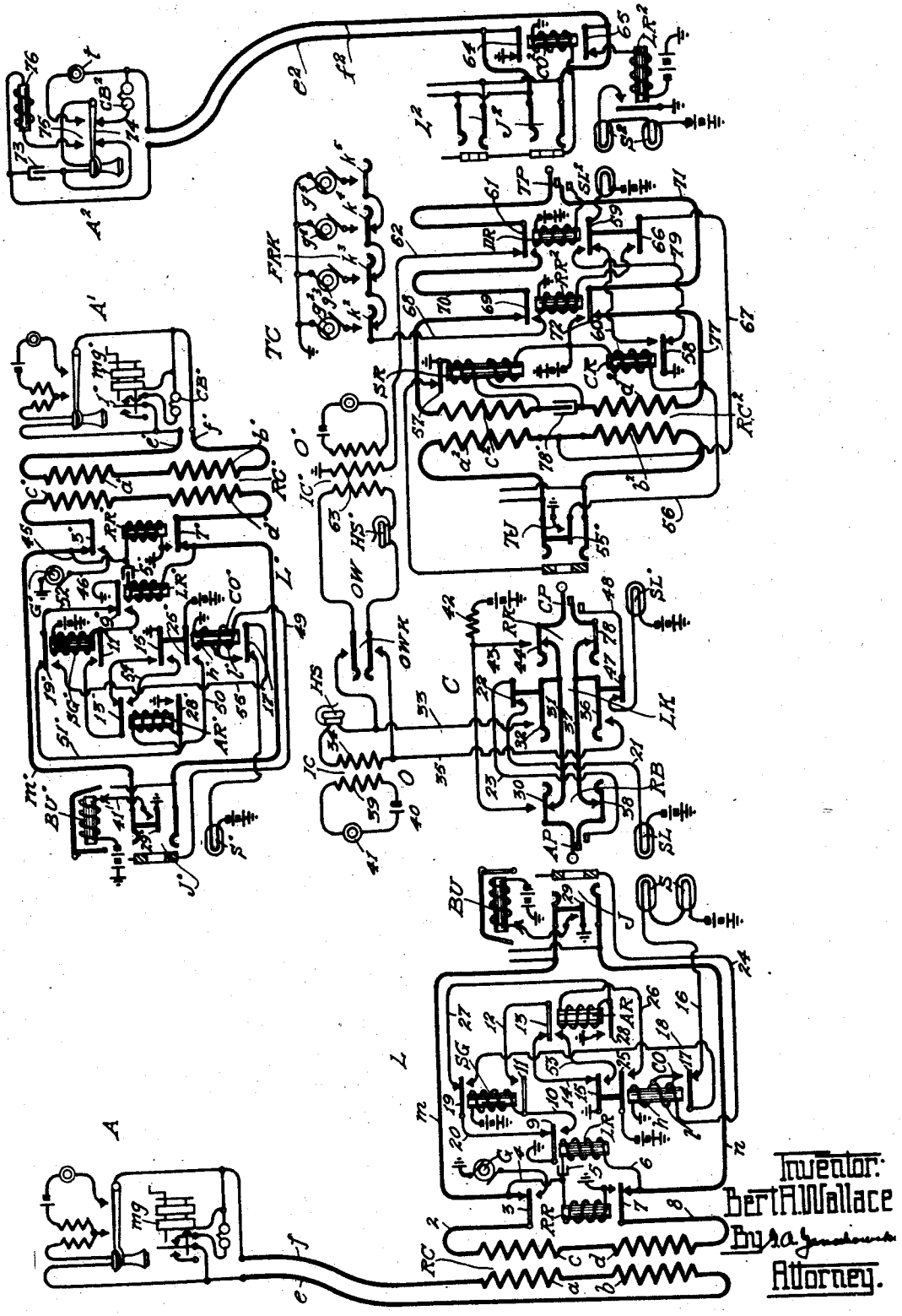
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TELEPHONE SYSTEM

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Inventor:
Bert A. Wallace
By his Attorney.

