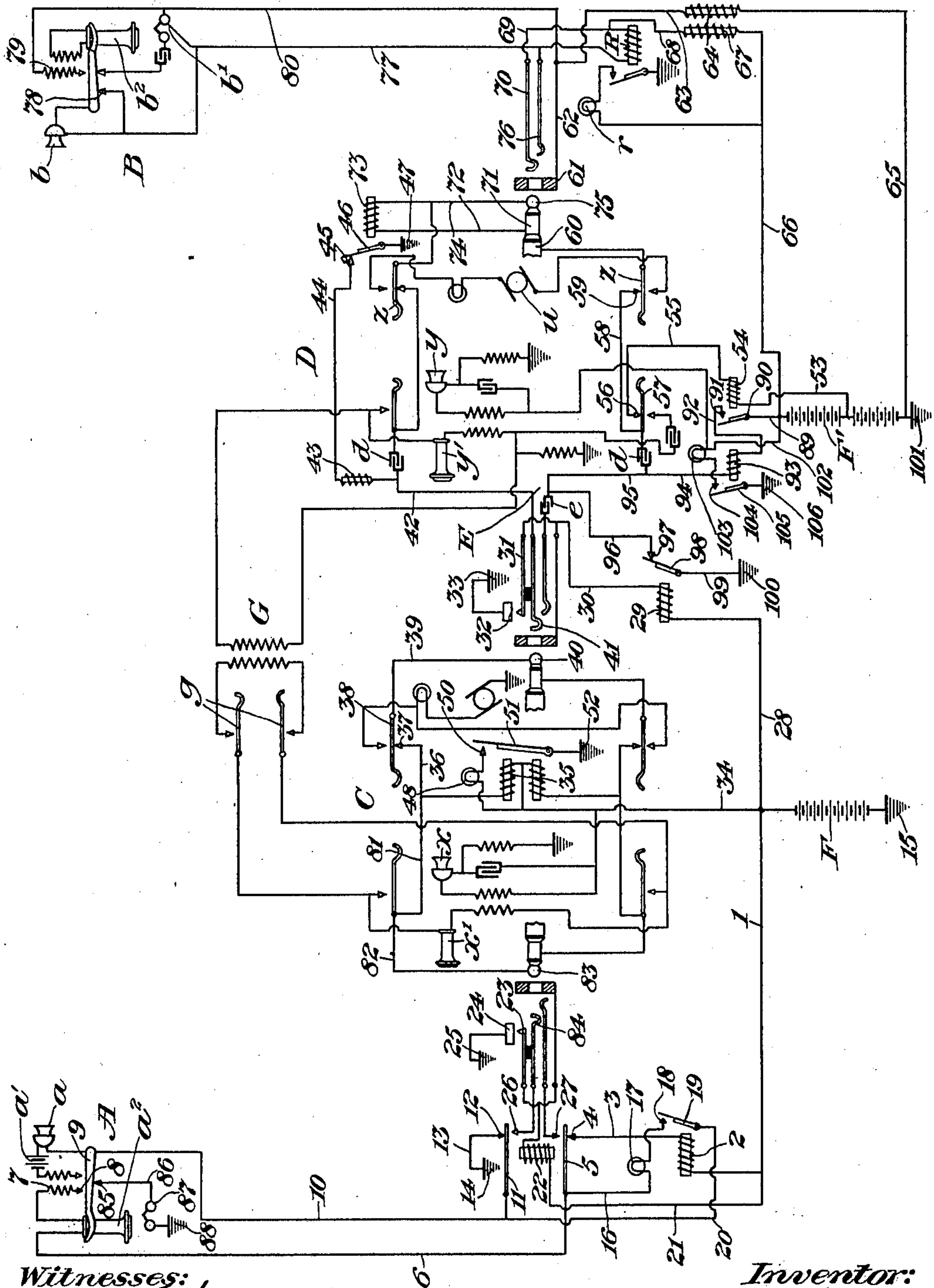


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TELEPHONE SYSTEM.
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TELEPHONE SYSTEM.

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To all whom it may concern:

Be it known that I, ALFRED H. DYSON, a citizen of the United States of America, and resident of Chicago, Cook county, Illinois, have invented a certain new and useful Improvement in Telephone Systems, of which the following is a specification.

