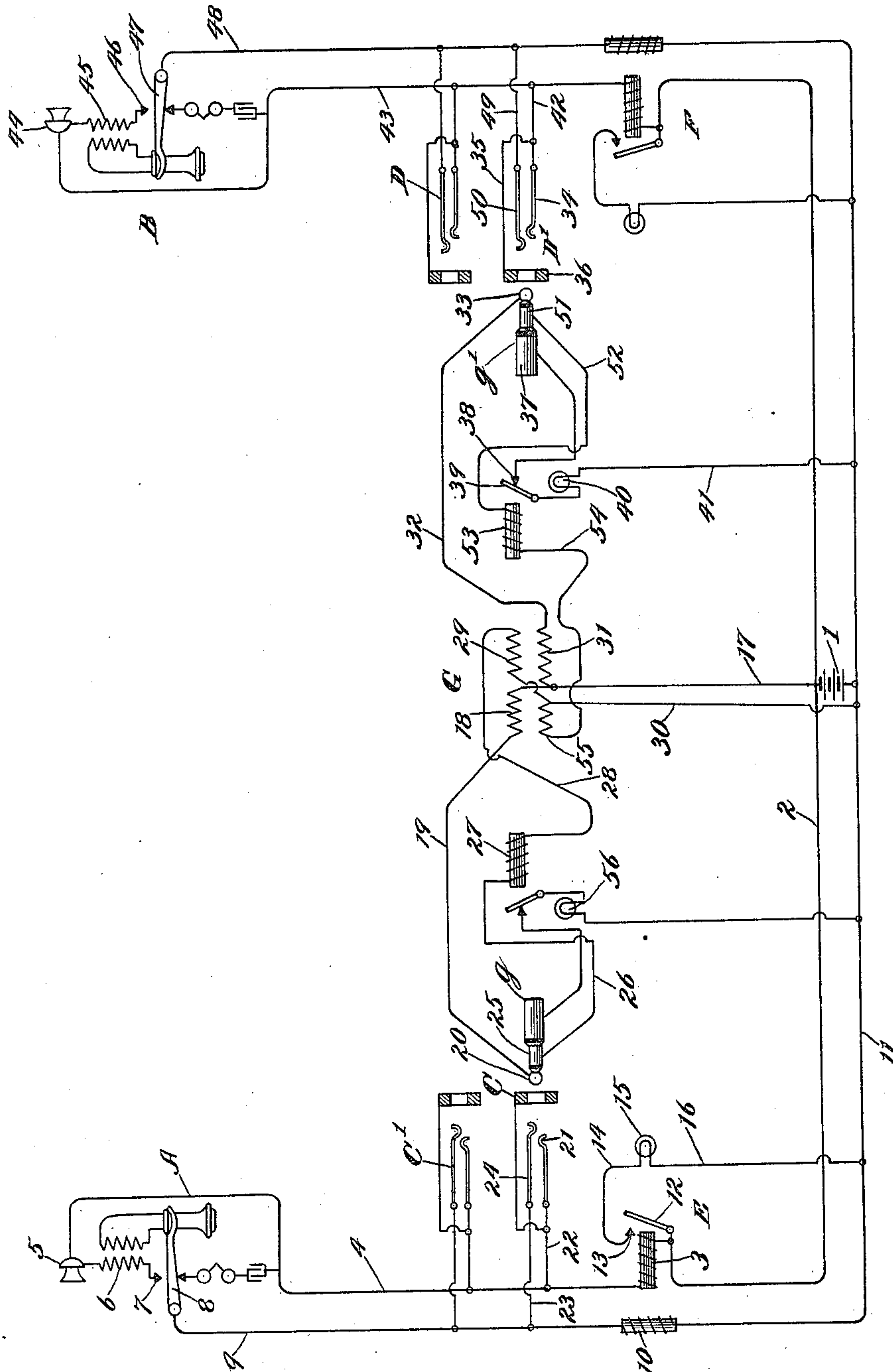


C. L. GOODRUM.
CENTRAL ENERGY TELEPHONE SYSTEM.
APPLICATION FILED APR. 6, 1903.

1,045,546.