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UNITED STATES PATENT OFFICE

BERT A. WALLACE, OF CHICAGO, ILLINOIS, ASSIGNOR TO KELLOGG SWITCHBOARD AND SUPPLY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS

TELEPHONE SYSTEM

Application filed September 29, 1927. Serial No. 222,720.

My invention relates to telephone circuits and more particularly to those known as line circuits. In exchanges in which only a few lines terminate, but which have many cord circuits for interconnecting the said lines it becomes necessary to make the cord circuits as simple as possible so as to conserve space. A feature of my invention is the novel manner in which I incorporate certain apparatus into the line circuit which is customarily in the cord circuit.

A further feature is the incorporation into the line circuit of ringing means for summoning the called subscriber.

Another feature is the manner in which the calling subscriber at a magneto type substation may signal for a recall.

The above features as well as others not specifically mentioned will be pointed out in the ensuing specification and appended claims and for a more complete understanding of my invention reference may be had to the accompanying drawing in connection with the following specification.

Referring to the drawing, magneto type substations are shown at A and A′ and are furnished with the usual apparatus and connected to the main exchange over conductors *e* and *f* and *e′* and *f′* respectively. These conductors terminate at the main exchange in the line circuits L and L′. A cord circuit C is also provided and is used for interconnecting the subscribers' substations or for connecting one of said magneto type substations with a toll switching trunk circuit TC to extend a call to a subscriber's substation A^2 of the common battery type. An operator's set O is provided for the cord circuit C and is connected by means of the order wires OW with an operator's set O′ associated with the trunk circuit TC. The line circuit L is provided with a line relay LR which is adapted to be energized when the subscriber at A operates the magneto *mg* to initiate a call. A signalling relay SG is provided to close an energizing circuit for the signal lamps S which are multiplied to a number of operators' positions at the exchange and the illumination of which informs the operators at whose positions at which they appear that a subscriber desires attention. A cut-off relay CO is provided to efface the lamps S after the call has been answered and busy signals BU are multipled through a number of positions to supply the customary busy signal when the line circuit is being used. A ringing relay RR is also provided to connect ringing current from the generator G to the subscriber's substation through the repeating coil RC. Multiple jacks J are also provided. The cord circuit C comprises an answering plug AP, a calling plug CP, a listening key LK adapted to connect the operator's set O with the cord circuit C, a ringing key RK, a ring back key RB, and supervisory lamps SL and SL′ for the usual supervisory purposes.

The trunk circuit TC is composed of a trunk jack TJ located at the same operator's position as is the cord circuit C; a repeating coil RC^2, a supervisory relay SR, a ringing relay RR^2, a signal lamp SL^2, and relays CR and DR adapted to control the operation of said lamp SL^2. A four party ringing key FRK which comprises the contacts k^2, k^3, k^4, and k^5 is associated with the ringing generators g^2, g^3, g^4, and g^5. A trunk plug TP is also provided and is adapted to be inserted into anyone of a plurality of jacks J^2 associated with the line circuit of a substation of the common battery type.

The line circuit L^2 comprises the multiple jacks J^2, the signal S^2, the line relay LR^2, and the cut-off relay CO^2. Connected to the line circuit L^2 by means of the conductors e^2 and f^2 is the subscriber's substation A^2 which is of the common battery type and comprises the usual apparatus.

