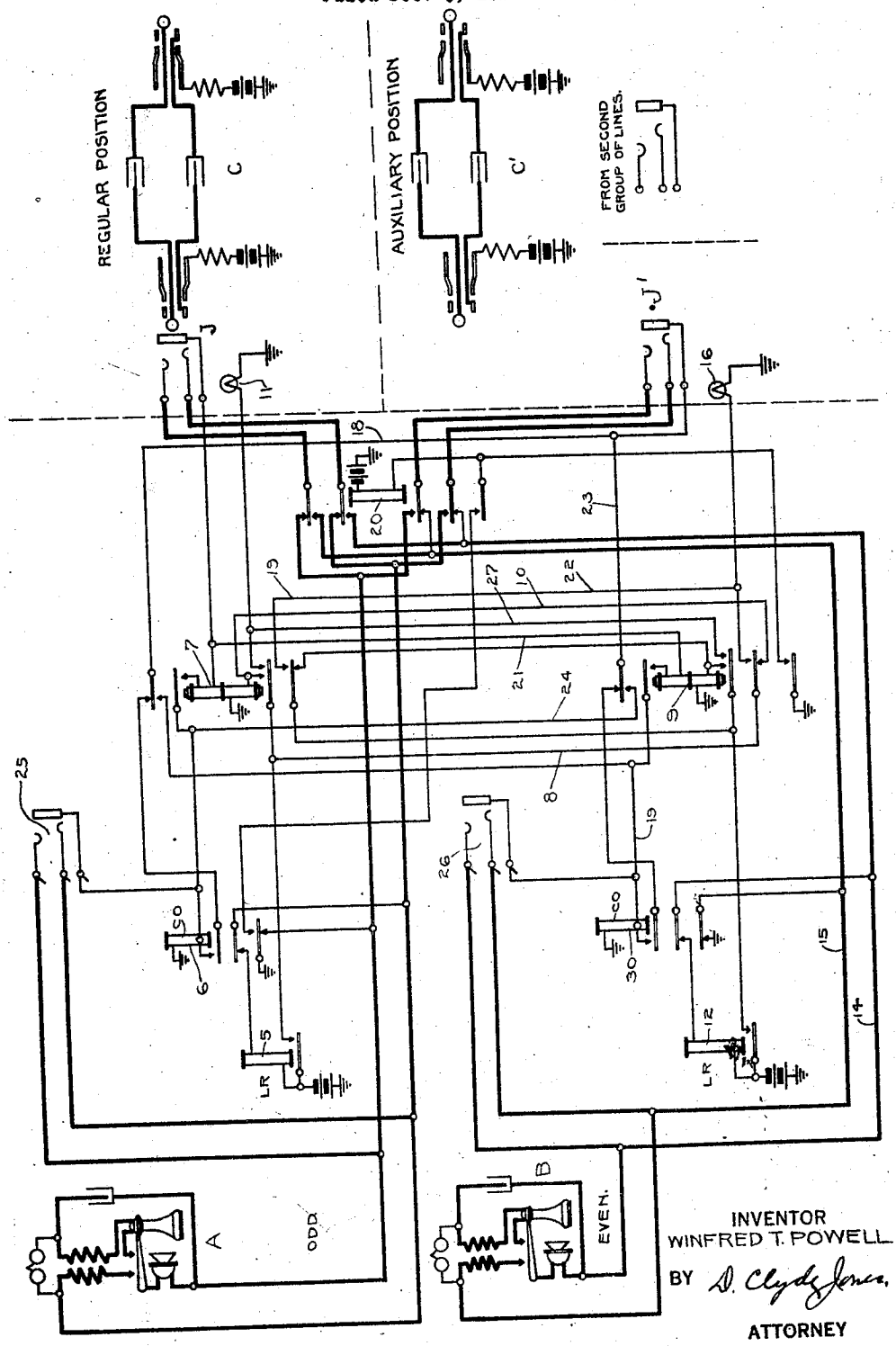
Jan. 12, 1926. 1,569,677

W. T. POWELL

TELEPHONE SYSTEM

Filed Dec. 8, 1922



INVENTOR
WINFRED T. POWELL
BY D. Clyde Jones,
ATTORNEY

Patented Jan. 12, 1926. 1,569,677

UNITED STATES PATENT OFFICE.

