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F. W. DUNBAR.

CENTRAL ENERGY TELEPHONE SYSTEM.

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NO MODEL.

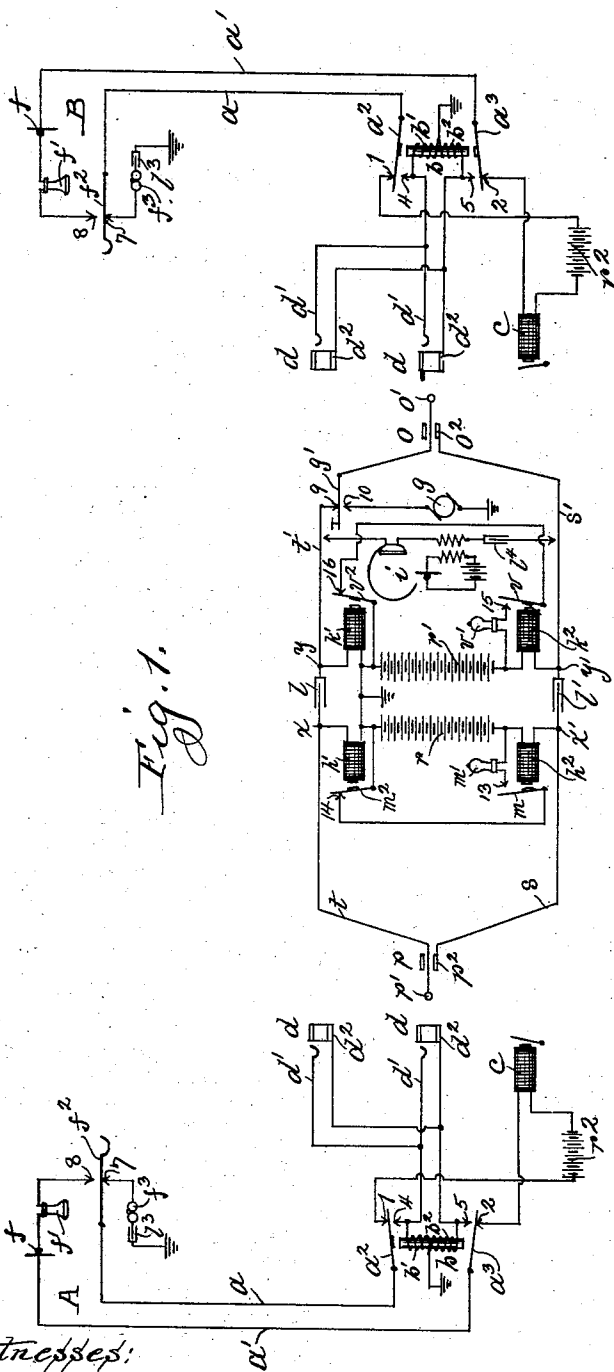


Fig. 1.

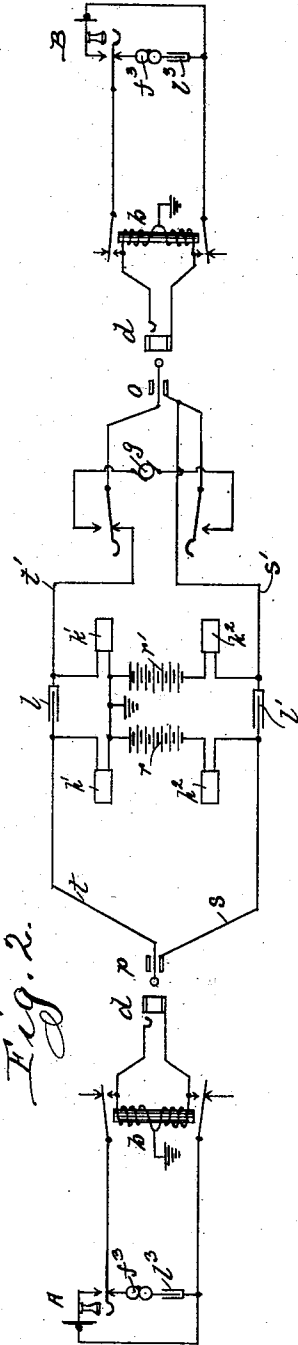


Fig. 2.

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UNITED STATES PATENT OFFICE.