For a clearer understanding of my invention I will describe the operation of the apparatus in completing a call between two subscribers' substations or lines of the magneto type. Assuming that the subscriber at A desires to converse with the subscriber at A′, she will operate the magneto generator *mg* which will cause current to flow over a circuit traced from one side of the magneto *mg* over the conductor *f*, thru the windings *a* and *b* of the repeating coil RC, conductor *e* and through the alternate contact of the magneto to the other side of the mag-

neto. Current flowing over this path causes current to be induced in the windings *c* and *d* to energize the relay LR. The energizing circuit being traced from winding *c*, over conductor 2, normal closed contact 3 of the ringing relay RR, conductor 4, condenser 5, through the winding of relay LR, conductor 6, normal contact 7, conductor 8, and through the winding *d* back to the winding *c* of the repeating coil RC. The relay LR energizes and closes its contact 9 to cause the signalling relay SG to be energized by current flowing from battery through relay SG, conductor 10, to ground at alternate contact 9. The relay SG attracts its armatures to close contacts 11 and 19 and thereby closes a locking circuit for itself traced from battery through relay SG, closed alternate contact 11, conductor 12, normal contact 13 of the auxiliary relay AR, conductor 14, to ground at normal contact 15 of the relay CO. As soon as the subscriber at A ceases to operate the magneto generator *mg* the relay LR deenergizes and restores its contact 9 to normal to close a circuit for the lamps S which are caused to light by current flowing from battery through the signals S, conductor 16, normal contact 17 of relay CO, conductor 18, alternate contact 19 of relay SG which did not deenergize when its original energizing circuit was broken by the restoring of contact 9 due to the locking circuit previously traced, and conductor 20 to ground at normal contact 9. The operators at the positions where the lamps S appear will notice the signals S and one of them will insert the answering plug of a cord circuit into the jack associated with a lamp S to answer the call.

Assuming that the plug AP of the cord circuit C is inserted into the jack J to complete the call the contact 29 is moved to its alternate position and closes an energizing circuit for the busy signals BU traced from battery through the winding of the signals to ground at 29 of the jack J. All the busy signals appearing at the different positions to which the jacks J, lamps S and busy signals BU are multipled operate to inform the operators at the different positions that the line circuit L is busy. The insertion of the plug AP into the jack J also closes an energizing circuit for the relay CO traced from battery through the lamp SL, conductor 21, normal contact 22 of the listening key LK, conductor 23, sleeve contacts of the connected plug AP and jack J, conductor 24, and through both windings *l* and *h* of relay CO to ground. The relay CO has a high resistance winding *h* and a low resistance winding *l* which when connected in series offers so much resistance to the flow of current that the lamp SL will not light, but the relay CO will operate. Relay CO operating opens its normally closed contact 17 to interrupt the circuit for the lamps S which are now effaced. Upon the attraction of the armature of relay CO, contact 15 assumes its alternate position and breaks the locking circuit for the relay SG which accordingly restores to normal. Contact 25 assumes its alternate position and closes an energizing circuit for the auxiliary relay AR traced from battery through alternate contact 25 of relay CO, conductor 26, relay AR, conductor 27, normal contact 19 of relay SG, conductor 20 to ground at normal contact 9 of relay LR. Current flowing over this path causes the relay AR to operate to close a locking circuit for itself and is held energized by current flowing over the previously described path through the relay AR to ground at alternate contact 28.

The operator at C next throws her listening key LK to connect the operator's set O with the calling subscriber A so that the subscriber may inform the operator of the number of the subscriber to whom she wishes to be connected. When the operator throws her listening key the contact 22 is opened which opens the energizing circuit for the relay CO which restores to normal and breaks the energizing circuit for the relay AR which also restores to normal. The subscriber at A and the operator are now connected in a conversational circuit through the repeating coil RC, normal contact 3 of relay RR, conductor *m*, tip contacts of the connected plug AP and jack J, normal contact 30 of the ringback key RB, conductor 31, alternate contact 32 of the actuated listening key LK, conductor 33, through the operator's head set HS, winding 34 of the induction coil IC, conductor 35, alternate contact 36 of the listening key LK, conductor 37, normal contact 38 of key RB, the ring contacts of AP and J, conductor *n*, normal contact 7, and over conductor 8, to the repeating coil RC. The voice currents are induced into the coils *a* and *b* and transmitted through the subscriber's substation in the well known manner, battery current being supplied from the battery 40 in circuit with the transmitter 41 and the winding 39 of the induction coil IC of the operator's set.

