said trunks to said coin control connector, a coin collect battery and a coin return battery in said dial office, means in said connector responsive to the dialing of one of two particular digits by the operator for selecting the coin collect battery and responsive to the dialing of the other of said particular digits by said operator for selecting the coin return battery, means in said connector effective in response to impulses created by operation of the dial by the operator for selecting said set of terminals, and means including means individual to said one coin line operative upon selection of said set of terminals by said coin control connector for connecting the selected coin battery to said one line to effect the desired operation of the coin control magnet at the associated coin subscriber's station.

7. In a telephone system, a dial office comprising subscribers' lines and stations, each of some of said stations including coin receiving means and a coin control magnet for selectively effecting the collection or return of deposited coins, a toll operator's position, trunks between said dial office and operator's position, means including one of said trunks connecting one of said coin subscribers' lines to said position for conversation on a call completed by an operator at said position, a coin control connector in said dial office having a set of terminals individual to said one coin line, means including an impulse dial at said position for extending a connection over another of said trunks to said coin control connector, a coin collect battery and a coin return battery in said dial office, means in said connector responsive to the dialing of one of two particular digits by the operator for selecting the coin collect battery and responsive to the dialing of the other of said particular digits by said operator for selecting the coin return battery, means in said connector effective in response to impulses created by operation of the dial by the operator for selecting said set of terminals, and means including means individual to said one coin line operative upon selection of said set of terminals by said coin control connector for opening the conversational connection between said one coin line and said one trunk, for connecting the selected one of said coin batteries to said line to effect a desired operation of the coin control magnet at the associated coin subscriber's station and for holding the connection between said one coin line and said one trunk while said coin control magnet is being operated.

8. In a telephone system, a dial office comprising subscribers' lines and stations, each of some of said stations including coin receiving means and a coin control magnet for selectively effecting the collection or return of deposited coins, a toll operator's position, trunks between said dial office and operator's position, means including one of said trunks connecting one of said coin subscribers' lines to said position for conversation on a call completed by an operator at said position, a coin control connector in said dial office having a set of terminals individual to said one coin line, means including an impulse dial at said position for extending a connection over another of said trunks to said coin control connector, a coin collect battery and a coin return battery in said dial office, means in said

connector responsive to the dialing of one of two particular digits by the operator for selecting the coin collect battery and responsive to the dialing of the other of said particular digits by said operator for selecting the coin return battery, means in said connector effective in response to impulses created by operation of the dial by the operator for selecting said set of terminals, and means including means individual to said one coin line operative upon selection of said set of terminals by said coin control connector for opening the conversational connection between said one coin line and said one trunk, for connecting the selected one of said coin batteries to said line to effect a desired operation of the coin control magnet at the associated coin subscriber's station, for holding the connection between said one coin line and said one trunk and for transmitting a distinctive tone to said operator's position while said coin control magnet is being operated.

9. In a telephone system, a dial office comprising subscribers' lines and stations including a station having coin receiving means and a coin control magnet for collecting or refunding coins deposited in said coin receiving means, an operator's position, trunks interconnecting said office and said position, means including impulse controlled switches and one of said trunks connecting the line of said coin station to said position on a call initiated at said station and completed by an operator at said position, means associated with said one trunk responsive to answer of the call by the operator for effecting the return of any coins then in said coin receiving means, a coin control connector, a set of terminals in the bank of said connector individual to the line of said coin station, means including another of said trunks for connecting said position to said coin control connector, an impulse dial at said position, a coin collect battery and a coin return battery in said dial office, means in said connector responsive to the dialing of one of two particular digits for selecting the coin collect battery and responsive to the dialing of the other of said two digits for selecting the coin return battery, means responsive to impulses created by the operation of said dial by said operator for operating said connector to seize said set of terminals, and means effective upon seizure of said set of terminals to connect the selected one of said coin batteries to the line of said coin station to effect a desired operation of the coin control magnet at said station.

