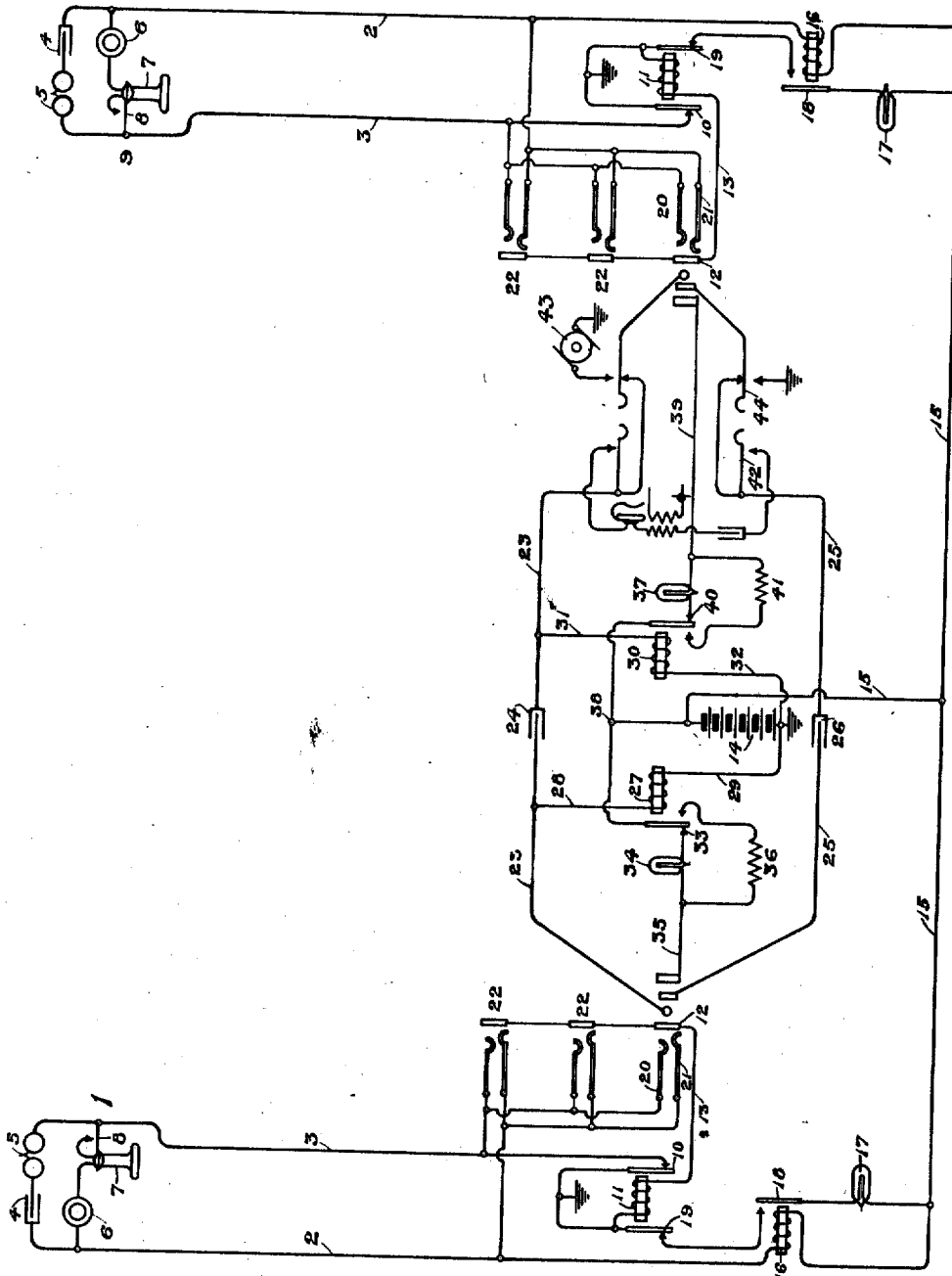


C. S. WINSTON.
CENTRAL ENERGY TELEPHONE SYSTEM.
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1,006,615.

Patented Oct. 24, 1911.



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CENTRAL-ENERGY TELEPHONE SYSTEM.

1,006,615.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, CHARLES S. WINSTON, a citizen of the United States, and resident of Chicago, county of Cook, and State of Illinois, have invented a new and useful Improvement in Central-Energy Telephone Systems, of which the following is a specification.

My invention relates to a central energy telephone system of the three-wire variety in which three contacts are connected in multiple throughout the switchboard section of the lines, two of said wires being ordinarily used for transmission purposes, the third wire being provided for signaling between subscribers and the central office and for testing the idle or busy condition of the lines.