FRANCIS W. DUNBAR, OF CHICAGO, ILLINOIS, ASSIGNOR TO KELLOGG SWITCHBOARD AND SUPPLY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

CENTRAL-ENERGY TELEPHONE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 721,124, dated February 17, 1903.

Application filed March 22, 1901. Serial No. 52,316. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS W. DUNBAR, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Central-Energy Telephone Systems, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to a central-energy telephone system, my object being to provide an improvement upon the telephone system disclosed in my Patent No. 686,272, dated November 12, 1901. In said patent I have shown the connection-terminals normally disconnected from the telephone-line and adapted to be connected therewith when connection is made with the line through the agency of a relay. I have illustrated also a relay employed for the additional function of disconnecting the individual annunciator from the line when connection is made therewith. In my reissued Patent No. 12,031, dated September 16, 1902, I have disclosed means for energizing said relay by sending current over a portion of the talking-circuit through the main contacts of the connection-terminal and the calling-plug. In said patent last above mentioned I have illustrated a specific form of my invention wherein the winding of the relay is bridged between the limbs of the talking-circuit, the relay being energized by current from the charging source adapted to traverse a metallic circuit including portions of the two talking-limbs. In accordance with the present invention I provide means whereby the relay is adapted to be bridged between the talking-limbs and is adapted to be energized by current passing over a portion of one of the talking-limbs with return through a third conductor. The present invention in this respect is a species under the generic invention disclosed in my patent last above mentioned.

I have illustrated my invention in the accompanying drawings, in which—

Figure 1 is a diagram illustrating two telephone-lines and the central-station apparatus for uniting the same for conversation. Fig.

2 is a similar diagram showing the modification in which the calling-currents are adapted to traverse the metallic talking-circuit.

Like characters refer to like parts in both figures.

The telephone-line A extends in two limbs a a' to the central station, where the limbs terminate, respectively, in springs a^2 a^3 , the former normally resting against contact 1 and the latter against contact 2. Between the contacts 1 and 2 the individual annunciator c and the battery r^2 are connected. At the substation the usual microphone f , receiver f' , and switch-hook f^2 are provided. The switch-hook normally rests against contact 7, connected through bell f^3 and condenser l^3 to ground. The condenser l^3 may be omitted if no extraneous currents, such as earth-currents, are encountered of sufficient magnitude to interfere with the correct operation of relays h' and k' , as hereinafter described. The switch-hook is adapted when the receiver is removed therefrom to engage contact 8, which is connected with the microphone and telephone-receiver. The springs a^2 and a^3 carry armatures adapted to be attracted by the relay b when it is energized. The relay b has two windings b' b^2 , united at one end and connected with ground. The opposite ends of the windings b' and b^2 are connected, respectively, with the contacts 4 and 5. The contact 4 is connected with the line-springs d' d' , the contact 5 with the sleeves d^2 d^2 of the connection-terminals d d .

The answering-plug p is provided with a tip p' and a sleeve p^2 , the former being connected with strand t and the latter with strand s . The calling-plug o is provided with a tip o' and a sleeve o^2 , the former being connected with strand t' and the latter with strand s' . The strands t and t' are united through condenser l and the strands s and s' through condenser l' .

The ringing-key g' , normally resting against contact 9, is adapted when depressed to engage contact 10, which is connected through generator g to ground. The operator's telephone set i is adapted to be bridged between the strands t' and s' , and a condenser l^4 is included in circuit therewith. Between the

strands t and s relays h' and h^2 are connected, the battery r being interposed between said relays. Between the strands t' and s' are the relays k' and k^2 , the battery r' being interposed between said relays. One pole of each of the batteries r and r' is grounded. The relay h' controls contacts m^2 and 14, and the relay h^2 controls contacts m and 13. The relay-contacts and the lamp m' are adapted to be included in circuit with battery r . Likewise the relay k' controls the contacts v^2 and 16, and the relay k^2 controls contacts v and 15. The contacts of relays k' and k^2 are adapted to be included with lamp v' in the circuit of battery r' .