WINFRED T. POWELL, OF ROCHESTER, NEW YORK, ASSIGNOR TO THE STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY, OF ROCHESTER, NEW YORK, A CORPORATION OF NEW YORK.

TELEPHONE SYSTEM.

Application filed December 8, 1922. Serial No. 605,718.

To all whom it may concern:

Be it known that I, WINFRED T. POWELL, a citizen of the United States, residing at Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Telephone Systems, of which the following is a full, clear, concise, and exact description.

In a manual telephone system maximum efficiency in operation is obtained by having each operator uniformly busy. Attempts have been made to obtain this result, by what is commonly known in this art, as call distribution, that is, the use of automatic means such as automatic switches or relays for evenly distributing calls to the operators. This means while it accomplishes the purpose is especially expensive and results in high maintenance cost so that thus far such arrangements have had but limited use.

It has also been proposed to eliminate the so-called multiple jacks in the switchboard and to provide instead multiple answering jacks and associated line lamps at each of the operator's positions at the switchboard. This arrangement however, has the disadvantage that the answering equipment at the switchboard is greatly increased while the size of the exchange is greatly limited owing to the space required for the added line lamps. In such a system, since several operators may attempt to answer the same call at the same time, due to the fact that the multiple line lamps at the calling line are lighted at a plurality of positions, all the cord circuits must be equipped with so-called operators-barring means, which is effective to permit the connection of only one operator to a calling line in the event that two operators attempt to answer a call. The cord circuits are thus made more complicated and much more expensive.

For the purpose of overcoming the defects of both of these mentioned arrangements, it is proposed to have each pair of lines terminate in a single answering jack at a regular operator's position, and in the event that both of the lines are in use at the same time, the second line of the pair is connected to an answering jack common to the pair of lines at a so-called auxiliary position. This arrangement is proposed since it has been observed that the lines of a pair may be so associated that ordinarily they are not both in use at the same time.

The main feature of this arrangement is, therefore, the provision of means whereby a pair of telephone lines have a common terminal at one operator's position and a second common terminal at a second operator's position.

Other features of this invention will appear from the detailed description and appended claims.

The drawing diagrammatically represents only a portion of the telephone system in which two lines whose substations appear at the extreme left, are extended to the main exchange at which the portion of the drawings above and to the right of the dotted line represents a regular operator's position at a manual switchboard. The portion of the drawings to the right and below the dotted line represents the auxiliary or secondary position at the same manual switchboard.

For convenience in description it is assumed that the telephone lines are divided into groups of two hundred lines each and that these lines are further arranged in one hundred pairs which terminate in a regular operator's position at the switchboard in one hundred jacks. This same hundred pairs of lines also terminate in answering jacks at an auxiliary position. If the lines are properly associated a very small number of calls need be answered through an auxiliary position, and for this reason the auxiliary answering jacks of several hundred pairs of lines terminate at this same auxiliary position.

It will, of course, be understood that the number of answering jacks at a regular position may be greatly increased depending upon the speed of the average operator and that the number of answering jacks at the auxiliary position may be correspondingly increased so that the system is not necessarily limited as above outlined.

It is believed that the invention will best be understood by describing the method of

extending a calling telephone line to an operator's position at the main exchange.

When the subscriber at A initiates a call, by removing his receiver from its switchhook, the line relay 5 is operated from grounded battery, winding of this relay, back contact and middle armature of cut-off relay 6, lower side of the calling line and through the substation circuits at A in series, over the upper side of the calling line, lowermost back contact and armature of cut-off relay 6 to ground. As soon as the line relay 5 is operated it causes the energization of the relay 7 in a circuit extending from grounded battery, armature and front contact of relay 5, conductor 8, middle armature and back contact of relay 9, conductor 10, lower winding of relay 7 to ground. With the relay 7 operated a pilot lamp 11 associated with the answering jack J of the pair of lines A and B is lighted over a circuit completed from ground, through the lamp 11, innermost front contact and armature of relay 7, front contact and armature of line relay 5 to grounded battery.