Patented Nov. 26, 1912.



Witnesses:
Geo. D. Perry
Geo. V. Thomas

Inventor:
Charles L. Goodrum
By *Quirkley & Durand*
Att. o.

UNITED STATES PATENT OFFICE.

CHARLES LANE GOODRUM, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY, OF ROCHESTER, NEW YORK, A CORPORATION OF NEW YORK.

CENTRAL-ENERGY TELEPHONE SYSTEM.

1,045,546.

Specification of Letters Patent.

Patented Nov. 26, 1912.

Application filed April 6, 1903. Serial No. 151,286.

To all whom it may concern:

Be it known that I, CHARLES L. GOODRUM, a citizen of the United States of America, and resident of Philadelphia, Pennsylvania, have invented a certain new and useful Improvement in Central-Energy Telephone Systems, of which the following is a specification.

My invention relates to telephone systems of that type in which the current, both for talking and signaling purposes, is supplied from suitable sources located at the exchange or central station.

Generally stated, it is the object of my invention to provide an improved and highly efficient telephone system of the common battery or central energy type.

A special object is to provide an improved construction and arrangement of the line and supervisory signaling devices involved in the switchboard apparatus at the exchange.

It is also an object to provide certain details and features of improvement tending to increase the general efficiency of a telephone system of this particular character.

To the foregoing and other useful ends, my invention consists in matters hereinafter set forth and claimed.

The accompanying drawing is a diagram illustrating a telephone system involving the principles of my invention.

As thus illustrated, the invention may comprise a suitable subscriber's apparatus located at the substations A and B, and connected through the medium of complete metallic line connection with the switchboard apparatus located at the exchange or central station. This switchboard apparatus may comprise the answering and multiple jacks C and C' connected with the line leading from substation A, and also a similar answering and multiple jacks D, D', connected with the line leading from substation B. As will be well understood, these jacks can be located on the switchboard in front of the operator. The line signal apparatus E can be associated with the answering jack C, and similar line signal apparatus can be associated with the answering jack D. The switchboard apparatus may also comprise the operator's cord-circuit G having the plugs *g* and *g'* adapted for insertion in the said jacks. The bat-

tery 1, is, it will be observed, preferably permanently connected with the subscribers' lines, and also with the middle portion of the cord-circuit. It is from this battery that current is supplied to the lines, both for the purpose of supplying talking current to the transmitters and also for the purpose of operating the line and supervisory signals involved in the switchboard apparatus.

It will be readily understood that the various instruments and devices involved in the telephone system thus illustrated can be of any suitable known or approved character. It will also be understood that the resistances of the various impedance coils, induction coils, etc., can be varied or adjusted to suit the conditions of any particular case, and in such manner as to secure the mode of operation and the results hereinafter specified. The principles and operation of the system will, however, be best understood by considering the various operations and circuit connections which necessarily take place in establishing connection between the lines of any two subscribers. For example, and assuming that the subscriber at substation A desires to talk to the subscriber at substation B, the removal of the receiver from the hook-switch at substation A results in the closing of a line circuit from the battery 1 through the battery lead 2, through the coil of the line relay 3, thence through the limb or line conductor 4, through the subscriber's transmitter 5 and the primary of the induction coil, through the contact of the hook-switch 8, through the other line conductor 9 and the impedance coil 10, and thence through the other battery lead 11 to the other pole of said battery. The current flowing through this closed line circuit is sufficient to energize the relay 3, thereby causing it to attract its armature. The said armature, when thus attracted as a result of the closing of the line circuit by the manipulation of the subscriber's hook-switch, completes a local circuit from one pole of the battery through the battery-lead 2 to the said armature 12, through the contact-point 13, and the conductor 14, thence through the line lamp signal 15 and the conductor 16, and through the battery lead 11 to the other pole of the battery. The current thus shunted