Assuming that subscriber A desires to talk with subscriber B, he lifts his telephone-receiver from the hook, thereby closing circuit of battery r^2 through indicator c and the limbs a a' . The indicator is thus actuated to convey to the operator the signal for connection. The operator then inserts answering-plug p in the connection-terminal belonging to line A, and the circuit of battery r is thus closed from ground over strand s , coil b^2 of relay b , to ground. The relay will thus be actuated to attract the armatures carried on springs a^2 and a^3 , thereby separating said springs, respectively, from contacts 1 and 2 to disconnect indicator c from circuit. The springs a^2 and a^3 then engage contacts 4 and 5, respectively, to connect the connection-terminals to the limbs a and a' . The operator now connects her telephone set in circuit and receives the number of the called subscriber B. She then lifts the calling-plug and touches the tip thereof to the sleeve d^2 of the connection-terminal belonging to line B. If she hears a click in her telephone, she will know that the line is busy; otherwise, hearing no click, she will know that the line is idle. If the line B is connected for conversation at another board, one of the charging-batteries of the cord connectors used for such connection at the other board will be connected between ground and the sleeves d^2 d^2 of the connection-terminals, and consequently when the tip o' is touched to the sleeve d^2 current passes through the tip o' , strand t' , and relay k' to ground. The opening and closing of this circuit by the touching and removal of the tip o' causes a current of self-induction in the winding of relay k' to traverse the operator's telephone to thereby cause the click in her telephone, which indicates that the line is busy.

Assuming that the line is not busy, the operator inserts the calling-plug in the connection-terminal belonging to line B, thereby sending the current of battery r' through the relay b . The current from battery r' will find a path from ground over strand s' and through winding b^2 to ground. The relay b of line B being thus energized, the connection-terminals will be connected with the limbs of the line. The operator then depresses the ringing-key g' to send calling-current from ground

through generator g , tip o' , line-spring d' , limb a , through the bell f^3 of subscriber B to ground. The depression of the ringing-key serves to open the strand t' . Current, however, will continue to flow from ground through battery r' , strand s' , and coil b^2 to ground, and the relay thus remains energized during the sending of the calling-current.

When the called subscriber lifts his receiver from the hook, the subscribers are united for conversation. Current from battery r passes over strands t s and limbs a a' of line A and from battery r' over strands t' s' and limbs a' a' of line B. Current also passes through the coils b' b^2 of the relays b . The actuation of the microphone of subscriber A causes a variation of the difference of potential between the points x and x' , thereby producing correspondingly - varying currents through the receiver at substation B. Likewise the microphone at substation B causes a variation of the difference of potential between the points y and y' , thereby causing a correspondingly-varying current to traverse the receiver at substation A. The windings b' and b^2 of relay b offer sufficient impedance to the passage of the talking-currents to prevent the passage of the same therethrough. The main function of the coil b' is to balance the telephone-line to prevent disturbance due to static discharges, and the coil b^2 energizes the relay.

The two windings are differentially wound with respect to each other, as shown in the drawings, so that when the subscribers' instruments are provided with bells disconnected from the ground and the ringing-current must be sent over both sides of the metallic circuit of the telephone the current passing in series across the line through the two windings will not cause the deenergization of the cut-off relay. It will also be noticed that by this differential winding of the two coils upon the cut-off relay the portion of the current which passes through the coil b' when the subscriber's telephone is off its hook is of such a direction as to assist that in the coil b^2 , and thus the relay b is more surely maintained in operated condition. The two coils are placed on opposite ends of the core, so as to secure retardation of the voice-currents, which might be materially shunted if the coils were superimposed.

When the subscribers have completed their conversation, they hang up their telephone-receivers, thereby signaling to the operator for disconnection. Thus when subscriber A hangs up his receiver the circuit of battery r through relay h' is opened and contacts m^2 and 14 are closed together. The current from battery r continues, however, to flow from ground over strand s , through coil b^2 , to ground, and the relay h^2 thus remains energized and closes together contacts m and 13. The circuit of battery r through lamp m' is thus closed by the relays, and the lamp is lighted to convey the signal for disconnection.

In a similar manner the lamp *v*' is controlled by the called subscriber. If either of the subscribers desires an immediate reconnection, he may by vibrating his switch-hook in the usual manner cause the intermittent lighting of the lamp corresponding to his line to thereby signal for reconnection.