My invention relates to telephone systems of that class in which the circuit connections are such that any subscriber of one exchange may be connected up for conversation with any subscriber of another exchange. Telephone systems of this character are usually known as trunking systems, the connections between the two exchanges consisting of a number of lines, commonly termed "trunk lines". With this arrangement, a subscriber of one exchange can send in a call asking for connection with a subscriber of another exchange, and the connection between the two subscribers can then be made through the medium of one of the trunk lines between the two exchanges, and also by means of the operator's cord-circuits at the two exchanges.

There are certain telephone systems in which the current for operating the subscribers' transmitters is supplied from local batteries located at the substations, while the current for operating the calling and supervisory signals at the central station is supplied from a battery associated with the switch-board apparatus. In other words, only the current necessary for signaling purposes is supplied from a central source, while the current for talking purposes is supplied from the local batteries at the substations. An exchange operating on this principle is ordinarily known as a centralized call exchange. There is, however, another type of telephone system in which the current, both for talking and signaling purposes, is supplied from a common or centralized battery located at the exchange or central station. With this arrangement, the current is supplied to the subscribers' lines from a central source, both for operating the subscribers' transmitters, and also for operating the line and supervisory signals involved in the switchboard apparatus. An exchange operating on this principle is known as a common battery exchange.

Now one of the principal objects of my

invention is to provide a simple and highly efficient construction and circuit arrangement whereby trunking may be successfully carried on between two exchanges, one of the centralized call type, and the other of the common battery type.

A special object is to provide an improved circuit arrangement whereby connection may be made from a centralized call exchange to a common battery exchange.

Another object is to provide an improved circuit arrangement whereby the originating operator at a central call exchange may have complete control and supervision of the connections and dis-connections between an exchange of this character and an exchange operating on the common battery principle.

A further object is to provide suitable and improved circuit arrangements whereby connection may be made from a centralized call exchange equipped with a particular form of switch-board apparatus to a common battery exchange also equipped with a particular form of switchboard apparatus.

In addition, it is also an object to provide certain details and features of improvement tending to increase the general efficiency and serviceability of a telephone system of this character.

The accompanying drawing is a diagram illustrating a trunking telephone system embodying the principles of my invention. In this diagram, a local battery substation is shown connected up with a centralized call exchange, and a common battery substation telephone set is shown suitably connected up with a common battery exchange. It will also be seen that a single trunk-line is shown extending between the two exchanges. It will be readily understood that only such instruments, devices and circuit connections are illustrated as are necessary to a full understanding of the invention.

In installing telephone systems it often becomes desirable and practically necessary to provide suitable circuit arrangements whereby a subscriber of one exchange may be connected up for conversation with a subscriber of another exchange. It often happens that the two exchanges are of different types—that is, that one is a centralized call exchange, while the other is a full common battery exchange. In such case, it is desir-

able that the trunking between the two exchanges be carried on without materially changing the mode of operation of the two exchanges, and without making any changes in the arrangement of the subscribers' lines and talking sets. In other words, it is desirable that the methods of operation of each exchange be retained, so far as the connecting and disconnecting of subscribers of one exchange is concerned. At the same time, it is desirable that the originating operator, or operator at whose exchange the call originates, have complete control and supervision of the trunk connections between the two exchanges. In view of these conditions and requirements, my improved trunking circuit connections are designed to afford a satisfactory method of trunking between a centralized call and a common battery exchange, and particularly in connection with two exchanges having the particular form of construction of switchboard apparatus herein shown and described.

As illustrated, the system comprises a substation A having a microphone transmitter a supplied with current from a local battery a' , and a substation B, having a microphone transmitter b supplied with current from the exchange or central station. The substation A is shown connected with the centralized call exchange indicated by C, while the substation B is illustrated as being connected with the common battery exchange indicated by D. The two exchanges are, it will be seen, connected by a suitable trunk-line E. It will be understood, however, that in a system of this character any desired number of trunk-lines can be employed between the two exchanges.