My invention has for its objects an arrangement of circuits at the central office of such a system, adapted to simplify and render the operation of such a system more efficient.

In the accompanying drawing I have shown one form of my invention in which I have used like reference numerals to indicate like parts as far as applicable.

A subscriber's station 1 is shown connected with the central office by means of conductors 2 and 3. At the substation a condenser 4 and call bell 5 are located in a normally-closed bridge of the line conductors and a transmitter 6 and receiver 7 are located in a bridge of said conductors, having its continuity normally broken at the switch hook 8 when the telephone apparatus is not in use. This particular substation apparatus is intended to typify any suitable common battery subscriber's outfit and the same substation arrangement has been indicated at substation 9 which is similarly connected with the central office.

Line conductor 3 is connected with ground through the normally-closed contact spring 10 of a cut-off relay 11, one side of the winding of said relay being connected with ground, the other side being connected with the testing terminals 12 of the jacks by means of conductor 13. The line conductor 2 is permanently connected with the non-grounded pole of the central office battery 14 by means of conductor 15 and the winding of the line relay 16. A suitable line signal 17 has the continuity of its circuit normally broken at the contact spring 18 of the line relay and normally-closed by the con-

tact spring 19 of the cut-off relay 11. The spring-jack of the line is provided with a tip contact spring 20 and a sleeve contact spring 21, multiple jacks 22, 22, being provided at each section of the switchboard.

The operator's cord circuit consists of a tip strand 23 having its two sides conductively separated by the plates of a condenser 24 but inductively united by said condenser for the transmission of talking currents. The sleeve strand 25 of the cord circuit is provided with a similar interposed condenser 26. The winding of a supervisory relay 27 is secured to one side of the tip strand of the cord circuit by means of a conductor 28 and with the grounded side of the battery 14 by means of conductor 29, and a supervisory relay 30 is connected to the other side of the tip strand by a conductor 31 and with the grounded side of the battery by means of conductor 32. Supervisory relay 27 is adapted to control through its normally-closed front contact anvil 33 the circuit of a supervisory lamp 34, said lamp being connected with the third contact of the corresponding plug by means of conductor 35. When the supervisory relay 27 is energized and attracts its armature the circuit of the lamp 34 is broken and a low resistance 36 is substituted for the lamp 34 in the path of current from the battery 14. A supervisory lamp 37 is provided for the opposite side of the cord circuit, and is similarly connected between the battery 14 and the sleeve of associated plug, by means of conductors 38 and 39, and the normally-closed front contact 40 of the associated relay 30. A low resistance path 41 is adapted to be substituted for the lamp 37 in the circuit when said relay is energized.

The operator's telephone set is adapted to be connected across the cord circuit in the usual manner by a listening key 42, said key being shown adapted to bridge the secondary of the operator's induction coil, a head telephone and a condenser across the line in series. A primary winding for the induction coil and a transmitter are indicated in connection with the operator's equipment. The ringing generator 43 may be connected with the line by means of a suitable ringing key 44 to signal the desired subscriber.

In the operation of the system the removal of the subscriber's telephone receiver at station 1 closes the limbs of the telephone

line to the flow of current from the battery 14, over conductor 15, through the winding of the line relay 16, the limbs of the telephone line including the substation apparatus and to ground through the normally-closed contact 10 of the cut-off relay 11. The operation of the line relay causes the illumination of the line signal 17 through the contacts of said relay and the normally-closed contacts of the cut-off relay 11. Noticing this signal the operator will insert the plug associated with the answering side of her cord circuit in the jack of the calling line. A flow of current will therefore result from the battery 14 over conductor 38, supervisory lamp 34, conductor 35, testing terminal 12 of the jack conductor 13 through the winding of the cut-off relay to ground. The operation of the cut-off relay will open the circuit of the line signal 17 at the normally-closed contacts 19 of said relay and will remove the ground from the limb 3 of the telephone line at the normally-closed contact 10 of said relay. The supervisory lamp 34 will not be illuminated by this flow of current, due to the fact that the subscriber's telephone is removed from its hook and a flow of current is therefore provided over conductor 15, the winding of the line relay, line conductor 2, the substation apparatus, line conductor 3, tip jack spring 20, tip cord strand 23, conductor 28, the winding of the supervisory relay 27, and conductor 29 to the opposite side of the battery. The operation of the supervisory relay 27, due to current through the substation apparatus, will open the circuit of the supervisory signal 34, and insert the resistance 36 in the circuit, preventing the operation of said signal. The operator will then throw her listening key 42 for the purpose of communicating with the calling subscriber. Ascertaining that the subscriber at station 9 is desired, said line will be tested in the usual manner by touching the tip of the calling plug to a testing terminal of said line. During the testing operation the condenser associated with the operator's telephone set and the condenser 26 in the sleeve cord strand are connected in series at the contacts of the listening key. The condenser 26 will be charged with negative battery over conductor 15, the winding of the line relay 16 and a portion of the sleeve strand 25; and the operator's telephone condenser will be charged with positive battery through the listening key contacts, tip strand 23, and conductors 31 and 32 including the winding of the relay 30. The testing terminal 12 is normally connected with the positive side of battery through conductor 13 and the winding of the cut-off relay 11, and as the condenser in the operator's telephone bridge is also charged with positive battery no discharge from the condenser

