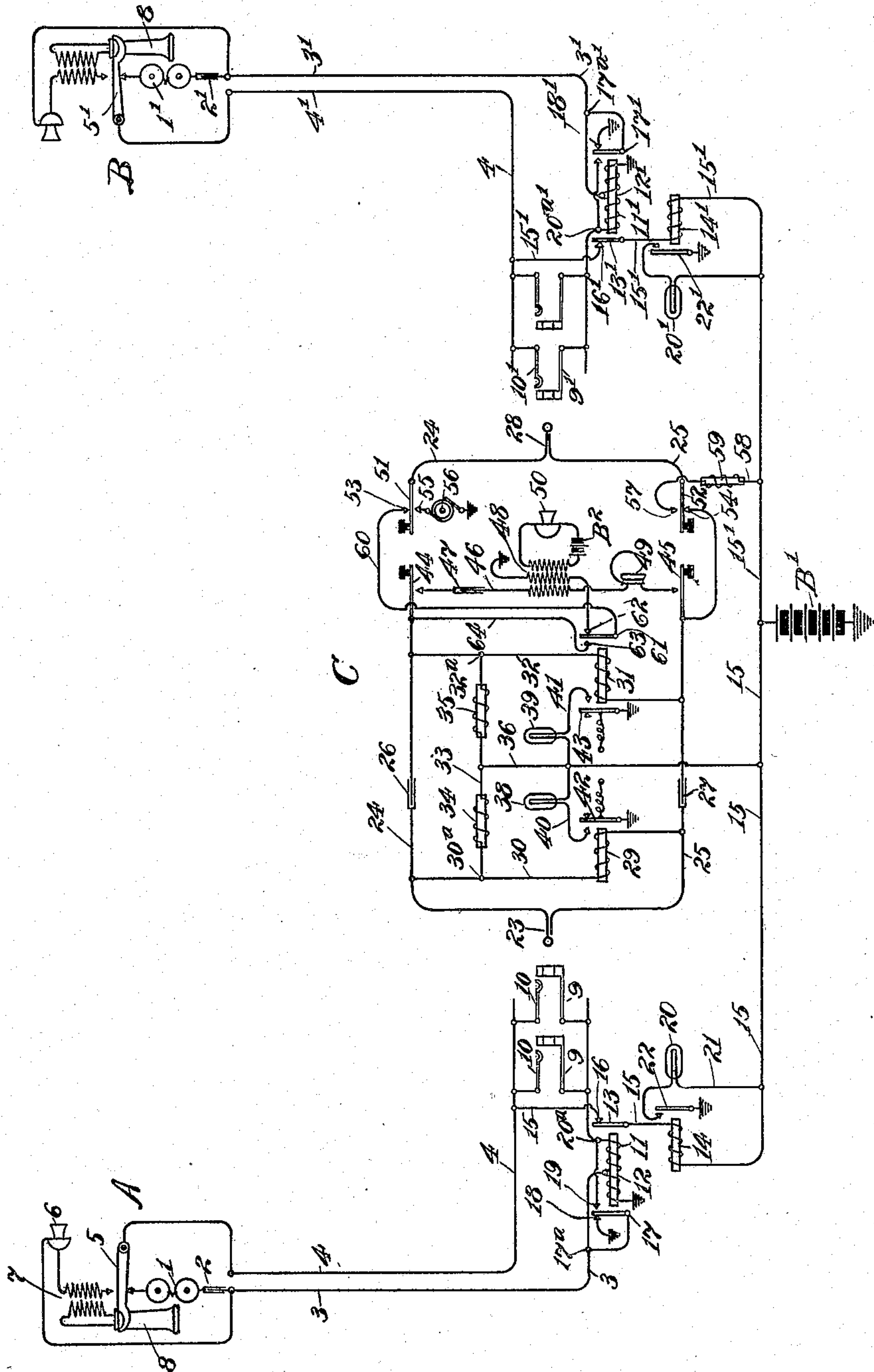


H. G. WEBSTER.
TELEPHONE SYSTEM.

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Witnesses
H. C. Mueller
Attorney

Inventor
Harry G. Webster
by Thomas H. Ferguson
Attorney

UNITED STATES PATENT OFFICE.

HARRY G. WEBSTER, OF CHICAGO, ILLINOIS, ASSIGNOR TO MILO G. KELLOGG, OF CHICAGO, ILLINOIS.