Now assuming that the subscriber at substation A desires connection with the subscriber at substation B, the circuit connections and operations which then take place are as follows: The removal of the receiver a^2 from the hook-switch at substation A serves to complete a circuit from the battery F, through the battery lead 1, through the coil of the line relay 2, through the conductor 3 and the contact-point 4, thence through the armature 5 and the line conductor 6, through the said receiver a^2 and the secondary 7 of the induction coil, through the contact-point 8 and the hook-switch 9, thence through the other line conductor 10, through the armature 11 and contact-point 12, through conductor 13, and thence through the ground or common connections 14 and 15 to said battery. The current flowing through this completed line circuit energizes the said relay 2, causing it to attract its armature. The said armature when attracted completes a short local circuit from the battery F through the conductor 1 and the coil of the relay 2, through the conductor 3 and contact-point 4,

through the armature 5 and conductor 16, through the line lamp 17, through the contact-point 18 and the armature 19, through the conductor 20 and the armature 11, thence through contact-point 12 and conductor 13, and through the ground or common connections 14 and 15 to said battery. Thus it will be seen that the relay 2, in attracting its armature, closes a local circuit through itself, by reason of which arrangement it continues to attract its armature until the local circuit is broken, regardless of whether the subscriber has hung up the receiver or not. In other words, the relay 2 is connected and arranged to serve as part of both line and local circuits. The flow of current through this local circuit causes the lamp 17 to glow, thus attracting the attention of the operator and indicating that the subscriber at substation A desires to give an order for connection. The originating operator at exchange C, or the exchange at which the call originates, then inserts the answering plug of the cord-circuit in the jack corresponding to the calling subscriber's line. This, it will be seen, operates to complete another local circuit from the battery F, through conductors 1 and 21, through the coil of the cut-out relay 22, thence through the jack contacts 23 and 24, it being observed that the insertion of the plug in the jack has closed these contacts, and thence through the ground or common connections 25 and 15, to said battery. The flow of current through this local circuit energizes the cut-out-relay 22, causing it to attract its two armatures 5 and 11. Consequently, the insertion of the plug operates to automatically disconnect the battery and line relay from the line, and the latter being deenergized, the line lamp is extinguished or restored. After thus inserting the plug and automatically restoring the line signal, the originating operator then presses the usual listening key, so as to establish connection between the line and the operator's talking set, which, it will be understood, may consist of the transmitter X and the receiver X'. The energizing of the cut-out relay having established connection between the jack and the line by reason of the armatures 5 and 11 having moved into contact with the contact-points 26 and 27, the originating operator can now receive an order for connection from the calling subscriber. It will be readily understood that the operator's talking set can be of any suitable or approved form. After receiving the order for connection, the originating operator then presses the key g in the operator's private order line G, it being observed that this order line is permanently connected with the trunking operator's talking set at the common battery exchange D, and is, by reason of the key g , normally disconnected

from the operator's talking set at the centralized call exchange C. The trunking operator's talking set, consisting of the transmitter Y and the receiver Y', being thus connected to the originating operator's talking set, the latter can then advise the trunking operator as to the character of the connection desired. Upon learning the number of the substation desired, the trunking operator then immediately assigns a certain idle trunk-line between the two exchanges, which line is, in this case, assumed to be the trunk-line E. The originating operator then immediately plugs into the trunk-jack connected with this trunk-line, and in so doing completes a local circuit from the battery F, through the conductor 28 and the coil of the supervisory relay 29 associated with the said jack, through the conductor 30, through the trunk-jack contacts 31 and 32, it being observed that these two contacts have been brought together by reason of the insertion of the originating operator's calling plug, and, finally, through the ground connections 33 and 15 to said battery. The insertion of the plug in the trunk-jack also operates to complete a circuit from the battery "F" through the conductor 34, and the lower coil of the relay 35, thence through the sleeve strand and the sleeve of the plug, through the spring 41 of the trunk-jack, through the conductor 42, impedance coil 43, conductor 44, contact point 45 and armature 46, and thence through the ground or common connections 47 and 15, to said battery. The completion of this grounded circuit serves to energize the relay 35, causing it to attract its armature. The said armature when attracted completes a short local circuit from the battery F, through conductor 34, supervisory lamp 48, thence through the contact-point 50 and the armature 51, and, finally, through the ground or common connections 52 and 15 to said battery. The current flowing through this local circuit causes the supervisory lamp 48 to glow, indicating that no connection has been made with the called subscriber. This lamp, as will be seen, continues to glow until the subscriber at substation B answers the call.