will occur when an idle line is tested. If the line is busy, however, the testing terminals 12 are connected with the negative side of the battery 14 through conductor 39, resistance 41, the front contact of the relay 30, and conductor 38, at the operator's position where a connection with the line exists. Under such conditions, when the tip of the plug is touched to the testing terminal the positively charged condenser of the operator's set and the sleeve strand condenser 26 connected in series with it, will discharge through the operator's head receiver producing a click therein to notify her that the line is busy. The path for this condenser discharge, which is of a positive character, may be traced to the negative side of the battery from said condensers through the operator's head telephone, the tip strand of the cord circuit to the testing terminal 12, thence to the position where a connection exists with the line, conductor 39 of the cord circuit at said position, resistance 41, front contact of the supervisory relay 30 and conductor 38 to battery. If no connection exists with the line the testing terminals 12, as previously stated, will be connected with the positive side of battery and no impulse will be received through the operator's receiver from the positively charged condensers. Upon the insertion of the calling plug to its full extent in the jack of the desired line current will flow from the battery 14 over conductors 38 and 39, including lamp 37, through the testing terminal 12, conductor 13 and the winding of the cut-off relay 11 to ground, the cut-off relay removing the ground connection from the line conductor 3 and opening the circuit of the line signal 17 at the normally-closed contacts 19 of said relay. Due to the fact that the called subscriber's receiver is upon its hook no current will flow at this time through the supervisory relay 30, and the supervisory lamp 37 will be illuminated by current in this path to indicate this condition at the subscriber's station to the operator. The operator will then throw her ringing key 44 to signal the subscriber; current flowing from the generator 43 over the tip strand of the cord circuit, tip spring 20 of the jack, line conductor 3, substation ringing apparatus, line conductor 2, sleeve spring 21, the sleeve strand of the cord circuit and back to the generator through the grounded contact of the ringing key 44. When the subscriber responds by removing his receiver from the hook, current will flow through the substation apparatus to energize the supervisory relay 30, from the battery 14, over conductor 15, the winding of the line relay 16, the limbs of the telephone line, the tip strand of the cord circuit, conductor 31, the winding of the relay 30, and back to battery over conductor 32. The operation

of the supervisory relay will substitute the resistance 41 in the circuit of the line relay in lieu of the lamp 37, which will be extinguished to indicate to the operator that the called subscriber has responded. The line signal 17 does not light when the called subscriber responds, the circuit of said signal being open at contact 19 of the cut-off relay. Either subscriber by replacing his receiver upon the hook will interrupt the flow of current through the supervisory relay individual to that subscriber's side of the cord circuit, permitting the armature of said relay to drop back and illuminate the corresponding supervisory signal. The retardation of the line relay 16 and the supervisory relays 27 and 30 is sufficient to prevent the shunting of voice currents, the path for talking currents containing only sufficient connections therewith during conversation for the supplying of battery to the lines.

What I claim is:

1. In a telephone system, the combination with a pair of telephone lines, of a cord circuit for making connection therewith for conversation, a line relay permanently connected with the line, a third conductor at the central office, a cut-off relay permanently connected with said third conductor and controlling contacts normally in the circuit of the line, a supervisory signal in said third conductor associated with the cord circuit, a normally-open low resistance path in the cord circuit in parallel with said signal, a source of current, and a supervisory relay connected between said source and the tip strand of the cord circuit and actuated in series with said line relay when the cord is connected with the line, the circuit of said signal being controlled by said relay, substantially as described.

2. In a telephone system, the combination with a pair of telephone lines, of a cord circuit for making connection therewith for conversation, a line relay permanently connected with the line, a third conductor at the central office, a cut-off relay permanently connected with said third conductor and controlling contacts normally in the circuit of the line, a signal for the line having its circuit jointly controlled by the contacts of said relays, a supervisory signal in said third conductor associated with the cord circuit, and a normally-open low resistance path in the cord circuit in parallel with said signal, a source of current, and a supervisory relay connected between said source and a strand of the cord circuit and responsive to current over the telephone line and through said line relay, the circuit of said signal being controlled by said relay, substantially as described.