TELEPHONE SYSTEM.

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To all whom it may concern:

Be it known that I, HARRY G. WEBSTER, a citizen of the United States, and resident of Chicago, county of Cook, and State of Illinois, have invented new and useful Improvements in Telephone Systems, of which the following is a specification.

The present invention relates to telephone systems generally, and more particularly to the arrangement of circuits and apparatus by which the subscriber and operator may signal each other, and by which the operator may be informed of the operative condition of a connected telephone line.

The object of this invention is to provide a novel organization of circuits and apparatus for accomplishing these functions.

In accordance with my invention, the usual link-circuit, for inter-connecting the telephone lines leading to the central office, is employed in association with a novel arrangement of circuit connections by which the connection of the link-circuit to a telephone line closes a circuit local to the central office and establishes a path in shunt to a portion of said circuit which is under the control of the subscriber's switch-hook. The closing of the local circuit, while the shunt remains open, causes the display of an associated supervisory signal and prevents the energization of the call signal magnet associated with the connected telephone line, while the closing of the shunt path causes the effacement of the supervisory signal.

The invention also comprises a novel arrangement of circuits and connections by which the call-signal is placed beyond its substation control.

The character of the invention will be more fully understood upon reference to the following detailed description taken in connection with the accompanying drawing, and the scope of the invention will be indicated in the appended claims.

In the said drawing, I have illustrated diagrammatically a telephone system embodying the features of the present invention.

In said drawing, substations A and B are shown connected to a central office C. The equipment at substation A, which may be of any preferred type, is here shown embodying a call-bell 1 included in series with a condenser 2 between the limbs 3—4 of the telephone line, by which the substation is con-

nected to the central office. The circuit through the call-bell 1 is normally closed by the switch-hook 5, so that incoming ringing current will find a path through the call-bell and the condenser. Included in a normally broken circuit between the limbs 3 and 4 of the telephone line, is the transmitter 6 and the primary winding of an induction coil 7. When the receiver 8 is removed from its hook 5, the circuit through the call-bell 1 is broken, and that through the transmitter and the primary winding of the induction coil is completed. The receiver is included in circuit with the secondary winding of the induction coil. At the central office, the limbs 3 and 4 of the telephone line terminate in the sleeves 9 and the spring contacts 10 of the usual multiple jacks. The limb 3 also normally includes in circuit a portion 11 of the winding of the call-signal-effacing electromagnet 12 which, as here shown, coöperates with an armature 13 to break the circuit including the call-signal-magnet 14, and thereby cut off said magnet from its associated telephone line. Obviously, instead of cutting off the call-signal from the control of the substation, other control-eliminating means may be employed equally well without departing from the spirit of the present invention. The attraction of the armature 13 breaks the branch-conductor 15 which extends from the limb 4 of the telephone line, through the winding of the call-signal-magnet 14, to the live pole of the grounded battery B'. Normally, the armature 13 remains in engagement with its contact 16 to maintain the branch 15 unbroken. An armature 17, shown at the opposite end of the electromagnet 12, is permanently connected at 17^a to the limb 3 of the telephone line and is adapted normally to engage the grounded contact 18 and to be drawn, by the energization of the electromagnet, against the contact 19 which is directly connected at 20^a to the limb 3 of the telephone line. With the armature 17 engaging the contact 19, it will be noted that the portion 11 of the winding of the electromagnet 12 is short circuited, and the limb 3 is freed from resistance or impedance. The call-signal, which is preferably an electric lamp 20, is included in a grounded branch 21, controlled by the armature 22 of the call-signal-magnet 14. Normally, this branch is broken, but is closed when the electromagnet 14 is energized.

The circuits and apparatus associated with substation B are substantially the same as those described in connection with substation A and are designated by corresponding primed characters.