Now, after making one of the usual tests, so as to ascertain whether or not the line of substation B is busy, the trunking operator then, in case the line is not busy, inserts the plug of the trunking cord-circuit in a jack corresponding to the line of substation B. After thus inserting the cord-circuit plug in the jack connected with the called subscriber's line, the trunking operator then projects ringing current on to the line in any suitable manner, as, for example, by pressing the ringing key Z, so as to throw current on to the line from the generator U. The generator current thus projected on to the

called subscriber's line rings the bell b' at substation B. Furthermore, the insertion of the trunking cord-circuit plug in the called subscriber's spring jack, serves to complete a local circuit from the battery F', through the conductor 53 and the coil of supervisory relay 54, thence through the conductor 55 and the contact-point 56, through the spring 57 of the usual listening key, thence through conductor 58 and the contact-point 59, through the ringing key Z, through the sleeve contact 60 of the trunking cord-circuit plug, thence through the testing ring or thimble 61 of the called subscriber's jack, through the conductors 62 and 63, through the impedance coil 64, thence through the conductor 65 to said battery. This energizes the relay 54, causing it to attract its armature. The said armature, as will be seen, continues to be attracted and held against its associated contact until the plug of the trunking operator's cord-circuit is withdrawn from the called subscriber's jack.

When the called subscriber responds to the call, that is to say, when the subscriber removes the receiver b^2 from the hook-switch, a line circuit is completed from the battery F', through the conductor 66, through the impedance coil 67, through the conductors 68 and 69, thence through the ring contact spring 70 of the called subscriber's jack, thence through the ring contact 71 of the plug, through the conductor 72, through the coil of the supervisory relay 73, through the cord-strand 74, through the plug tip 75, thence through the tip spring 76 of said jack, through the line conductor 77 and the subscriber's transmitter b , through the hook-switch 78 and the primary 79 of the induction coil, thence through the other line conductor 80, through the conductor 62, and the impedance coil 64, thence through the conductor 65, to said battery. The current takes this path, it will be seen, by reason of the coil of supervisory relay 73 being of lower resistance than the line relay R, which is also in the line circuit, consequently, the line relay R does not become energized when the called subscriber answers the call, and in this way the said subscriber responds without causing the line lamp r to glow. In other words, the coil of supervisory relay 73 constitutes a relatively low resistance shunt adapted to be placed in the line to short-circuit the line relay R. The current flowing through this supervisory relay 73 energizes it and causes it to attract its armature 46. Now as this armature, as will be seen from the previous description of the connections, constitutes part of the energizing circuit of the supervisory relay 35 in the originating operator's cord-circuit, it follows that when attracted this armature serves to break or open the circuit of relay 35, thereby causing the latter to be-

come deenergized, and to release its armature 51. This armature 51 in moving away from contact 50 breaks or opens the local circuit in which the supervisory lamp 48 is included, and in this way the called subscriber in answering a call closes a line circuit which energizes the relay 73, and the energizing of this relay in turn opens or breaks the grounded trunk line circuit, thereby deenergizing the originating operator's supervisory relay and restoring or extinguishing the supervisory lamp 48. In this way, the originating operator is enabled to supervise the connections and to know when the called subscriber responds to the call.

The trunking operator's cord-circuit is preferably provided with condensers d located in each talking strand, and the lower limb of the trunk line is preferably provided with a condenser e , located preferably just outside of the trunk jack.

After finishing their conversation, the subscribers in hanging up their receivers automatically signal for disconnection. For example, the subscriber at substation A, in hanging up receiver a^2 , completes a grounded line circuit from the battery F, through the conductor 34, through the coil of supervisory relay 35, thence through the conductor 81 and the talking strand 82 of the cord-circuit, thence through the plug tip 83 and the jack spring 84, through the contact-point 26 and the armature 11, through the line conductor 10 and the hook-switch 9, and thence through the contact-point 85 and the conductor 86, through the subscriber's bell 87, and, finally, through the ground connections 88 and 15 to said battery. This, it will be seen, again energizes the relay 35, causing it to attract its armature and close the local circuit including the lamp 48. This lamp then glows or lights up, and in so doing indicates that the subscribers are ready to be disconnected. The originating operator then withdraws both plugs from the jacks—that is to say, both from the calling subscriber's jack and the trunk jack, so as to disconnect the two lines. It will also be seen, however, that the hanging up of the receiver b^2 at substation B opens the line circuit, thereby deenergizing the line relay 73, and allowing the latter to release its armature. The said armature, when released, immediately makes contact with the resting contact-point 45, thereby again closing the grounded trunk-line circuit including the coil of relay 35. In this way, the opening of the called subscriber's line by the depression of the hook-switch also operates to automatically energize the relay 35, and to cause the lamp 48 to glow. In other words, either subscriber can, by hanging up the receiver, energize the relay 35 and operate the supervisory or clearing-