The operator being informed that the subscriber at A′ is the desired party will note the busy signal BU′ to see if the line is idle. If it is idle she will insert the calling plug CP into the jack J′ which will close the contact 29′ to operate the busy signals BU′ at each of the positions at which they appear by placing ground upon the multiple conductor 41′. The operator will next actuate her ringing key RK to operate the ringing relay RR′ of the line circuit L′ to cause ringing current to be supplied to the called substation A′. The ringing relay RR′ is energized by current flowing from battery, through the resistance 42, conductor 43, al-

ternate contact 44 of the key RK, tip contacts of CP and J', conductors m' and 45, to ground through relay RR'. Relay RR' attracts its armature to close contacts 3' and 7' to complete the circuit for the ringing current which may be traced from ground, through the ringing generator G', conductor 46, alternate contact 3', through the windings c' and d' of the repeating coil RC', alternate contact 7' to ground. The current induced into the coils a' and b' flows over conductor e', through normal contact l', through the call bell CB', over conductor f' and coil d' of the repeating coil RC'.

The ringing key is actuated intermittently and if the subscriber fails to answer the operator informs the subscriber at A of that fact and the call is abandoned. If the subscriber at A' answers the call the operator is immediately apprised of that fact because her listening key is still actuated and she will hear the subscriber. As soon as the operator learns that the subscriber has answered she returns her listening key LK to normal to disconnect the operator's set O from the conversational or heavily marked conductors. Immediately upon the restoring of the key LK the energizing circuit of the relay CO is again completed and the said relay CO energizes and again closes the circuit for the relay AR which locks itself up over the previously described circuit. The closing of normal contact 47 of key LK closes an energizing circuit for the relay CO' of the line circuit L' which is energized by current flowing from battery, through signal SL' closed contact 47, conductor 48, sleeve contacts of CP and J', conductor 49, and the high and low windings h' and l' of the relay CO'. Due to the high resistance winding the signal lamp SL' is not lighted at this time but the relay CO' energizes and closes a circuit for the relay AR' which is actuated by current flowing from battery over alternate contact 25' of relay CO', conductor 50, relay AR', conductor 51', normal contact 19', conductor 52 to ground at normal contact 9' of relay LR'.

Instead of keeping her listening key LK operated until the called subscriber answered the operator could have returned her listening key LK to normal as soon as she had been told the number of the subscriber wanted. In that case the relays CO and AR of the line circuit LR and the relays CO' and AR' of the line circuit L' would restore to normal each time the operator flicked her listening key to supervise the connection.

Upon the termination of conversation the subscribers replace their receivers upon the switchhooks, and operate the magneto generators mg and mg'. The subscriber at A operating the generator mg causes current to flow through the coils a and b of the repeating coil RC which sets up induced current in the windings c and d which energizes the relay LR which establishes a circuit for the relay SG as previously described. The relay SG closes a locking circuit for itself traced from battery, relay SG, alternate contact 11, conductor 12, alternate contact 13 of relay AR' which has remained energized, conductor 53 to ground at alternate contact 15 of relay CO. As soon as the subscriber ceases to operate the generator mg the relay LR deenergizes and returns to normal breaking the original energizing circuit for the relay SG at contact 9; the relay, however, remains energized over the previously traced holding circuit and a shunt circuit is established for the high resistance winding h of the relay CO. This shunt circuit removes enough resistance from the circuit to allow the lamp SL to light. The current flowing from battery over the previously traced circuit through the low winding 1 of the relay CO, alternate contact 17, conductor 18, alternate contact 19, and conductor 20 to ground at normal contact 9 of relay LR.