Referring to the means at the central office for connecting different subscribers for conversation, 23 represents the answering-plug whose tip and sleeve are connected respectively to the strands 24 and 25 of the cord or link-circuit. These strands are provided with the usual condensers 26—27 and terminate at their opposite ends in the tip and sleeve, respectively, of the calling-plug 28. A supervisory signal-controlling electromagnet 29, associated with the answering-plug 23, is connected by means of the conductor 30 in bridge of the strands 24 and 25, and a second supervisory signal-controlling electromagnet 31, associated with the calling-plug 28, is bridged, by a conductor 32, between the said strands on the calling-plug side of the condensers 26—27. The conductors 30 and 32 are connected by a conductor 33, which includes, in circuit, impedances 34 and 35. The conductor 33 is connected at a point between the impedances 34 and 35 with the live pole of the battery B' by means of a conductor 36 and a portion of the branch-conductor 15. The supervisory signals 38—39, which are preferably electric lamps, are included in grounded branches 40 and 41, under the control of the armatures 42 and 43, associated with the electromagnets 29 and 31 respectively. These branches are normally open, but may be individually closed upon the energization of the associated magnet. A listening-key 44—45 is adapted to connect the answering-plug contacts, by way of the strands 24—25, to a bridged conductor 46, including in circuit a condenser 47, the primary winding of an induction coil 48 and the operator's receiver 49. The operator's transmitter 50 is included in a local circuit with the battery B² and the secondary winding of the induction coil 48. A ringing-key 51—52 is arranged to break the metallic circuit of the strands 24—25 at the back contacts 53—54 and to connect the tip of the plug 28, by means of the front contact 55, to a grounded branch including the generator 56, and to connect the sleeve of the plug 28 to the live pole of the battery B' by way of the front contact 57 and the branch conductor 58. The latter branch is provided with an impedance 59 in circuit. The back contact 53, associated with the movable contact 51 of the ringing-key, is connected by a conductor 60 with an armature 61 associated with the electromagnet 31. Normally, this armature engages a fixed contact 62 which is directly connected through a tertiary winding of the induction-coil 48 to ground. When attracted by the magnet 31, the armature 61 engages a fixed

contact 63 which is directly connected by the conductor 64 to the strand 24.

In the operation of the system, assuming that the subscriber at substation A desires to converse with the subscriber at substation B, he removes his receiver from its hook, thereby completing a circuit, which will cause the energization of the call-signal-magnet 14 and the consequent display of the call-signal 20. This circuit may be traced from the live pole of the battery B', through the branch 15 including armature 13 and contact 16 of the control-magnet 12, to the limb 4 of the telephone line, thence to the substation through the switch-hook 5, primary winding of the induction coil 7, transmitter 6, through limb 3 of the telephone line, the armature 17 and contact 18 of the control-magnet 12, to ground. This will sufficiently energize the call signal magnet 14 to draw over its armature 22 to close branch 21, which includes the call-signal 20 in circuit, and thereby cause the display of said signal. Upon observing the display of this signal, the operator will insert the answering-plug 23 into one of the jacks associated with the telephone line 3—4 and press the listening-key 44—45 to close a circuit between the substation and her telephone-set in order to determine the wishes of the calling party. The insertion of the plug 23 into the jack will close a circuit local to the exchange through the signal-controlling electromagnets 12 and 29, as follows: from the live pole of the battery B', through a portion of the conductor 15, the conductor 36, branch 33 including the impedance 34, branch 30 including the winding of the electromagnet 29, thence through the strand 25 of the link-circuit to the sleeve of the answering-plug 23, thence through the sleeve of the jack, portion of the limb 3 of the telephone line, the portion 11 of the winding of the control-magnet 12, and the armature 17 and contact 18 of said magnet, to ground. This will sufficiently energize the electromagnet 12 to draw the armature 13 away from contact 16 and thus interrupt the circuit through the winding of the call-signal-magnet 14 and thereby remove the control of said magnet from the operator at substation A. The same energization of the electromagnet 12 will attract the armature 17 against the contact 19, thus short-circuiting the portion 11 of the winding of said electromagnet and completing a circuit from the point 20^a, through the contact 19, armature 17, to the limb 3, thence through the other portion of the winding of the electromagnet 12, to ground. This second circuit will also sufficiently energize the electromagnet 12 to maintain its armatures 13 and 17 in their attracted positions.