out signal associated with the originating operator's cord-circuit. The originating operator, observing this signal, then, as stated, withdraws both plugs from the jacks. It will be seen, however, that during all this time the trunking operator knows nothing about the condition of the subscriber's lines—that is to say, does not know whether or not the two subscribers have finished conversation. Consequently, the trunking operator does not withdraw the plug of the trunk cord-circuit from the jack of the subscriber's line until the proper signal is received from the originating operator. This signal is given by the originating operator in withdrawing the plug from the trunk jack, it being observed that as soon as this is done the relay 29 is deenergized, and its armature thereby released. The said armature, when released, completes a grounded circuit from the common battery F', through the conductor 89 and the armature 90, it being observed that the latter is attracted by the magnet of relay 54, thence through the contact-point 91, and the conductor 92, through the coil of relay 93, and the conductor 94, through the cord-strand 95 and the lower limb of trunk-line E, thence through the conductor 96 and the contact-point 97, through the armature 98 of relay 29, thence through the conductor 99, and, finally, through the ground connections 100 and 101 to said battery. Thus included in the closed grounded trunk-line circuit, the relay 93 is energized sufficiently to attract its armature. The said armature, when attracted, closes a local circuit, from the battery F', through the conductor 102, through the supervisory lamp 103, thence through the contact-point 104 and the armature 105, and through the ground or common connections 106 and 101 to said battery. The flow of current through this local circuit causes the lamp 103 to glow, and the trunking operator observing this signal then withdraws the plug of the trunking cord-circuit from the called subscriber's spring jack. Thus, as explained, the trunking operator acts entirely on the instructions given by the originating operator, and does not disconnect until a proper signal is received from the latter. It will also be seen that though a call originates at the centralized call exchange, the connections between the two exchanges are made in a satisfactory and efficient manner, and without interfering with the approved or established methods of operation. Furthermore, these advantages are obtained in a trunking telephone system involving a centralized call exchange having jacks normally disconnected from the lines, and involving a common battery exchange having cord-circuit shunts adapted to be placed in the lines for the purpose of short-circuiting or shunting out the line relays.

It will be seen that the supervisory relay 35 is double-wound and connected at a point between the two coils, with the non-grounded pole of the battery. In this case, the upper coil is used by the calling subscriber, as he hangs up his telephone, for closing the circuit of the supervisory lamp. In a similar way, and through the medium of the short-circuiting relay 73, the called subscriber can close a grounded trunk-line circuit including the lower coil of the relay 35. Thus the two coils balance each other, so as to produce a quieting effect on the talking circuit. In addition, each coil is, with the arrangement shown, adapted to serve as part of the supervisory signaling apparatus. It will be understood, of course, that the sleeve contacts of the plugs connected with the originating operator's cord circuit do not make contact with the thimbles or testing rings of the jacks,—that is, when the plugs are fully inserted. In other words, the lower or sleeve strand of the cord circuit C is not connected through the plug sleeves with the said testing rings when the plugs are inserted. Consequently, these testing rings are used for testing purposes only, the test being made by touching the tip of the plug to the testing ring of the jack of the line being tested. When this is done, and if the line is busy or in use, current flows from ground through the testing ring, through the tip of the plug, through the upper coil of the relay 35, and thence to the non-grounded pole of the battery. The supervisory relay being thus energized, the supervisory lamp is lighted momentarily, thus giving a visual busy test.

I claim as my invention—

1. In a trunking telephone system, the combination of a centralized call exchange, a common battery exchange, a trunk-line extending between the two exchanges, a calling subscriber's line suitably connected with the centralized call exchange, a subscriber's telephone set including a local battery and microphone transmitter, a called subscriber's line suitably connected with the common battery exchange, a subscriber's telephone set suitably connected with said called subscriber's line, said last mentioned telephone set including a microphone transmitter connected and arranged to receive current from the common source at the common battery exchange, means whereby an operator may produce a call signal at any called subscriber's station, an order line extending between originating and trunking operators, and means by which the originating operator supervises the connection.