across the connection which contains the lamp 15, and which is in parallel with the subscriber's apparatus, is sufficient to cause the said lamp to rise to full glow. The central operator, observing this signal, understands that the subscriber at substation A desires to communicate with some other subscriber. Accordingly, the said operator then inserts the plug *g* in the answering jack C, and in so doing establishes a circuit from one pole of the battery through the conductor 17, through the winding 18 of the repeating coil, through the talking or top strand 19 of the cord-circuit, through the plug-tip 20, through the tip spring 21 of the said jack, through the jack connection 22, thence through the line conductor 4, to and through the substation apparatus, back through the other line conductor 9, and through the other jack connection or conductor 23, through the ring spring or contact 24, through the ring contact 25 of the plug, through the other talking strand 26 of the cord-circuit, through the coil of the supervisory relay 27, through the other portion 28 of the said talking strand, through another winding 29 of the repeating coil, and through the conductor 30 to the other pole of said battery.

The coil of the relay 27, being of less resistance than the impedance coil 10, and the winding 18 being of less resistance than the coil of the relay 3, the insertion of the plug in the answering jack of the calling subscriber's line operates to shunt the line relay 3, and also the impedance coil 10, and to direct sufficient current through the relay 27 to energize it, and cause it to attract its armature, thereby preventing a display of the supervisory signal allotted to this end of the cord-circuit. The shunting of the line-relay 3 operates, of course, to obliterate the line signal. Upon learning the number of the substation desired by the calling subscriber, which may be accomplished in any of the well known or approved ways, the operator then proceeds to connect the other end of the cord-circuit with the multiple jack allotted to the line of the called subscriber, and to signal the latter in the usual and well-known manner. The insertion of the plug *g'* in the multiple jack D' completes a line circuit from the battery through the conductor 17, through another winding 31 of the repeating coil, through a talking conductor 32, through the plug-tip 33, through the tip-spring 34 of the jack, through the sleeve 35 of the jack, which is electrically united with the tip-spring, thence through the testing ring or thimble 36 of the jack, through the sleeve contact 37 of the plug, thence through the contact 38 and the armature 39, through the supervisory lamp signal 40, and through the conductor 41 to the other pole of the battery. The current flow-

ing through this local-circuit causes the lamp 40 to rise to full glow, thereby indicating that the called subscriber has not answered the call. When, however, as the called subscriber responds by removing the receiver from the hook-switch, a line circuit is then formed from the battery, as indicated, to the plug-tip 33, through the tip spring 34, through the jack connection or conductor 42, thence through the limb or line conductor 43, through the called subscriber's transmitter 44, through the primary winding 45 of the associated induction coil, through the contact 46, and the hook-switch 47, through the other line conductor 48, through the other jack connection or conductor 49, through the ring spring or contact 50 of the jack, through the ring contact 51 of the plug, through the talking conductor or strand 52, through the coil of supervisory relay 53, through the talking conductor 54, through another winding 55 of the repeating coil, and thence through the conductor 30 to the other pole of the battery. A circuit is also completed through the relay of the line signal apparatus F and also through the impedance coil associated with this apparatus, but inasmuch as the resistances of the winding 31 and the relay 53 are less than the resistances of the relay and impedance coil indicated at F, the current flows through the path including the winding 31 and the relay 53 rather than through the path including the line-signal apparatus. Consequently, the called subscriber in responding to the call causes sufficient current to flow through the supervisory relay 53 to enable the latter to attract its armature 39. This, of course, opens the circuit of the lamp 40, and the resulting obliteration of this supervisory signal tells the operator that the subscriber has answered the call.

The talking circuit thus established between the two subscribers includes the limbs of the two lines, tip and ring contacts of the plugs and jacks, the coils of the supervisory relays, and the windings of the repeating coils and the strands of the cord-circuit. In this connection it will be observed that the jacks and cord-circuit, both of the three-way type, are each connected by only two conductors with the lines. In other words, there are but two conductors between each jack and the balance of the apparatus. Furthermore, the system is characterized by all, or at least most, of the approved methods of operation.