The operator at the regular position on noting that the lamp 11 is lighted inserts the answering plug of her cord circuit C which may be of any well-known type, into the jack J whereupon the relay 7 is locked operated from grounded battery through the sleeve of the last mentioned plug, sleeve of the jack J, upper winding, front contact and armature of relay 7, winding of the cut-off relay 6 to ground. The cut-off relay 6 is thus operated and attracts its armatures to disconnect the line relay 5 from the calling line. This line relay thereupon deenergizes and extinguishes the line lamp 11. If the associated even line of substation B has not initiated a call during the time that the line A is in use, when the operator at the regular position removes her plug P from the jack J the cut-off relay 6 and the relay 7 deenergize.

If while the calling line A is extended through the regular operator's position, the line B initiates a call, this line is extended to the jack J′ of the pair of lines A and B on an auxiliary position. Under this assumption the line relay 12 is energized from grounded battery, winding of this relay, back contact and middle armature of cut-off relay 30, conductor 14 of the calling line through the substation circuits in series at B, conductor 15 of the calling line, lowermost armature and back contact of cut-off relay 30 to ground. The operation of line relay 12 lights the line lamp 16 of the associated pair of lines at the auxiliary operator's position. The circuit for lighting line lamp 16 extends from grounded battery, armature and front contact of line relay 12, armature and front contact of relay 7, conductor 19, through lamp 16 to ground. The operator at the auxiliary position then inserts the plug of the cord circuit C^1 into the jack J′ of the associated pair of lines, which operation extends battery through the sleeve contacts of the plug and jack J′, conductor 18, uppermost armature and front contact of relay 7, conductor 19, winding of cut-off relay 30 to ground. The energization of relay 30 disconnects the line relay 12 from its associated line B which results in the deenergization of this line relay and the consequent extinguishing of line lamp 16. When the operator at the auxiliary position has removed the plug of her cord circuit from the jack J′ the operating circuit of the cut-off relay 30 is interrupted permitting this relay to deenergize and to reconnect the line relay 12 to the line B.

It will be noted in this case that as soon as the cut-off relay 30 is operated it closes a locking circuit for itself, independent of the contacts of relay 7 so that the connection to jack J′ of the auxiliary position will not be interrupted in the event of the deenergization of the relay 7. The locking circuit for the relay 30 is now closed from ground, winding of this relay, its innermost front contact and armature, upper back contact and armature of relay 9, conductor 23, sleeve contact of the jack J′, sleeve of the answering plug of the operator's cord circuit C′ to grounded battery.

It has doubtless been noticed that the switching relay 9 has not been operated under either of the foregoing conditions with the result that the odd line A is connected to the regular operator's position while the even line B is connected to the auxiliary operator's position. This was due to the fact that the even line B did not initiate a call until its associated jack J was already in use.

Let it be assumed that the line B initiates a call at a time when the line A is not calling. Under this assumption when the line relay 12 is energized over a circuit including conductors 14 and 15 as already described, the switching relay 9 is actuated from grounded battery, armature and front contact of line relay 12, lowermost armature and back contact of relay 7, lower winding of relay 9 to ground. The relay 9 on operation closes a locking circuit for itself from ground through its lower winding, its innermost front contacts and armature, armature and front contact, of relay 12 to grounded battery. With the relay 9 operated switching relay 20 is actuated from grounded battery, its winding, lowermost front contact and armature of relay 9 to ground. The switching relay 20 when thus operated connects the even line B to the answering jack J at the regular operator's position and disconnects the odd line A from this jack, and