2. In a trunking telephone system, the combination of a centralized call exchange provided with an originating operator's cord-circuit, a common battery exchange provided with a trunking operator's cord-

circuit, a trunk line extending between the two exchanges, a local battery substation suitably connected with said centralized call exchange, a common battery substation suitably connected with said common battery exchange, means whereby an operator may produce a call signal at any called subscriber's station, an order line extending between originating and trunking operators, and means by which the originating operator supervises the connection.

3. In a trunking telephone system, the combination of a calling subscriber's line, a calling subscriber's telephone set including a microphone transmitter and a local battery, an originating operator's cord-circuit, a battery associated with said cord-circuit and connected and arranged to supply current to the calling subscriber's line for signaling purposes only, a trunking operator's cord-circuit, a trunk line connected and arranged to serve as medium of connection between the two cord-circuits, a called subscriber's line terminating at the exchange at which the trunking operator's cord-circuit is located, line signal apparatus associated with the called subscriber's line, a subscriber's telephone set suitably connected with the called subscriber's line and involving a microphone transmitter, and a common battery associated with the trunking operator's cord-circuit and connected and arranged to supply current to the called subscriber's line for both talking and signaling purposes.

4. In a trunking telephone system, the combination of switch-board apparatus involving suitable line terminals and line or calling signals, a battery associated therewith and connected and arranged to supply current to said lines for signaling purposes, local batteries for talking purposes, a trunk line terminating in a trunk-jack located at the exchange having said switchboard apparatus, suitable switch-board apparatus connected and associated with the other end of said trunk line, said last mentioned switchboard apparatus involving suitable line terminals and line or calling signals, a common battery connected and arranged to supply current to the lines terminating at said last mentioned switchboard apparatus, for both talking and signaling purposes, means whereby an operator may produce a call signal at any called subscriber's station, an order line extending between originating and trunking operators, and means by which the originating operator supervises the connection.

5. In a trunking telephone system, the combination of a calling subscriber's line, a jack normally disconnected from said line, an originating operator's cord-circuit associated with said jack, line signal apparatus associated with the calling subscriber's line, a cut out relay for restoring the line signal

apparatus and establishing connection between the line and the said jack, a battery associated with the originating operator's cord-circuit and connected and arranged to supply current for both energizing said cut-out relay and operating the said line signal apparatus, a trunk jack associated with the said originating operator's cord-circuit, a trunk-line having one end permanently connected with said trunk-jack, a trunking operator's cord-circuit permanently connected with the other end of said trunk-line, a spring jack associated with said trunking operator's cord-circuit, a called subscriber's line permanently connected with said last mentioned jack, a line relay associated with the called subscriber's line, the said trunking operator's cord-circuit being provided with a low resistance supervisory relay adapted to be placed in the line to short-circuit said line relay, and a battery associated with the trunking operator's cord-circuit and suitably connected for supplying current to the called subscriber's line for talking purposes, and also for the purpose of energizing the said line and supervisory relay.

6. In a trunking telephone system, the combination of two exchanges, a trunk line extending between the two exchanges, a supervisory relay and a battery at one exchange, a plug switch for closing a local circuit including said battery and relay, a grounded circuit including one limb of said trunk line, said circuit having a normally closed switch-point controlled by said supervisory relay, a supervisory relay and a normally open switch-point in said grounded circuit at the other exchange, a supervisory relay for controlling said normally open switch-point, a battery permanently connected with said third supervisory relay, said battery being grounded to form part of the said grounded circuit including one limb of the trunk line, a plug switch for closing or completing a circuit through said third supervisory relay, so as to close said normally open switch-point in the grounded trunk-line circuit, a supervisory lamp located in a local circuit including said last mentioned battery, and a normally open switch-point controlled by the relay located in the grounded trunk-line circuit, this relay in the trunk-line circuit being energized and the said lamp being caused to glow when the first mentioned relay is deenergized.

7. In a trunking telephone system, the combination of a trunk line connected at one end with a trunk-jack, an originating operator's supervisory relay associated with said jack, an originating operator's supervisory lamp associated with the said relay, a normally open switch-point controlled by the said supervisory relay, a trunking operator's supervisory relay, a grounded trunk-

line circuit including said originating operator's supervisory relay, a normally closed switch-point in said grounded circuit controlled by the trunking operator's supervisory relay, a battery permanently connected with said originating operator's supervisory relay and also arranged to supply current to said lamp, a second grounded circuit including the other limb of said trunk line, normally open and normally closed switch-points in said grounded circuit, a relay under the control of the trunking operator and arranged to control the said normally open switch-point, a trunking operator's supervisory lamp, a battery permanently connected with said lamp, a normally open switch-point in the circuit of said trunking operator's supervisory lamp, and a relay located in said second grounded circuit and arranged to control a normally open switch-point in the circuit of the trunking operator's supervisory lamp.