In Fig. 2 I have illustrated a modification in which the ringing-currents are sent over the metallic talking-circuit. The apparatus and circuits are the same as in Fig. 1, except that the bell *j*³ is connected directly between the limbs *a* and *a'*, while the generator *g* at the central station is adapted to be bridged between the terminals of the calling-plug. The strand *s'* is not opened by the ringing-key.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with a telephone-line extending in two limbs to the central station, of a relay adapted to be bridged between said limbs and having its winding connected with a third conductor, and a source of electricity at the central station adapted to be connected between said third conductor and one of the limbs of said line to energize said relay, substantially as described.

2. The combination with a telephone-line extending in two limbs to the central station, of a relay adapted to be bridged between said limbs and having its winding connected with a third conductor, a source of electricity at the central station connected with said third conductor adapted to be bridged between said limbs and adapted to send current through said third conductor to energize said relay, substantially as described.

3. The combination with a telephone-line extending in two limbs to the central station, of a relay adapted to be included in a bridge between the two limbs of said line, the electrical center of said bridge being connected with a third conductor, a source of electricity at the central station connected with said third conductor and adapted to be bridged between said limbs and adapted to send current over said third conductor to energize the said relay, substantially as described.

4. The combination with a telephone-line extending in two limbs to the central station of a relay adapted to be bridged between said limbs and having the electrical center of the winding thereof connected with a third conductor, and a charging source of electricity connected with said third conductor and adapted to be bridged between said limbs and adapted to send current over said third conductor and through said relay to energize the same, substantially as described.

5. The combination with a telephone-line extending in two limbs to the line-contacts at the central station, of a relay bridged between the said limbs and having its windings connected with a third conductor, a cord connector terminating in connecting-plugs, and

a charging source of electricity bridged between the two strands of said cord connector and connected with said third conductor, substantially as described.

6. The combination with a telephone-line extending in two limbs to the central station, of a relay adapted to be connected in a bridge between the two limbs of said line and having the winding thereof connected with a third conductor, a charging source of electricity connected with said third conductor and adapted to be bridged between the two limbs of said line and adapted to send current through the windings of said relay over said third conductor and a portion of one of the limbs of said line, a calling-generator, a ringing-key for connecting said generator with the called line, and means to prevent the de-energization of said relay during calling, substantially as described.

7. The combination with a telephone-line extending in two limbs to the central station, of a relay adapted to be connected in a bridge between the two limbs of said line and having the windings thereof connected with a third conductor, a charging source of electricity connected with said third conductor and adapted to be bridged between the two limbs of said line and adapted to send current through the windings of said relay over said third conductor and a portion of one of the limbs of said line, a calling-generator, a ringing-key for connecting said generator with the called line only, and means to prevent the de-energization of said relay during calling, substantially as described.

8. The combination with a telephone-line, of a signaling device therefor at the central office, a cut-off relay having two differential windings, one of said windings being permanently connected to the spring-jack or connection-terminal of the line and with suitable return, and effecting the operation of the cut-off relay when connection is made to the line, and thus rendering the signaling device inoperative, a calling-generator, and means for sending calling-current over the called line only without de-energizing said relay, substantially as described.

9. The combination with a telephone-line, of a signaling device therefor at the central office, a cut-off relay having two differential windings, one of said windings being permanently connected to the spring-jack or switching-terminal of the line and with suitable return, and means for sending a current through said winding when a connection is made with the line to operate said relay and open the circuit of said signaling device, a calling-generator, and means for sending calling-current over the called line only without de-energizing said relay, substantially as described.

10. The combination with a telephone-line extending in two limbs to the central station, of a relay adapted to be connected in a bridge between the two limbs of said line and having the windings thereof connected with a