The operator noticing the lamp SL glowing will know that the subscriber at A is either ringing off or desiring to make a recall and will throw her listening key LK to connect her operator's set O to the line and receiving no answer to her inquiry as to the number wanted will know that the subscriber is ringing off and will remove the plugs AP and CP from the jacks J and J' and return her listening key LK to its normal position. The operation of the magneto generator mg' will cause the energization of the relay LR' by induced current flowing through the windings d' and c' of the repeating coil RC', normal contact 3', condenser 5', relay LR', normal contact 7' to the winding d'. The relay LR' attracts its contact 9' which establishes an energizing circuit for the relay SG' traced from battery, relay SG', and alternate contact 9' to ground. Relay SG' closes a locking circuit for itself so that the relay SG' remains energized upon the deenergization of relay LR'. The locking circuit being traced from battery, relay SG', alternate contact 11', alternate contact 13' of relay AR', conductor 54 to ground at alternate contact 15'. The attraction of contact 19' by the relay SG' closes a shunt circuit for the high resistance winding h' of relay CO' and this allows the signal lamp SL' to glow; the circuit being traced from battery, signal SL', normal contact 47, conductor 48, sleeve contacts of the plug CP and jack J', conductor 49, the low resistance winding l' of relay CO', alternate contact 17', conductor 55, alternate contact 19', conductor 52 to ground at normal contact 9' of the relay LR'.

The lamp SL' serves the same purpose for the called subscriber as does the signal SL for the calling subscriber namely to signal for a disconnection or a recall. When the opera-

tor throws her listening key LK to find out whether a recall or a disconnection is desired the circuits for the relays CO and CO' are both broken and the relays return to normal. The relay CO breaking the holding circuits for the relays AR and SG and the lamp SL which return to normal and the relay CO' breaking the circuits for the relays AR' and SG' and the lamp SL' which all return to normal so that when the operator removes the plugs AP and CP from the jacks J and J' and releases her listening key LK all the apparatus is in its normal position. The relays AR and AR' are provided with copper sleeves to make them slow to release so that the relays SG and SG' will restore to normal before the contacts 13 and 13' have restored. This is to prevent the lamps SL and SL' from lighting to signal a false recall when the operator's key LK is returned to normal. It is obvious that if only one of the subscribers signals for a disconnection only one of the signals SL or SL' will glow.

Should either of the subscribers desire to make a recall before the plugs are taken from the jacks the procedure is the same as is followed in signalling for a disconnection but when the operator presses her listening key LK and inquires the wants of the party signalling for a recall she will be told the number wanted and will complete the call. Likewise if the calling subscriber desires to recall the operator before the call has been completed she will operate her hand generator *mg* which will operate the relays in the line circuit in the same manner as when signalling for a disconnection. The operator noticing the lighted lamp SL will throw her listening key LK and the calling subscriber can ask for the number wanted.

Assuming that the subscriber A desires to converse with the subscriber's substation A^2 which is of the common battery type and located at a distance exchange she will initiate the call and the procedure will be the same as in the previously traced call until the operator is informed of the number wanted when she will operate the order wire key OWK which will connect by means of the order wires the operator's set O at the cord circuit C to the operator's set O' at the distant exchange and inform the operator at O' of the number wanted. The operator at the distant exchange will select an idle trunk circuit and inform the operator at O which one was selected. Assuming it was the trunk circuit TC the operator will release the order wire key OWK and will insert the plug CP into the jack TJ associated with the trunk circuit TC.