When the subscribers have finished talking, the hanging up of the receivers at the two substations opens the circuits including the supervisory relays 27 and 53. This, of course, causes each relay to release its armature, and when thus released the two supervisory lamps 56 and 40 will rise to full glow.

Thus, the line signals are under the control of the subscriber, the manipulation of the hook-switch for the purpose of closing the line-circuits resulting in a display of the line signals. As explained, a display of the supervisory signals is accomplished by replacing the subscribers' receivers on the hook-switches, and by the consequent opening of the line circuits and the deenergizing of the supervisory relay. Thus both the display of the line and the clearing out signals are accomplished automatically.

It will be observed that the repeating coil windings are so arranged that they constitute both an inductive and a conductive means of connection between the two ends of the cord-circuit. In other words, the winding 18 bears an inductive relation to the winding 55, and a conductive relation to the winding 31. In the same way, the winding 29 bears an inductive relation to the winding 31 and a conductive relation to the winding 55.

This arrangement can, of course, be changed or modified to some extent without departing from the spirit of my invention.

I claim as my invention:—

1. In a telephone system, the combination of subscribers' lines, sub-station apparatus involving a switch-hook for each line, a plurality of three-way spring jacks connected with each line, there being but two conductors leading from each jack to its allotted line, the sleeve or outer contact of each jack being connected with the tip contact thereof, suitable line signal apparatus adapted to be controlled by said switch-hook, a three-way operator's cord-circuit provided with plugs adapted for insertion in said jacks, each plug provided with three contacts, a battery at the central station connected and arranged for supplying current to the lines for both talking and signaling purposes, repeating coil windings serving as medium of permanent connection between the poles of said battery and the talking strands of said cord-circuit, and supervisory signaling apparatus associated with said cord-circuit and adapted to be controlled by said hook-switches when the plugs are in the jacks.

2. In a telephone system, the combination of subscribers' lines, suitable substation apparatus involving a subscriber's hook-switch for each line, a plurality of three-way jacks connected with each line, each jack being provided with but two jack connections, a battery at the central station connected and arranged for supplying current to the lines for both talking and signaling purposes, suitable line signaling apparatus adapted to be controlled by said hook-switch, a three-way operator's cord-circuit provided with plugs adapted for insertion in said jacks, repeating coil windings serving as medium of permanent connection between said plugs

and the poles of the battery, said repeating coil windings being arranged to both inductively and conductively connect the two plugs, and suitable supervisory signaling apparatus associated with the cord-circuit and adapted to be controlled by said hook-switches when the plugs are in the jacks.

3. In a telephone system, the combination of subscribers' lines, suitable sub-station apparatus for each line, three-way jacks connected with the lines at the central station, each jack being provided with but two connections leading therefrom, a battery at the central station permanently connected with the lines and adapted for supplying current to the latter for both signaling and talking purposes, an operator's cord-circuit provided with plugs adapted for insertion in said jacks, repeating coil windings serving as medium of permanent connection between the poles of said battery and the talking strands of said cord-circuit, said repeating coil windings being arranged to both inductively and conductively connect the two plugs, and suitable supervisory signaling apparatus associated with the cord-circuit and adapted to be controlled by said hook-switches when the plugs are in the jacks.

4. In a telephone system, the combination of subscribers' lines, suitable substation apparatus for each line, a battery at the central station connected and arranged for supplying current to the lines for both talking and signaling purposes, a plurality of three-way jacks connected with each line, each jack having but two jack connections, an operator's three-way cord-circuit provided with plugs adapted for insertion in said jacks, and repeating-coil windings serving as medium of permanent connection between the poles of said battery and the talking strands of said cord-circuit, said repeating coil windings being arranged to both inductively and conductively connect the two plugs.