connects it to the jack J' at the auxiliary operator's position. Also with the relays 9 and 12 operated the line lamp 11 associated with the jack J is now lighted from ground, lamp 11, conductor 27, innermost front contact and armature of relay 9, front contact and armature of line relay 12 to grounded battery. When the operator at the regular position answers this call by inserting the plug of cord circuit C into jack J the cut-off relay 30 is energized from ground, winding of this relay, conductor 19, inner upper armature and front contact, and winding of relay 9, conductor 21, sleeve of the jack J, sleeve of the plug connected thereto to grounded battery. The cut-off relay 30 on energization disconnects the line relay 12 from the conductors of its line B, thereby extinguishing the line lamp 11. This cut-off relay is now held operated from ground, winding of this relay, conductor 19, innermost upper armature and front contact of relay 9, winding of this relay, conductor 21, through the sleeve contacts of the jack J and the plug P of the cord circuit C, and through a resistance to grounded battery. When the operator at the regular position terminates the call by removing the plug from the jack J, relays 9, 12 and 20 deenergize to leave the circuits in their normal condition.

If, however, during the time that the line B is initiating a call, the line A starts a call, the line lamp 16 at the auxiliary position is lighted from ground, lamp 16, armature and front contact of relay 9, conductor 8, front contact and armature of line relay 5 to grounded battery. The operator at the auxiliary position inserts the answering plug of her cord circuit into the jack J' and completes a circuit from grounded battery, through the sleeve contacts of the plug and jack J', conductor 23, uppermost armature and front contact of relay 9, conductor 24, winding of the cut-off relay 6 to ground. Cut off relay 6 is operated to close a locking circuit for itself, independent of the contacts of the relay 9. This circuit may be described as extending from ground, winding of relay 6, its inner front contact and armature, back contact and armature of relay 7, conductor 18 to grounded battery through the sleeve contacts of the jack J' and plug. Also as soon as cut-off relay 6 is operated, switching relay 20 is locked operated from grounded battery, its winding, lowermost front contact and armature of relay 6 to ground. In this way if line B terminates its connection before the line A has completed its telephone conversation, the connection between line A and jack J' at the auxiliary position is not interrupted.

In case the subscriber at line B initiates a second call before the subscriber at line A terminates the connection just described, then line B is reconnected to the jack J at the regular operator's position. It should be stated that the relays 7 and 9 are designed to be slightly slow in releasing their armatures so that when the subscriber at the calling line replaces his receiver on its switch hook, while the plug is in the multiple jack of its associated line the cut-off relays such as 6 and 30 of this calling line will not be locked. Let it be assumed that line B is busy as a called line, during the time that line A is calling and that the subscriber on line A terminates the call. In the event that the relays 7 and 9 are not slow releasing, then the cut-off relay 6 is held operated from ground, its winding, its innermost front contact and armature, uppermost back contact and armature of relay 7, conductors 18 and 23, uppermost armature and back contact of relay 9, innermost armature and front contact of relay 30, through the sleeve contacts of jack 26 and to grounded battery through the calling end of the cord circuit that is connected to line B. Lines A and B may be called in the usual manner through the well-known multiple jacks such as 25 and 26 associated with these lines.

The releasing of a connection has not been described since it takes place in the manner now well known.

What is claimed is:—

1. In a telephone system, telephone lines arranged in pairs a primary operator's position, a secondary operator's position, an answering jack for each pair of telephone lines at each of said operator's positions, means responsive to the initiation of a call on either of said lines for connecting said calling line to said primary position and for connecting the other telephone line of said pair to said secondary position.

2. The method of handling telephone calls which consists in grouping the lines in pairs, extending a call from either of a pair of lines to a predetermined outlet, thereupon extending a call contemporaneously originated from the other line of the pair to a second predetermined outlet and then having operators complete the connections.

3. In a telephone system, a pair of telephone lines, a primary operator's position, a secondary operator's position, an answering jack for said lines in each operator's position, one telephone line of a pair being normally connected to the answering jack at one operator's position, the second telephone line of the pair being normally connected to an answering jack of the second operator's position, and a relay responsive to a call on said second telephone line for connecting said line to said jack at said first position and for transferring the connection of said first line from its jack at the first position to said jack at said second position.

4. In a telephone system, a pair of tele-

phone lines, two operator's positions, answering jacks in each position, one telephone line of said pair being normally connected to the answering jack at one operator's position, the second telephone line of the pair being normally connected to an answering jack at said second operator's position, a relay responsive to a call on said second telephone line for connecting said line to said jack at said first position and for transferring the connection of said first line from its jack at the first position to its jack at the second position, and means for holding the lines in the condition thus extended until both of the lines have terminated their calls.