The insertion of the plug CP into the jack TJ establishes a circuit for the lamp SL' which will be caused to glow by current flowing from battery through the lamp SL', normal contact 47, conductor 48, sleeve contacts of the plug CP and jack TJ, to ground at normal contact 57 of relay SR. The contact 55' of the jack TJ assumes its alternate position to close an energizing circuit for the control relay CR traced from battery through the winding of CR, conductor 56 to ground at alternate contact 55'. The relay CR operates and attracts its contact 58 which closes an energizing circuit for the signal lamp SL^2 which will be caused to glow by current flowing from battery through the lamp SL^2, normal contact 59 of relay DR, conductor 60 to ground at alternate contact 58 of relay CR. The operator at the position where the lamp SL^2 appears will see it glowing and know that the operator at the cord circuit C has plugged into the proper trunk jack and will touch the tip of the plug TP against the sleeve of the jack J^2 to test the busy condition of the called line. If the line is busy there will be a high battery potential on the sleeve contact of the jack J^2 which will flow through the tip contact of the plug TP, normal contact 61 of relay DR, conductor 62 to ground through the tertiary winding 63 of the induction coil IC' which will produce the characteristic click in the operator's head set HS' by which she will know the line is busy, and so inform the operator at O who will instruct the subscriber at A to replace her receiver upon the switchhook and wait until the call has been completed when she will ring the calling subscriber back. The operator at O' will test the line from time to time until she finds it idle when the call will be completed as hereinafter described. When the operator at O learns that the call has been completed she will operate her ring-back key RB which will cause the ringing relay RR to operate. Current flowing from battery through resistance 42, alternate contact 30 of key RB, tip contacts of J and AP, conductor *m*, and ringing relay RR to ground. Relay RR operates to connect ringing current from generator G to the subscriber's line to summon the subscriber. This procedure may be followed in all cases where the called line is at a distance exchange if it is desired.

If the line is not busy she will insert the plug TP into the jack J^2 and will actuate a plunger of the four party ringing key FRK to place the ringing generator of the proper frequency in condition for transmitting ringing current to the called line. Assuming that generator g^3 is of the proper frequency, the operator will depress the plunger associated with contact k^3 which will assume and remain in its alternate position until another plunger is depressed. Upon the insertion of the plug TP into the jack J^2 an energizing circuit for the relays DR and CO^2 is established and the said relays DR and CO^2 will be operated by current flowing from battery through relay DR, sleeve contacts of the jack and plug to ground through the winding of relay CO^2. Relay CO^2 attracts its armature

and contacts 64 and 65 assume their alternate positions to prevent the operation of the relay LR^2 when the subscriber A^2 removes his switchhook to answer the call. The relay DR attracts its armature and contact 59 assumes its alternate position which opens the energizing circuit of the lamp SL^2 which will accordingly be effaced and its contact 61 is attracted to disconnect the tertiary winding 63 from the tip contact of the plug TP and DR also attracts its contact 66. The operator at O depresses the ringing key RK which will permit current to flow from battery, through resistance 42, contact 44, tip contacts of the plug CP and jack J winding a^2 of repeating coil RC^2, conductor 67, alternate contact 66 to ground through relay RR^2. Current flowing over this path will cause the ringing relay RR^2 to close its alternate contacts to connect ringing current to the called line. The ringing current will flow from the grounded side to the ringing generator g^3, through the generator g^3, alternate contact k^3, normal contact k^2, conductor 68, alternate contact 69 of relay RR^2, conductor 70, alternate contact 61 of relay DR, tip contacts of TP and J^2, conductor e^2, condenser 73, closed normal contacts 74, call bell CB^2, conductor f^2, ring contacts of jack J^2 and plug TP, conductor 71, alternate contact 72 of RR^2 to battery and ground. The call bell CB^2 is actuated over this circuit to notify the subscriber at A^2 that a call is to be answered.

The ringing key RK is operated intermittently and each time it is restored to its normal position the ringing relay RR^2 is deenergized and restores its contacts 69 and 72 to their normal position. If the subscriber at A^2 answers during a ringing period nothing will happen until the ringing key RK is restored to normal and the relay RR^2 deenergizes. If the subscriber answers during a silent period the contacts 69 and 72 will be in their normal position and the removal of the reciver from its switchhook will establish an energizing circuit for the supervisory relay SR which will operate by current flowing from battery, through the lower winding of relay SR, winding d^2, conductor 77, normal contact 72, conductor 71, ring contacts of TP and J^2, conductor f^2, transmitter t, closed switchhook contacts 75, coil 76, conductor e^2, tip contacts of jacks J^2 and plug TP, alternate contact 61, conductor 70, winding c^2, to ground through the upper winding of SR. The operation of SR causes the circuit for the lamp SL′ to be broken at 57 and the same will be effaced to notify the operator O that the subscriber at A^2 has responded.