8. In a trunking telephone system, the combination of a calling subscriber's line, a normally open connection across the terminals of said line, a line relay connected and arranged to close said normally open connection, a battery connected to supply current through said relay to said line, a line lamp, the local circuit of said line lamp including said relay and normally open connection and also including said battery, the coil of said relay thereby being adapted to serve as part of both line and local circuits, an originating operator's cord-circuit, a trunking operator's cord-circuit adapted to serve as medium of connection between the two cord-circuits, supervisory signal apparatus associated with the trunking operator's cord-circuit, a plug switch and suitable connections whereby the originating operator has control of the said supervisory signal apparatus, a called subscriber's line, a line relay associated with said called subscriber's line, the trunking operator's cord-circuit being provided with a supervisory relay of relatively low resistance adapted to be placed in the line to short-circuit said last mentioned relay, supervisory signal apparatus associated with the originating operator's cord-circuit, and suitable connections and circuit-changing devices whereby said last mentioned supervisory apparatus may be controlled or brought into action either by the closing of a grounded line circuit including one limb of the calling subscriber's line, or by the opening of the called subscriber's line circuit.

9. In a trunking telephone system, the combination of a calling subscriber's line, a called subscriber's line, an originating operator's supervisory signal, connections and circuit changing means whereby said signal may be displayed by closing a grounded circuit including one limb of the calling sub-

scriber's line, suitable connections and circuit-changing means whereby said signal may be displayed by the opening of the called subscriber's line circuit, line signal apparatus associated with the calling subscriber's line, a centralized call battery connected to supply current to the calling subscriber's line for signaling purposes only, line signal apparatus associated with the called subscriber's line, a second battery connected and arranged to supply current to the called subscriber's line for both talking and signaling purposes, a trunking operator's supervisory lamp, and suitable connections and circuit closing devices whereby the said last mentioned lamp may be caused to glow by the closing of a grounded circuit including one limb of a trunk-line.

10. In a trunking telephone system, the combination of a calling subscriber's telephone set including a microphone transmitter and local battery and also including a grounded bell connected by a hook-switch with one side of the line, a called subscriber's telephone set including a microphone transmitter and a hook-switch for closing the line circuit, suitable line signal apparatus associated with the calling subscriber's line, a centralized call battery connected and arranged for supplying current to the calling subscriber's line for the purpose of operating said line signal apparatus, an originating operator's supervisory relay permanently connected with said battery, suitable connections whereby said relay may be energized by the closing of a grounded line circuit including said grounded bell, suitable line signal apparatus associated with the called subscriber's line, a battery connected and arranged to supply current to the called subscriber's line for talking purposes and also for the purpose of operating the said last-mentioned line signal apparatus, a suitable trunk-line, a normally open grounded circuit including one limb of said trunk-line and also including the originating operator's supervisory relay, a trunking operator's supervisory relay connected and arranged to be deenergized when the called subscriber's line is open, a normally open switch-point in the grounded circuit controlled by said trunking operator's supervisory relay, a trunking operator's supervisory signal, and suitable connections and circuit-closing devices whereby the originating operator may close a grounded circuit including the other limb of said trunk line, and whereby the closing of this second grounded trunk-line circuit will cause the said trunking operator's supervisory signal to be displayed.

11. In a trunking telephone system, the combination of a centralized call exchange, a common battery exchange, a trunk-line extending between the two exchanges, a trunk-

jack connected with the trunk line at the centralized call exchange, a trunking operator's cord-circuit connected with the trunk-line at the common battery exchange, a condenser in one limb of the trunk-line at the jack end thereof, suitable supervisory signal apparatus associated with the trunking operator's cord-circuit, an originating operator's cord-circuit provided with a plug adapted for insertion in said jack, suitable connections and circuit closing devices whereby the insertion of the plug in said jack maintains the said supervisory signal apparatus in an operative condition, and whereby the withdrawal of the plug from said jack causes the operation of said apparatus and the display of the supervisory signal, means whereby an operator may produce a call signal at any called subscriber's station, an order line extending between originating and trunking operators, and means by which the originating operator supervises the connection and receives a signal, over a ground circuit, when the called subscriber hangs up the receiver.