5. In a telephone system, telephone lines arranged in pairs, a primary operator's position, a secondary operator's position, an answering jack for each pair of telephone lines at each of said operator's positions, a signal associated with each of said jacks, and means responsive to the initiation of a call on either of said lines for operating the signal of said pair of lines at said primary position, said means also functioning to connect the other telephone line of said pair to said secondary position.

6. In a telephone system, telephone lines arranged in groups, a primary operator's position, a secondary operator's position, an answering jack for the lines of a group at each of said operators' positions, a signal associated with each of said jacks, a switching relay, a line relay and a cut-off relay for each of said telephone lines, means responsive to the initiation of a call on one of the telephone lines of a group for operating the line relay and switching relay of said line, means responsive to the actuation of said line relay and said switching relay for operating the signal of said group of lines at said primary position, a cord circuit and means responsive to the connection of said cord circuit with said calling telephone line for operating said cut-off relay, and means controlled by said cut-off relay for terminating the operation of said signal.

7. In a telephone system, telephone lines arranged in groups, a primary operator's position, a secondary operator's position, an answering jack for the lines of a group at each of said operators' positions, a signal associated with each of said jacks, a switching relay, a line relay and a cut-off relay for each of said telephone lines, means responsive to the initiation of a call on one of the telephone lines of a group for operating the line relay and switching relay of said telephone line, means responsive to the actuation of said line relay and said switching relay for operating the signal of said group of lines at said primary position, a cord circuit, means responsive to the connection of said cord circuit with said calling telephone line for operating said cut-off relay, means controlled by said cut-off relay for terminating the operation of said signal, and means for locking said cut-off relay and switching relay operated while said cord circuit is connected to said telephone line.

8. In a telephone system, telephone lines arranged in pairs, a primary operator's position, a secondary operator's position, an answering jack for each pair of telephone lines at each of said operators' positions, a line relay, a switching relay and a cut-off relay for each telephone line, means responsive to the initiation of a call on one of said telephone lines for operating its associated line relay, means controlled by said operated line relay for operating the switching relay of said telephone line, means controlled by the joint operation of said line relay and said switching relay for operating the signal of said pair of lines at said primary position, a cord circuit, means responsive to the connection of said cord circuit to said calling telephone line for operating the cut-off relay of the calling line and for holding operated said switching relay, means responsive to the operation of said cut-off relay for terminating the operation of said signal and removing said line relay from the control of its telephone line, and an additional relay controlled by the operation of one of said switching relays for reversing the normal connections of said telephone lines at said primary and secondary positions.

9. In a telephone system, telephone lines arranged in pairs, a primary operator's position, a secondary operator's position, cord circuits at each of said positions, an answering jack for each pair of telephone lines at each of said operators' positions, a line relay, a switching relay, and a cut-off relay for each telephone line, means responsive to the initiation of a call on one of said telephone lines for operating its associated line relay, means controlled by said operated line relay for operating the switching relay of said telephone line, means controlled by the joint operation of said line relay and said switching relay for operating the signal of said pair of lines at said primary position, a cord circuit, means responsive to the connection of said cord circuit to said calling telephone line for operating the cut-off relay of the calling line, means responsive to the operation of said cut-off relay for terminating the operation of said signal and for removing said line relay from the control of its telephone line, an additional relay controlled by the operation of one of said switching relays for reversing the normal connections of said telephone lines at said primary and secondary positions, and means for maintaining said last mentioned switching relay

operated while a cord circuit remains connected to its telephone line.

10. The method of handling telephone calls which consists in grouping the lines in pairs, extending a call from either one of a pair of lines to a predetermined outlet, thereupon extending a call contemporaneously originated from the other line of the pair to a second predetermined outlet, and completing the calls from said outlets.

In witness whereof, I hereunto subscribe my name this 7th day of December A. D., 1922.

WINFRED T. POWELL.