The conversational circuit may be traced as follows:—Repeating coil windings a and b, and c and d, normal contact 3, conductor m, tip contacts of plug AP and jack J, normal contact 30 of RB, conductor 31, normal contact 44 of RK, the tip contacts of CP and TJ, windings a^2 and b^2 of the repeating coil RC^2, ring contacts of TJ and CP, normal contact 78, conductor 37, normal contact 38 of ringback key RB, ring contacts of AP and J, conductor n, normal contact 7 to the windings of the repeating coil RC. The voice currents in the windings a^2 and b^2 will be induced in the windings c^2 and d^2 and will flow through normal contact 69 of RR^2, conductor 70, alternate contact 61, tip contacts of the plug TP and jack J^2 out over the subscriber's loop and back through the ring contacts of J^2 and TP, conductor 71, normal contact 72, and conductor 77 to the winding d^2 of repeating coil RC^2 and through the condenser 78′ to the winding c^2.

Upon the termination of conversation the subscriber at A^2 replaces the receiver upon its switchhook which returns to its normal position opening the switchhook contacts 75. This breaks the energizing circuit for the relay SR which returns to normal and closes its normal contact 57 which again furnishes ground to the lamp SL′ to cause the same to glow to signal for a disconnection. The subscriber at A also signals for a disconnection as previously described and the operator noting the glowing of the lamps SL and SL′ will withdraw the plugs AP and CP from the jacks J and TJ. The apparatus in the line circuit L will restore to normal as previously described. The withdrawal of the plug CP from the jack TJ will break the circuit for the lamp SL′ which will be effaced and will allow the contact 55 of jack TJ to return to its normal position opening the energizing circuit of the relay CR which deenergizes and restores its contact 58 to its normal position which closes an energizing circuit for the disconnect lamp SL^2 traced from battery, lamp SL^2, alternate contact 59, conductor 79, to ground at normal contact 58. The operator at the distant exchange will notice the lamp glowing and will know that the operator at O has removed the plug CP from the jack TJ and the trunk circuit TC is no longer in use and will thereupon remove the plug TP from the jack J^2 which will destroy the energizing circuits for the relays CO^2 and DR. The relay CO^2 restoring places the line relay LR^2 again under the control of the subscriber at A^2 so that calls may be initiated or received. The relay DR restoring effaces the disconnection signal SL^2 by breaking the circuit therefore at contact 59. All the apparatus is now in its normal position and ready for use in establishing another connection.

It will be understood that the line circuits L and L′ are not restricted to use with a magneto type telephone station but may also be used with a distant exchange substituted for the magneto type substation here described. Therefore, while I have illustrated an embodiment of my invention I do not wish to be limited thereto, as changes and modifications

will readily suggest themselves without departing from the spirit and scope of the appended claims.

What I claim as new, and desire to secure by Letters Patent of the United States is:—

1. A telephone system of the class described including a calling and a called subscriber's substation terminating at a main exchange, line circuits at said main exchange, repeating coils operatively connecting said line circuits with said substations, a cord circuit for interconnecting said substations by means of said line circuits, a source of ringing current at said line circuits, means in said line circuits adapted to connect said source of ringing current to the called line, and operator controlled means in said cord circuit for controlling the means in said line circuit.

2. A telephone system of the class described including a calling subscriber's line and a called subscriber's line terminating at a main exchange, line circuits at said main exchange, repeating coils operatively connecting said line circuits with said subscribers' lines, a cord circuit for interconnecting said line circuits, a source of ringing current at said line circuits, individual connecting means in said line circuits, and operator controlled means in said cord circuit for actuating said connecting means to connect said source of ringing current to said subscribers' lines.