10. In a telephone system, a dial office comprising subscribers' lines and stations, each of some of said stations including coin receiving means and a coin control magnet for selectively effecting the collection or return of deposited coins, a toll operator's position, trunks between said dial office and operator's position, means including one of said trunks connecting the line of one of said coin subscribers' stations to said position for conversation on a call completed by an operator at said position, a coin control connector in said dial office having a set of terminals individual to each of said coin lines, means including an impulse dial at said position for extending a connection over another of said trunks to said coin control connector, a coin collect battery and a coin return battery in said dial office, means in said connector responsive to the dialing of one of two particular digits by the operator for selecting the coin collect battery and responsive to the dialing of the other of said particular digits

by said operator for selecting the coin return battery, means in said connector effective in response to the dialing of the directory-listed number of said one coin subscriber's station for selecting the set of terminals individual to the line of said station and for connecting the selected coin battery to said line to effect the desired operation of the coin control magnet at said one of the coin subscribers' stations.

11. In a telephone system, a dial office comprising subscribers' lines and stations, each of some of said stations including coin receiving means and a coin control magnet for selectively effecting the collection or return of deposited coins, a toll operator's position including an impulse dial, trunks between said dial office and operator's position, means including one of said trunks connecting the line of one of said coin subscribers' stations to said position for conversation on a call completed by an operator at said position, a coin control connector in said dial office having a set of terminals individual to each of said coin lines, means at said position for extending a connection over another of said trunks to said coin control connector, a coin collect battery and a coin return battery in said dial office, means in said connector responsive to the dialing of one of two particular digits by the operator for selecting the coin collect battery and responsive to the dialing of the other of said particular digits by said operator for selecting the coin return battery, means in said connector effective in response to the dialing of the directory-listed number of the coin station on said one of the coin lines for selecting the set of terminals which is individual to the line of said one subscriber's stations, and means including means individual to said one coin line operative a predetermined interval of time after selection of said set of terminals by said coin control connector for connecting the selected coin battery to said one line to effect the desired operation of the coin control magnet at the associated coin subscriber's station.

12. In a telephone system, a dial office comprising subscribers' lines and stations, each of some of said stations including coin receiving means and a coin control magnet for selectively effecting the collection or return of deposited coins, a toll operator's position, trunks between said dial office and operator's position, means including one of said trunks connecting the line of one of said coin subscribers' stations to said position for conversation on a call completed by an operator at said position, a coin control connector in said dial office having a set of terminals individual to each of said coin lines, means including an impulse dial at said position for ex-

tending a connection over another of said trunks to said coin control connector, a coin collect battery and a coin return battery in said dial office, means in said connector responsive to the dialing of one of two particular digits by the operator for selecting the coin collect battery and responsive to the dialing of the other of said particular digits by said operator for selecting the coin return battery, means in said connector responsive to the impulses created by the dialing of the directory-listed number of the subscriber's station on said one coin line for absorbing by an advance of the brushes and return to normal any digits preceding the tens and units digits of said number and for selecting the set of terminals which is individual to said one coin line responsive to the tens and units digits of said number, an auxiliary switch associated with said selector, said auxiliary switch being advanced one position in response to each digit dialed after connection of said position to said connector, means effective at the end of the train of impulses created by the dialing of the units digit of said number for automatically advancing said auxiliary switch to measure off an interval of time during which the impulses created by the dialing of a ringing code digit of said number are received in said connector, and means rendered effective at the end of said interval for connecting the selected coin battery to said one line to operate the coin control magnet at the associated coin subscriber's station.

13. In a telephone system, an office comprising dial impulse controlled switches for establishing conversational connections, subscribers' lines and stations, each of certain of said stations including means for receiving coins and coin disposal means for collecting and refunding deposited coins, an operator's position comprising a dial for use in selectively controlling the operation of switches in said dial office, a trunk from said dial office to said position, a special connector in said dial office for use in effecting the disposal of coins deposited at any one of said certain stations, a set of terminals in the bank of said connector individual to each of said certain stations, means including said trunk for connecting said position to said connector, means in said connector responsive to selective current impulses created by the operation of said dial for operating said connector to connect with the line of any desired one of said certain stations, and means in said connector selectively responsive to current impulses created by the operation of said dial for effecting the actuation of the coin disposal means at said one station to collect or return deposited coins, as desired.

JOHN G. WALSH.