It will be observed that when the operator has inserted the plug 23 into one of the jacks, and the electromagnet 12 has been energized

to cut off the control of the call signal, a second path, through the substation and in shunt to a portion of the local circuit at the central office, will exist. This shunt path
 5 extends from the point 30^a in the conductor 30, through a portion of said conductor, a portion of the strand 24, to the tip of the plug 23, thence through the spring contact 10 of the jack, limb 4 of the telephone line,
 10 through the substation, back through limb 3 of the telephone line, to its point of connection 17^a with the branch leading to the armature 17. The portion of the local circuit shunted by this substation path extends
 15 from the point 30^a in the conductor, through said conductor including the winding of the electromagnet 29, to the strand 25, through said strand to the tip of the plug 23, thence through the jack-sleeve 9, limb 3 to the
 20 point 20^a, thence again to the limb 3 at the point 17^a by way of the contact 19 and armature 17. When the central office circuit alone is closed, the current flowing in it is sufficient to energize the electromagnet 29
 25 sufficiently to attract the armature 42 to close the grounded branch 40 and thereby cause the display of the signal 38. If, however, while the central office circuit remains closed, the substation shunt be closed also,
 30 as by the removal of receiver 8 from its hook, enough current will be shunted from the central office circuit to deenergize the winding of the electromagnet 29 sufficiently to allow its armature 42 to be drawn against its back
 35 stop and the supervisory signal 38 thereby to be effaced.

Upon closing the listening-key 44—45, the branch 46 is included in circuit with the transmitter at substation A and the wishes of
 40 the party at said substation learned by the operator through the instrumentality of her telephone-set, comprising the transmitter 50 and receiver 49. Having learned that the calling party wishes to converse with the
 45 subscriber at substation B, the operator first tests the line of the latter substation by placing the tip of the plug 28 against the sleeve 9' of one of the jacks associated with said
 50 substation line. If the latter line is busy, a potential will exist upon the sleeve 9' which will cause a momentary flow of current through the strand 24, the movable contact 51 of the ringing-key 51—52, the back
 55 contact 53, the branch 60, armature 61, contact 62 and the tertiary winding of the induction coil 48, to ground. This will cause a "click" in the operator's receiver 49, thus
 60 indicating to her that the line is busy.

If the line is found to be idle, the operator
 65 inserts the plug 28 into one of the jacks associated with the line 3'—4' and closes the ringing-key 51—52. Prior to the closing of the ringing-key, a local circuit, corresponding to the local circuit through the windings
 70 of the electromagnets 12 and 29, at the an-

swering end of the link-circuit, is completed through the windings of the electromagnets 12' and 31, as follows: from the live pole of the battery B', through a portion of the conductor 15, the conductor 36, the conductor 33
 75 including the impedance 35, conductor 32 including the winding of the electromagnet 31, strand 25 of the link-circuit including the back contact 54 and the movable contact 52 of the ringing-key to the sleeve of the calling-plug 28,
 80 thence through the sleeve 9' of the jack, the portion 11' of the winding of the electromagnet 12', the armature 17' and contact 18', to ground. This, as previously explained, will interrupt the branch 15' including the wind-
 85 ing of the call-signal-magnet 14' associated with the telephone line 3'—4' and at the same time short circuit the portion 11' of the winding of the electromagnet 12' and complete a circuit through the other portion of
 90 said winding, to ground, thus maintaining the armatures 13' and 17' in their attracted positions. Upon closing the ringing-key 51—52, this local circuit is broken at the con-
 95 tact 54, but a second circuit is completed from the live pole of the battery through a portion of the conductor 15', the branch 58 including the impedance 59, the contact 57 and the movable contact 52 of the listening-
 100 key and the strand 25 to the sleeve of the calling-plug 28 and thence, as before, through the winding of the electromagnet 12'. By this circuit, the armatures 13' and 17' are maintained in their attracted positions,
 105 while the ringing-key is held depressed. At the same time, the movable contact 51 of the ringing-key connects the tip of the plug 28 through the generator 56 to ground, and a circuit is completed through the branch 4' of
 110 the telephone line, the switch-hook 5', call-bell 1', condenser 2', branch 3' of the telephone line and the grounded portion of the winding of the cut-off relay 12', to ground. Current is thus supplied to actuate the call-
 115 bell 1' at substation B. As soon as the ringing-key 51—52 is released, the local circuit through the windings of the electromagnets 12' and 31 is completed again and, until the receiver at substation B is removed from its
 120 hook, the current flowing in said circuit is sufficient to maintain the signal 39 displayed.