3. A telephone system of the class described including a pair of subscribers' telephone lines, line circuits for said subscribers' lines located at a main exchange, a cord circuit for interconnecting said lines, signals for said cord circuit, a relay in each of said line circuits having a low resistance winding and a high resistance winding, and means in said line circuit for shunting said high resistance winding to cause said signals in said cord circuit to operate to signal for a recall.

4. A telephone system of the class described including a calling subscriber's line and a called subscriber's line, a line circuit for each of said lines, a cord circuit for interconnecting said lines, a signal lamp for each of said line circuits, a signal lamp for said cord circuit, means in said line circuit operable to actuate said signal lamp in said line circuit when a coil is initiated, a relay for said line circuit operable upon the connection of said cord circuit to said line circuit to efface said signal lamp and return said first means to normal, said first means controlled over said subscriber's line and adapted to be reoperated to actuate said signal lamp in said cord circuit to signal for a disconnection.

5. A telephone system including a subscriber's line, a line circuit associated with said subscriber's line, a cord circuit for connecting said subscriber's line to other subscribers' lines, a signal lamp for said line circuit, means in said line circuit controlled over said subscriber's line for operating said signal lamp to indicate a call, a signal lamp in said cord circuit, means in said line circuit for returning said first means to normal and for preventing the operation of said second signal, said first means being reoperable to render a portion of said second means inoperative to allow said second signal to operate to indicate a recall.

6. A telephone system including a calling and a called subscriber's telephone line, line circuits associated with said telephone lines, a cord circuit for interconnecting said lines, a signal lamp for said line circuit, a line relay and a signalling relay, said line relay controlled over said calling line and operable to energize said signalling relay to operate said line circuit signal lamp to indicate a call, a cut-off relay for said line circuit operable upon the interconnection of said line circuit and said cord circuit to efface said signal, a second signal for said cord circuit, said line and signalling relays adapted to operate said second signal to signal for a disconnection when said line relay is energized after said line and cord circuits have been connected.

7. A telephone system including line circuits, multiple calling signals for each of said line circuits, multiple jacks and associated multiple visual signals for each of said line circuits, means controlled over one of said lines for operating its associated multiple calling signal, operator controlled means for operating the multiple visual signals associated with said line, and signalling means individual to said line under operator control for signalling over said line.

8. A telephone system including a line circuit terminating at the central office in multiple jacks, multiple calling signals and multiple visual signals associated with said jacks, repeating coil connecting said jacks to said line circuit, means for applying signalling current to said line to cause the operation of said multiple calling signals, and operator controlled means for effacing said calling signals and for operating said visual signals.

9. A telephone system including a line circuit terminating at the central office in multiple jacks, multiple calling signals and multiple visual signals associated with said jacks, a repeating coil connecting said jacks to said line circuit, means for applying signalling current to said line to cause the operation of said multiple calling signals, operator controlled means for effacing said calling signals and for operating said visual signals, and ringing control apparatus individual to the line under operator control for supplying signalling current through said repeating coil to said line for signalling thereover.

10. A telephone system including a line circuit terminating at the central office in

multiple jacks, multiple calling signals and multiple visual signals associated with said jacks, a repeating coil connecting said jacks to said line circuit, means for applying signalling current to said line to cause the operation of said multiple calling signals, operator controlled means for effacing said calling signals and for operating said visual signals, ringing control apparatus individual to the line under operator control for supplying signalling current through said repeating coil to said line for signalling thereover, and a cord circuit provided with a supervisory signal controllable by apparatus individual to and associated with said multiple jacks.

11. A telephone system including line circuits terminating at the exchange in line and cut-off equipment, telephone substations connected to said line circuits, a source of power at each of said substations for operating the line equipment associated with the substation's line circuit, a second source of power associated with said line and cut-off equipment, and operator controlled means for connecting said second source of power to its associated line circuit.

Signed by me at Chicago, in the county of Cook, and State of Illinois, this 27th day of September, 1927.

BERT A. WALLACE.