5. In a telephone exchange system, the combination of a telephone line, a line relay, a repeating coil, a line signal controlled by said relay, a common battery for supplying current to the line for talking and signaling purposes, a local circuit through a winding of said repeating coil and a relay for controlling the same, and means for placing a winding of the repeating coil in parallel with the line relay when a connection is made to line, adapted to shunt the line relay to prevent a display of the line signal.

6. In a telephone exchange system, the combination of a telephone line, a line relay, a repeating coil, a line signal controlled by said relay, a common battery for supplying current to the line for talking and signaling purposes, a local circuit through a winding of said repeating coil and a relay for controlling the same, and means for placing a

winding of the repeating coil in parallel with the line relay when a connection is made to line, adapted to shunt the line relay to prevent a display of the line signal, said repeating coil having windings through which talking current is supplied to the line.

7. In a telephone exchange system, the combination of a telephone line, a line relay, a repeating coil, a line signal controlled by said relay, a common battery for supplying current to the line for talking and signaling purposes, and means for placing a winding of the repeating coil in parallel with the line relay when a connection is made to line, adapted to shunt the line relay to prevent a display of the line signal, a supervisory relay, a supervisory lamp, and a local circuit including said lamp and battery in series with a winding of said repeating coil.

8. In a telephone exchange system, the combination of a telephone line, a line relay in one side of the line, a repeating coil winding for shunting said relay to deenergize the same, a local circuit through a winding of said repeating coil and a relay for controlling the same, an impedance coil in the other side of the line, a repeating coil winding for shunting said impedance coil, and a battery for supplying talking current through said repeating coil windings to the line.

9. In a telephone exchange system, the combination of a repeating coil, a battery, a supervisory lamp, a local circuit including said lamp and battery in series with a winding of said repeating coil, and a relay controlling said local circuit.

10. A telephone exchange system including a telephone line, a jack therefor, a cord circuit for uniting telephone lines in conversation, disconnect signal apparatus including a relay governed by line equipment, and a signal-presenting device governed by the armature of the said relay and adapted for inclusion in a circuit that contains a repeating coil winding and two normally separated contacts of a plug of said cord circuit, said jack being adapted to connect said contacts of said plug when said plug is inserted, whereby circuit through said signal-presenting device is established in part by the engaged plug and jack.

11. A telephone exchange system including a telephone line, a jack therefor, a cord circuit for uniting telephone lines in conversation, disconnect signal apparatus including a relay governed by line equipment, and a signal presenting-device governed by the armature of the said relay and adapted for inclusion in a circuit that contains a repeating coil winding and two normally separated contacts of a plug of said cord circuit, said jack being adapted to connect said contacts of said plug when said plug is inserted, whereby circuit through said signal-presenting device is established in part by

the engaged plug and jack, the armature of said relay when unattracted serving to establish a circuit for said signal-presenting device at another point.

12. In a telephone exchange system, the combination of a jack, a plug adapted to be inserted in said jack, a supervisory signal device, and an energizing circuit for said device including a repeating coil winding and normally separated contacts of said plug, said jack having means therein for connecting together said contacts to establish said circuit.

13. In a telephone exchange system, the combination of a jack, a plug adapted for insertion in said jack, a lamp, and a circuit for said lamp including a repeating coil winding and normally separated contacts of said plug, said jack having means therein for connecting together said contacts to establish said circuit.

14. In a telephone exchange system, the combination of a jack, a plug adapted for insertion in said jack, a lamp, a circuit for said lamp including a repeating coil winding and normally separated contacts of said plug, and a relay controlling said circuit, said jack provided with means for connecting together said contacts to establish said circuit.

15. A telephone exchange system including a telephone line, a common battery having both poles thereof permanently connected with opposite sides of said line, a jack for said line, a cord circuit for uniting telephone lines in conversation, disconnect signal apparatus including a repeating coil winding and a relay governed by line equipment, and a signal-presenting device governed by the armature of the said relay and adapted for inclusion in a circuit that contains two normally separated contacts of a plug of said cord circuit, said jack being adapted to connect said contacts of said plug when said plug is inserted, whereby circuit through said signal-presenting device is established in part by the engaged plug and jack.