- third conductor, a charging source of electricity connected with said third conductor and adapted to be bridged between the two limbs of said line, and adapted to send current through the winding of said relay over said third conductor and a portion of one of the limbs of said line, a calling-generator, a ringing-key for connecting said generator with the opposite limb of said line and for disconnecting said charging source from said limb and a signal device at the substation adapted to be traversed by the current from said generator, substantially as described.
11. The combination with a telephone-line extending in two limbs to the central station, of a connection-terminal normally disconnected therefrom, a relay for connecting said connection-terminal with the line and adapted to have its winding bridged between the opposite contacts of said connection-terminal and connected with a third conductor, and a charging source of electricity connected with said third conductor and adapted to be connected between the contacts of said connection-terminal and adapted to energize said relay, substantially as described.
12. The combination with a telephone-line extending in two limbs to the central station, of an indicator-controlling magnet normally connected with the line, a relay adapted when energized to disconnect said indicator from the line and to have its windings bridged between the two limbs of said line and connected with a third conductor and a charging source of electricity adapted to be connected between one limb of said line and said third conductor to energize said relay, substantially as described.
13. The combination with a telephone-line extending in two limbs to the central station, of a relay adapted to be bridged between said limbs and connected with a third conductor, a charging source of electricity connected with said third conductor and adapted to be bridged between said limbs and adapted to send current over said third conductor and a portion of one of the limbs of said line, and a switch for disconnecting said source from the opposite limb of said line whereby the actuation of said switch does not affect the energization of said relay, substantially as described.
14. The combination with a telephone-line extending in two limbs to the central station, of a cut-off relay having an actuating-winding connected with one of said limbs during conversation, a second winding on said relay connected with the other limb of the line and serving to balance the circuit when a connection exists, and means to send an actuating-current through said first-mentioned winding, substantially as described.
15. The combination with a telephone-line extending in two limbs to the central station, of a cut-off relay having an actuating-winding connected with one of said limbs during conversation, a second winding on said relay
- differentially disposed with reference to said first-mentioned winding, said second winding being connected with the other limb of the line and serving to balance the circuit when a connection exists, and means to send an actuating-current through said first-mentioned winding, substantially as described.
16. The combination with a telephone-line, of a signaling device therefor at the central office, a cut-off relay having two windings, and means to send current through one of said windings during a connection to operate the relay and render the signaling device inoperative, substantially as described.
17. The combination with a telephone-line, of a signaling device therefor at the central office, a cut-off relay having two windings, and means for sending a current through one of said windings when a connection is made with the line to operate said relay and open the circuit of said signaling device, substantially as described.
18. The combination with a telephone-line, of a signal-controlling electromagnet for the line at the central office, a cut-off relay for the line having two windings, and means for sending an energizing-current through one of said windings continuously during a connection to operate the relay and thereby cut out the said electromagnet, substantially as described.
19. The combination with a telephone-line, of a signal-controlling electromagnet for the line at the central office, a cut-off relay having two windings, and a local circuit established when a connection is made with the line, said circuit including one winding of said relay and a source of current, whereby the said relay is operated to render the said magnet inoperative, substantially as described.
20. The combination with a telephone-line, of a signal-controlling electromagnet for the line at the central office, a cut-off relay for the line having two windings, a source of current and a circuit completed during an established connection including said source and one of said windings, said circuit including a portion of the talking-circuit, whereby the relay is operated and the magnet is cut out, substantially as described.
21. The combination with a telephone-line, of a signal-controlling electromagnet for the line at the central office, a cut-off relay for the line having two windings, a source of current, and a local circuit completed during the act of making connection with the line, said circuit including one of said windings and said source and a portion of the talking-circuit, whereby the relay is operated and the magnet is cut out, substantially as described.
22. The combination with a telephone-line, of a signal-controlling electromagnet for the line at the central office, a cut-off relay for the line having two windings, one of said windings being adapted to be connected with one line-conductor, a cord-circuit and a source

of current connected therewith, said source being also connected with said winding of the relay, whereby when the cord-circuit is connected with the line a path for current through said winding is provided and the relay is operated to cut out the said magnet, substantially as described.

23. The combination with a telephone-line, of a signal-controlling electromagnet for the line at the central office, a cut-off relay for the line having two windings, a source of current, one of said windings being adapted to be connected between one line-conductor and said source, a cord-circuit, and a connection from one strand thereof to the opposite pole of said source, said strand and line-conductor being connected together when a connection exists with the line, whereby said winding and source are included in a local circuit by the act of establishing a connection with the line and the relay is operated to cut out the said magnet, substantially as described.

24. The combination with a telephone-line, of a signal-controlling electromagnet for the line at the central office, a cut-off relay for the line having two windings, an operator's connecting-circuit, a source of current at the central office adapted to be connected with the line to furnish current for talking and to send current through one of said windings to operate the relay and thereby cut out the said magnet, substantially as described.

25. The combination with a telephone-line, of a signal-controlling electromagnet for the line at the central office, a cut-off relay for the line having two windings, a cord-circuit, a supervisory relay and source of current associated therewith, said source being adapted to be connected in the metallic talking-circuit for conversational purposes when a connection is established with the line and to send current through one of said windings to operate the cut-off relay, substantially as described.