12. In a trunking telephone system, the combination of a centralized call exchange, a calling subscriber's line connected with said exchange, a common battery exchange, a called subscriber's line connected with said last-mentioned exchange, a trunk-line extending between the two exchanges, a trunk-jack connected with the trunk-line at the centralized call exchange, a supervisory signal apparatus located at the common battery exchange, a local circuit including the centralized call battery at the first mentioned exchange, a relay in said local circuit, said local circuit also including a pair of normally separated contacts of said jack, a grounded circuit including one limb of the trunk-line, a normally closed switch-point in said grounded circuit controlled by said relay, an originating operator's cord-circuit plug adapted for insertion in said jack, the plug when inserted in the jack causing the said normally separated contacts to be brought together, so as to energize said relay and open said normally closed switch-point in the grounded circuit, and suitable connections whereby the withdrawal of the plug and the consequent closing of said grounded circuit causes the operation of said supervisory signal apparatus and the display of the supervisory signal.

13. In a trunking telephone system, the combination of a calling subscriber's line, an originating operator's cord circuit, a trunking line, a condenser in a limb thereof at the jack end, a trunking operator's cord circuit, a called subscriber's line, together with line and supervisory signaling apparatus associated with the two lines and the two cord circuits, batteries at the central stations for supplying current to the line circuits to

- operate the line and supervisory signals, means whereby an operator may produce a call signal at any subscriber's station, an order line extending between originating and trunking operators, and means by which the originating operator supervises the connection and receives a signal, over a ground circuit, when the called subscriber hangs up the receiver.
14. In a trunking telephone system, the combination of calling and called subscribers' lines, a trunking line, a plurality of two wire cord circuits for connecting the trunking lines with the subscribers' lines, a battery associated with one cord circuit and permanently connected with one of the subscriber's lines, and a battery associated with the other cord circuit and normally connected with the other subscriber's line and a cut-off relay to disconnect said battery from the latter line during conversation.
15. A trunking telephone system comprising a trunk line, calling and called subscribers' lines, means for connecting the trunk line with the subscribers' lines, a centralized battery for furnishing current to the trunk line for signaling purposes, means whereby an operator may produce a call signal at any called subscriber's station, an order line extending between originating and trunking operators, and means by which the originating operator supervises the connection and receives a signal when the called subscriber hangs up the receiver.
16. In a telephone system, a subscriber's line, a jack normally disconnected therefrom, means for trunking said line into connection with another line, means for giving a disconnect signal by grounding the first mentioned line at the subscriber's station, and a cut-off relay actuated over a circuit independent of the talking circuit of the line.
17. In a telephone system, a subscriber's line, a jack normally disconnected therefrom, means including originating and trunking operator's cord circuits for trunking said line into connection with some other line, a supervisory signal, and means for operating said signal by either grounding the first mentioned line or the operator's cord circuit.
18. In a telephone system, a calling subscriber's line, a jack normally disconnected therefrom, means for automatically connecting the jack with the line when the originating operator answers the call, a trunking operator's cord circuit, a supervisory apparatus for the originating operator, and means for causing said supervisory apparatus to give a disconnect signal upon the grounding of either the calling telephone line or the trunking line leading to the trunking operator's cord circuit.
19. In a telephone system, a calling telephone line, a jack normally disconnected therefrom, means including an originator's cord circuit and a trunking operator's cord circuit for trunking the line into connection with some other line, a line signal for the calling telephone line, a cut-off relay, means for energizing the cut off relay over a local circuit independent of the talking circuit to retire the line signal and connect the jack with the calling line when the originating operator answers the call, and means, including a metallic circuit, by which the called subscriber gives a disconnect signal.
20. In a telephone system, a pair of telephone lines, a line relay for one line temporarily disconnected therefrom, and a line relay for the other line temporarily shunted during conversation, a trunk line for connecting said lines for conversation and means associated therewith for shunting the latter line relay.
- Signed by me at Chicago, Cook county, Illinois, this 12th day of April 1902.
- ALFRED H. DYSON.
- Witnesses:
 ARTHUR F. DURAND,
 HARRY P. BAUMGARTNER.