16. A telephone exchange system including a telephone line, a common battery having both poles thereof permanently connected with opposite sides of said line, a jack for said line, a cord circuit for uniting telephone lines in conversation, disconnect signal apparatus including a repeating coil winding and a relay governed by line equipment, and a signal-presenting device governed by the armature of the said relay and adapted for inclusion in a circuit that contains two normally separated contacts of a plug of said cord circuit, said jack being adapted to connect said contacts of said plug when said plug is inserted, whereby circuit through said signal-presenting device is established in part by the engaged plug and jack, the

armature of said relay when unattracted serving to establish a circuit for said signal-presenting device at another point.

17. In a telephone exchange system, the combination of a jack, a common battery permanently connected with said jack, a plug adapted to be inserted in said jack, a supervisory signal device, and an energizing circuit for said device including a repeating coil winding and normally separated contacts of said plug, said jack having means therein for connecting together said contacts to establish said circuit.

18. In a telephone exchange system, the combination of a jack, a common battery permanently connected with said jack, a plug adapted for insertion in said jack, a lamp, and a circuit for said lamp including a repeating coil winding and normally separated contacts of said plug, said jack having means therein for connecting together said contacts to establish said circuit.

19. In a telephone exchange system, the combination of a jack, a common battery permanently connected with said jack, a plug adapted for insertion in said jack, a lamp, a circuit for said lamp including a repeating coil winding and normally separated contacts of said plug, and a relay controlling said circuit, said jack provided with means for connecting together said contacts to establish said circuit.

20. A telephone exchange system including a telephone line, a jack therefor, a cord circuit for uniting telephone lines in conversation, disconnect signal apparatus including a repeating coil winding and a relay governed by line equipment, a signal-presenting device governed by the armature of the said relay and adapted for inclusion in a local circuit that contains two normally separated contacts of a plug of said cord circuit, and a line signal device adapted to be shunted by a portion of said local circuit to retire the line signal, said jack being adapted to connect said contacts of said plug when said plug is inserted, whereby circuit through said signal-presenting device is established in part by the engaged plug and jack.

21. A telephone exchange system including a telephone line, a jack therefor, a cord circuit for uniting telephone lines in conversation, disconnect signal apparatus including a repeating coil winding and a relay governed by line equipment, a signal-presenting device governed by the armature of the said relay and adapted for inclusion in a local circuit that contains two normally separated contacts of a plug of said cord circuit, and a line signal device adapted to be shunted by a portion of said local circuit to retire the line signal, said jack being adapted to connect said contacts of said plug when said plug is inserted, whereby circuit

through said signal-presenting device is established in part by the engaged plug and jack, the armature of said relay when unattracted serving to establish a circuit for said signal-presenting device at another point.

22. In a telephone exchange system, the combination of a jack, a plug adapted to be inserted in said jack, a supervisory signal device, an energizing circuit for said device including a repeating coil winding and normally separated contacts of said plug, said jack provided with means for connecting together said contacts to establish said circuit, and a line signal device adapted to be shunted by a portion of said circuit to retire the line signal.

23. In a telephone exchange system, the combination of a jack, a plug adapted for insertion in said jack, a lamp, a circuit for said lamp including a repeating coil winding and normally separated contacts of said plug, said jack provided with means for connecting together said contacts to establish said circuit, and a line signal device adapted to be shunted by a portion of said circuit to retire the line signal.

24. In a telephone exchange system, the combination of a jack, a plug adapted for insertion in said jack, a lamp, a circuit for said lamp including a repeating coil winding and normally separated contacts of said plug, a relay controlling said circuit, said jack provided with means for connecting together said contacts to establish said circuit, and a line signal device adapted to be shunted by a portion of said circuit to retire the line signal.