3. In a telephone system, the combination with a pair of telephone lines, of a cord circuit for making connection therewith for

conversation, a line relay permanently connected with the ring side of the line, a source of current at the central office, a supervisory relay having its coil connected between said source and the tip strand of the cord circuit, a third conductor at the central office, a cut-off relay having its coil permanently connected in said third conductor and controlling contacts normally in the line, a supervisory signal in said third conductor, and a low resistance path in parallel with the said signal, said supervisory relay being adapted to open the circuit of said signal and close said low resistance path during conversation, said supervisory relay and said line relay being actuated in series and possessing sufficient impedance to prevent the shunting of the voice currents, substantially as described.

4. In a telephone system, the combination with a telephone line, of a cord circuit for making connection therewith for conversation, a source of current, a line relay having a single coil connected between said source and the telephone line, a supervisory relay for the cord circuit having a single coil connected between the other pole of said source and a strand of the cord circuit, a signal for the line having its circuit controlled by said line relay, and a signal for the cord circuit being independent of the talking strands and having its circuit controlled by said supervisory relay, said line and supervisory relays being actuated in series when the cord is connected with the line and the line is closed at the substation, and a switch at the substation of said line for operating the cord supervisory relay to actuate said signal, substantially as described.

5. In a telephone system, the combination with a telephone line, of a central source of current, a line relay having its coil permanently connected between a pole of said source and a limb of said line, a cut-off relay controlling normally closed contacts in the circuit of the other limb of said line and the other pole of said source, a cord circuit, a supervisory signal for the cord circuit adapted to be actuated over a path independent of the talking circuit and through the coil of said cut-off relay when the cord is connected with the line, a supervisory relay for the cord circuit controlling contacts in the circuit of said supervisory signal and having its coil connected between a pole of said source and a strand of the cord circuit, said relay being actuated over the telephone line when the cord is connected with a line closed at the substation, substantially as described.

6. The combination with a telephone line, of a central source of current, a line relay permanently connected between a pole of said source and a limb of said line, a cut-off

relay controlling normally closed contacts in the circuit of the other limb of said line and said source, a cord circuit, a signal for the cord circuit actuated by current through the coil of said cut-off relay, a supervisory relay for the cord circuit controlling contacts in the circuit of said signal and having its coil connected between a strand of the cord circuit and a pole of said source, said line relay being actuated by current over the telephone line and through contacts of said cut-off relay when the line is closed at the substation and the cord circuit is not connected with the line and being adapted to be actuated in series with said supervisory relay when the cord is connected with a line closed at the substation, substantially as described.

7. In a telephone system, the combination with a telephone line and a cord circuit connected for conversation, a source of current, a relay for the line having a single coil said coil being connected between a pole of said source and a limb of said telephone line, and a relay for the cord circuit having a single coil, said coil being connected between the other pole of said source and the other limb of said telephone line, said relays being actuated in series when the line is closed at the substation, a supervisory signal being independent of the talking strands and controlled by contacts of said cord relay, and a switch at the substation of said line for operating said cord relay to actuate said signal, substantially as described.

8. In a telephone system, the combination with a telephone line and a cord circuit connected for use, of a source of current and a pair of relays bridged between the two limbs of the talking circuit thereof, one of said relays being permanently associated with the line and controlling the line signal, and the other of said relays being permanently associated with the cord and controlling

the supervisory signal, said supervisory signal being independent of the talking strands of said cord circuit, a switch at the substation in the circuit of both of said relays, all of the transmitter current for the line passing through a coil of each of said relays in series, substantially as described.

9. In a telephone system, the combination with a telephone line and a cord circuit connected for conversation, a supervisory signal and a circuit including a third conductor of said cord circuit for displaying said signal, a source of current having one pole connected with a strand of the cord circuit, and the other pole connected with a limb of the telephone line to furnish transmitter current to the line, the other strand of the cord circuit and the other limb of the telephone line being free from connections with said source during conversation, substantially as described.

10. In a telephone system, the combination with a telephone line and a cord circuit connected for use, of a source of current and a pair of relays, each having a single coil bridged between the two limbs of the talking circuit thereof, one of said relays being permanently associated with the line and controlling the line signal, and the other of said relays being permanently associated with the cord and controlling the supervisory signal, a cut-off relay and an initial energizing circuit for said cut-off relay including the said supervisory signal, and a third conductor of said cord circuit, substantially as described.

Signed by me at Chicago, county of Cook, and State of Illinois, in the presence of two witnesses.

CHARLES S. WINSTON.

Witnesses:

CHARLES A. SIMPSON,
E. F. GRIER.