26. The combination with a telephone-line extending in two limbs to the central station, of a relay having springs or moving parts with which said limbs are connected, an indicator normally connected with said springs or moving parts, a third conductor connected with the middle point of the winding of said relay, and a charging source of electricity adapted to be connected between one limb of the line and said third conductor to energize the relay, substantially as described.

27. The combination with a telephone-line, of a relay having springs or moving parts in which the limbs of said line terminate, a connection-terminal with which said springs or moving parts are adapted to connect when the relay is operated, the middle point of the winding of said relay being connected with a third conductor, a cord-circuit and a connecting-plug, a battery connected therewith and with the third conductor, whereby the relay is energized when the plug is inserted

in the connection-terminal, substantially as described.

28. The combination with a telephone-line extending in two limbs to the central station, of a relay bridged across the line and having springs or moving parts with which said limbs are connected, a third conductor with which the middle point of the winding of said relay is connected, a signaling device normally connected with said springs or moving parts, a connection-terminal adapted to be connected by said springs or moving parts with the telephone-line when the relay is actuated, a cord-circuit and connecting-plug, and a battery connected therewith, whereby upon the insertion of the plug the relay is actuated to disconnect the signaling device and connect the connection-terminal, substantially as described.

29. The combination with a telephone-line, and a connection-terminal therefor, of a signal-controlling electromagnet normally connected with said line, a relay for disconnecting said electromagnet from the line, and having two windings, a cord-circuit terminating in a connecting-plug and adapted to be placed in conductive relation with the line, a source of electricity associated with the cord-circuit and adapted to be placed in the metallic circuit of the line, and means for closing the circuit of said source through a winding of said relay when connection is made with the line, said relay-circuit including a talking-strand of the cord-circuit, a main terminal of the connecting-plug, a line-contact and a portion of the talking-limb of the telephone-line with suitable return, substantially as described.

30. The combination with a calling telephone-line and a connection-terminal normally operatively disconnected therefrom of a relay for connecting said connection-terminal with the line, and having two windings, a cord-circuit terminating in a connecting-plug, a source of electricity and means for closing the circuit of said source through a winding of said relay when connection is made with the line in response to the call, said relay-circuit including one of the main terminals of the connecting-plug and a line-contact of the telephone-line, with suitable return, substantially as described.

31. The combination with a telephone-line, of a test-terminal normally disconnected therefrom, a relay for connecting said test-terminal with the line, and having two windings, testing apparatus, a cord-circuit terminating in a connecting-plug, supervisory signal apparatus associated with the cord-circuit, a source of electricity also associated with the cord-circuit, and means for closing the circuit of said source over the telephone-line to operate the said supervisory apparatus and through one winding of said relay when connection is made with the line, said relay-circuit including one of the main termi-

nals of the connecting-plug and a line-contact of the telephone-line with suitable return, substantially as described.

32. The combination with a telephone-line and a connection-terminal in the form of a spring-jack normally not in operative relation with said line, of a cord-circuit and connecting-plug, supervisory signaling apparatus associated with said circuit, a central source of current associated with said line and circuit to operate said supervisory apparatus, and a relay having two windings, and means to direct current from said source through one winding of said relay to energize the relay to place said jack in operative relation with the line when said plug is inserted into said jack, substantially as described.

33. The combination with a telephone-line and a connection-terminal in the form of a spring-jack normally not in operative relation with the line, of a connecting-plug and a cord-circuit, a central source of current associated with said line and circuit to furnish current for talking purposes, supervisory signal apparatus associated with the cord-circuit and operated from said source of current, and a relay having two windings, one winding thereof being energized from said source by the insertion of said plug into and deenergized by its withdrawal from said jack for controlling the operative relation of said jack with said line, substantially as described.

34. In a telephone system, a metallic circuit line, a connection-terminal in the form of a spring-jack normally not in operative relation with said line, a connecting-plug and a cord-circuit, a signaling device normally in operative relation with said line, a central source of current and supervisory signaling apparatus associated with said line and cord-circuit, said source being adapted to furnish current for the operation of said apparatus and for talking purposes, and a relay with two windings, one of which is actuated from said source when said plug is inserted in said jack to render said signaling device inoperative and to place said jack in operative relation with said line, substantially as described.