25. A telephone exchange system including a telephone line, a jack therefor, a cord circuit for uniting telephone lines in conversation, disconnect signal apparatus including a relay governed by line equipment, a talking circuit including a winding of said relay, and a signal-presenting device governed by the armature of the said relay and adapted for inclusion in a circuit that contains two normally separated contacts of a plug of said cord circuit, said jack being adapted to connect said contacts of said plug when said plug is inserted, whereby circuit through said signal-presenting device is established in part by the engaged plug and jack.

26. A telephone exchange system including a telephone line, a jack therefor, a cord circuit for uniting telephone lines in conversation, disconnect signal apparatus including a relay governed by line equipment, a talking circuit including a winding of said relay, and a signal-presenting device governed by the armature of the said relay and adapted for inclusion in a circuit that contains two normally separated contacts of a plug of said cord circuit, said jack being

adapted to connect said contacts of said plug when said plug is inserted, whereby circuit through said signal-presenting device is established in part by the engaged plug and jack, the armature of said relay when unattracted serving to establish a circuit for said signal-presenting device at another point.

27. In a telephone exchange system, the combination of a jack, a plug adapted to be inserted in said jack, a talking circuit containing a supervisory relay winding, a supervisory signal device, and an energizing circuit for said device including normally separated contacts of said plug, said jack provided with means for connecting together said contacts to establish said circuit.

28. In a telephone exchange system, the combination of a jack, a plug adapted for insertion in said jack, a talking circuit containing a supervisory relay winding, a lamp, and a circuit for said lamp including normally separated contacts of said plug, said jack provided with means for connecting together said contacts to establish said circuit.

29. In a telephone exchange system, the combination of a jack, a plug adapted for insertion in said jack, a talking circuit containing a supervisory relay winding, a lamp, a circuit for said lamp including normally separated contacts of said plug, controlled by said relay winding, said jack provided with means for connecting together said contacts to establish said circuit.

30. A telephone exchange system including a telephone line, a common battery having both poles thereof permanently connected with opposite sides of said line, a jack for said line, a cord circuit for uniting telephone lines in conversation, disconnect signal apparatus including a relay governed by line equipment, a talking circuit including a winding of said relay, and a signal-presenting device governed by the armature of the said relay and adapted for inclusion in a circuit that contains two normally separated contacts of a plug of said cord circuit, said jack being adapted to connect said contacts of said plug when said plug is inserted, whereby circuit through said signal-presenting device is established in part by the engaged plug and jack.

31. A telephone exchange system including a telephone line, a common battery having both poles thereof permanently connected with opposite sides of said line, a jack for said line, a cord circuit for uniting telephone lines in conversation, disconnect signal apparatus including a relay governed by line equipment, a talking circuit including a winding of said relay, and a signal-presenting device governed by the armature of the said relay and adapted for inclusion in a circuit that contains two normally separated contacts of a plug of said cord circuit, said jack being adapted to connect said

contacts of said plug when said plug is inserted, whereby circuit through said signal-presenting device is established in part by the engaged plug and jack, the armature of said relay when unattracted serving to establish a circuit for said signal-presenting device at another point.

32. In a telephone exchange system, the combination of a jack, a common battery permanently connected with said jack, a talking circuit containing a supervisory relay winding, a plug adapted to be inserted in said jack, a supervisory signal device, and an energizing circuit for said device including normally separated contacts of said plug, said jack provided with means for connecting together said contacts to establish said circuit.

33. In a telephone exchange system, the combination of a jack, a common battery permanently connected with said jack, a talking circuit containing a supervisory relay winding, a plug adapted for insertion in said jack, a lamp, and a circuit for said lamp including normally separated contacts of said plug, said jack provided with means for connecting together said contacts to establish said circuit.

34. In a telephone exchange system, the combination of a jack, a common battery permanently connected with said jack, a talking circuit containing a supervisory relay winding, a plug adapted for insertion in said jack, a lamp, a circuit for said lamp including normally separated contacts of said plug, controlled by said relay winding, said jack provided with means for connecting together said contacts to establish said circuit.

35. A telephone exchange system including a telephone line, a jack therefor, a cord circuit for uniting telephone lines in conversation, disconnect signal apparatus including a relay governed by line equipment, a talking circuit including a winding of said relay, a signal-presenting device governed by the armature of the said relay and adapted for inclusion in a local circuit that contains two normally separated contacts of a plug of said cord circuit, and a line signal device adapted to be shunted by a portion of said local circuit to retire the line signal, said jack being adapted to connect said contacts of said plug when said plug is inserted, whereby circuit through said signal-presenting device is established in part by the engaged plug and jack.

36. A telephone exchange system including a telephone line, a jack therefor, a cord circuit for uniting telephone lines in conversation, disconnect signal apparatus including a relay governed by line equipment, a talking circuit including a winding of said relay, a signal-presenting device governed by the armature of the said relay and adapted

ed for inclusion in a local circuit that contains two normally separated contacts of a plug of said cord circuit, and a line signal device adapted to be shunted by a portion
5 of said local circuit to retire the line signal, said jack being adapted to connect said contacts of said plug when said plug is inserted, whereby circuit through said signal-presenting device is established in part by the en-
10 gaged plug and jack, the armature of said relay when unattracted serving to establish a circuit for said signal-presenting device at another point.

37. In a telephone exchange system, the
15 combination of a jack, a plug adapted to be inserted in said jack, a talking circuit containing a supervisory relay winding, a supervisory signal device, an energizing circuit for said device including normally sepa-
20 rated contacts of said plug, said jack provided with means for connecting together said contacts to establish said circuit, and a line signal device adapted to be shunted by a portion of said circuit to retire the line
25 signal.

38. In a telephone exchange system, the combination of a jack, a plug adapted for insertion in said jack, a relay, a talking circuit including a winding of said relay, a
30 lamp, a circuit for said lamp including normally separated contacts of said plug, controlled by said relay, said jack provided with means for connecting together said contacts to establish said circuit, and a line
35 signal device adapted to be shunted by a portion of said circuit to retire the line signal.

39. In a telephone exchange system the combination of a jack, a plug adapted for
40 insertion in said jack, a talking circuit containing a supervisory relay winding, a lamp, a circuit for said lamp including normally separated contacts of said plug, controlled by said relay winding, said jack provided
45 with means for connecting together said contacts to establish said circuit, and a line signal device adapted to be shunted by a portion of said circuit to retire the line signal.

50 40. In a telephone system, in combina-

tion, a supervisory signal, a local circuit therefor, a winding of a repeating coil, two short circuited jack contacts and two normally separated contacts of a plug of the cord circuit in series in the circuit over
55 which said signal is actuated.

41. In a telephone system, the combination with a cord circuit of a repeating coil therefor, a signaling device, a plug having normally separated contacts to one of which
60 said signaling device is normally connected, and to another of which a winding of said repeating coil is normally connected, a source of current connected between the other terminal of said winding of the re-
65 peating coil and the other terminal of said signaling device, and means to complete a short circuit between the said contacts of said plug to display said signal, substantially as described.
70

42. In a telephone system, a central source of current, a repeating coil winding connected with one pole of said source, a signaling device connected to the other pole of
75 said source, a connecting plug having one contact connected to a terminal of said signaling device and another contact connected to a terminal of said repeating coil winding, a jack having contacts adapted to short circuit the contacts of said plug when the
80 plug is inserted in the jack, whereby said signaling device is actuated, substantially as described.

43. In a telephone system, the combination with a central source of current, a connecting plug, a repeating coil winding connected between a contact of said plug and a pole of said source, a signaling device connected between another contact of said plug and the other pole of said source, and means
85 to short circuit the said contacts of said plug whereby the signaling device is actuated, substantially as described.

Signed by me at Philadelphia, Penna., this 23rd day of March, 1903.

CHARLES LANE GOODRUM.

Witnesses:

JOHN H. REID,

LOTTIE NUSTAUM.