35. The combination with a telephone-line having a limb extending to the central station, of a signaling device normally connected with said limb, a line-contact for said limb normally disconnected therefrom, a cord-circuit and connecting-plug, supervisory signaling apparatus associated with said cord-circuit, a central battery to furnish current for talking purposes and for the operation of said apparatus, and a relay having two windings, one of which is energized from said battery to cause the relay to disconnect said limb from said signaling device and to connect the same with the line-contact when a connection is established with the line, substantially as described.

36. The combination with a telephone-line having a limb extending to the central station, of a spring or moving part with which

said limb connects at the central office, a signaling device connected with said spring or part in its normal position, a line-contact for said limb, a cord-circuit and connecting-plug, a central battery associated with the said line-circuit, supervisory signals also associated with the circuit, said battery being adapted to furnish current to the substations for talking purposes and for operating said supervisory signals, and a relay having two windings, one of which is also energized from said battery to cause the said relay to disconnect said spring or part from the signaling device and to connect it with the line-contact when a connection is established with the line, substantially as described.

37. The combination with a telephone-line, of a signaling device therefor at the central office, a cut-off relay having two differential windings, one of said windings being permanently connected to the spring-jack or connection-terminal of the line and with one side of the talking-circuit, said permanently-connected winding effecting the operation of the cut-off relay when connection is made to the line, and thus rendering the signaling device inoperative, substantially as described.

38. The combination with a telephone-line, of a signaling device therefor at the central office, a cut-off relay having two differential windings, one of said windings being permanently connected to the spring-jack or switching-terminal of the line, and means for sending a current over a portion of the talking-circuit and through said winding when a connection is made with a line to operate said relay and open the circuit of said signaling device, substantially as described.

39. The combination with a telephone-line, of a signaling device therefor at the central office, a cut-off relay having two windings differentially disposed and so connected as to be unaffected by currents sent through the two windings in series one of said windings being permanently connected to the spring-jack or connection-terminal of the line and with one side of the talking-circuit, and means to send current through said winding when a connection is made with a line, so as to operate the relay and render the signaling device inoperative, substantially as described.

40. The combination with a telephone-line extending in two limbs to the central station, of a cut-off relay having an actuating-winding connected with one of said limbs during conversation, a balancing-coil connected with the other limb of the line to provide a balanced circuit during conversation, and means to actuate said relay, substantially as described.

41. The combination with a telephone-line extending in two limbs to a central station, of a cut-off relay legged from one limb of the line during conversation to a third conductor, means to operate said relay when a connection exists with the line, and other means to

balance said line during the connection, substantially as described.

42. The combination with a telephone-line, of a signaling device therefor at the central office, a cut-off relay having two differential windings, and means to send current over a portion of the talking-circuit and through one of said windings during a connection to operate the relay and render the signaling device inoperative, substantially as described.

43. The combination with a telephone-line, of a signaling device at the central office, a cut-off relay having two differential windings, and means for sending a current over a portion of the talking-circuit and through one of said windings when a connection is made with the line to operate said relay and open the circuit of said signaling device, substantially as described.

44. The combination with a telephone-line, of a signal-controlling electromagnet for the line at the central office, a cut-off relay for the line having two differential windings, and means for sending an energizing-current over a portion of the talking-circuit and through one of said windings continuously during a connection to operate the relay and thereby cut out the said electromagnet, substantially as described.

45. The combination with a telephone-line and a connection-terminal in the form of a spring-jack normally not in operative relation with the line, of a signaling device therefor at the central office, a cut-off relay having two windings differentially disposed and so connected as to be unaffected by currents sent through the two windings in series, one of said windings being permanently connected to the spring-jack, a connecting-plug and a cord-circuit, a central source of current associated with said line and circuit to furnish current for talking purposes, supervisory signaling apparatus associated with the cord-circuit and operated by said source of current, one winding of said relay being energized from said source by the insertion of said plug into and deenergized by its withdrawal from said jack, said relay serving to connect the jack into operative relation with the line and to render the signaling device inoperative, substantially as described.

In witness whereof I have hereunto subscribed my name in the presence of two witnesses.

FRANCIS W. DUNBAR.

Witnesses:

JOSEPH C. BELDEN,
MELANCTHON R. NYMAN.