When the subscriber at substation B removes his receiver 8' from its hook in response to the call, he closes a path over the telephone line in shunt to a portion of the local
 125 central office circuit including the windings of the magnets 12, and 31, previously traced. This shunt path shunts enough current from the said winding of the electromagnet 31 to cause the effacement of the signal 39. It is substantially the same as that traced in connection with substation A, but for clearness may be traced again as follows: from the point
 130 32^a in the branch 32, through a portion of said branch to the strand 24 of the link-cir-

cuit, thence through the branch 64, the contact 63, armature 61, which will remain attracted by the lesser flow of current through the winding of the electromagnet 31 against its contact 63, the branch 60, contact 53, movable contact 51, link-conductor 24, to the tip of the calling-plug 28, thence through the spring-contact 10' of the jack, limb 4', through the substation, back through limb 3' to the point of its connection 17^a with the branch leading to the armature 17' of the electromagnet 12'. With the subscribers so connected, conversation may be carried on between them over a metallic circuit including the limbs 3—4 and 3'—4' of their telephone lines and the strands 24 and 25 of the link-circuit, as usual; and during this conversation, both of the supervisory signals 38 and 39 will remain effaced. However, when either subscriber hangs up his receiver and thereby breaks his shunt to the electromagnet controlling the corresponding supervisory signal, said signal will be displayed; and when both signals 38 and 39 are displayed, the operator will then know that conversation is ended and may disconnect the subscribers.

During conversation, talking current is supplied to the telephone lines by a circuit from the live pole of the battery B', a portion of the conductor 15, the conductor 36, to its connection with the conductor 33, there dividing; a portion of the current passing through impedance 34, stand 24, to the tip of the plug 23, spring contact 10 of the jack, over the branches 4 and 3 of the telephone line including the induction coil and transmitter at substation A, and through the grounded portion of the winding of the electromagnet 12, to ground; and the other portion passing through the impedance 35, the stand 24, to the tip of the plug 28, thence through the spring contact 10' of the jack, the limbs 4' and 3' of the telephone line including the induction coil and transmitter at substation B, and through the grounded portion of the winding of the electromagnet 12', to ground. With this arrangement, it will be seen that the impedance 34 balances the impedance due to the energized portion of the electromagnet 12, while the impedance 35 balances that due to the electromagnet 12'. From what has been previously stated, it will also be apparent that these same impedances are common to the subscribers' circuits and the central office local circuits which coöperate in the control of the supervisory signals 38 and 39. These impedances, therefore, also assist in the shunting action by which the electromagnets 29 and 31 are deenergized when the substation circuits are closed.

It will be understood that, in the practice of my invention, many changes may be made without departing from the spirit and

scope of the same. For example, batteries B' and B² may be one and the same battery, instead of separate batteries as shown in the diagram. Furthermore, the substation equipment may be replaced by other forms of equipment, the signal lamps may be replaced by other types of signals, and other modifications of the system employed. I therefore do not wish to be limited to the precise matter disclosed, but aim to cover, by the terms of the appended claims, all such alterations and modifications.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. A telephone system comprising a telephone line extending from a substation to a central office, a line signal controlling relay, a supervisory relay, a resistance, means under the control of the operator for energizing said relays by closing a circuit including said relays and resistance, means for displaying a signal in response to the said energization of the supervisory relay, means under the control of the subscriber for shunting current from said supervisory relay by closing a path between one terminal of the winding of said signal controlling relay and a point intermediate of said supervisory relay and said resistance, whereby said signal is effaced.

2. A telephone system comprising a telephone line extending from a substation to a central office, a line signal controlling relay, a link-circuit adapted to make connection with said line, a supervisory relay and a source of current associated with said link-circuit, means operative upon the connection of said link-circuit to said line to energize said relays, means for displaying a signal in response to said energization of said supervisory relay, means under the control of the subscriber for effacing said signal by shunting current from said supervisory relay by closing a path including only the resistance of said telephone line and the connected substation apparatus whereby said signal is effaced.

3. A telephone system comprising a telephone line extending from a substation to a central office, a line signal controlling relay, a link-circuit adapted to make connection with said line, a supervisory relay, a resistance and a source of current associated with said link-circuit, means operative upon the connection of said link-circuit to said line to energize said relays, means for displaying a signal in response to the said energization of said supervisory relay, means under the control of the subscriber for shunting current from said supervisory relay by closing a path between one terminal of the winding of said signal controlling relay and a point intermediate of said supervisory relay and said resistance, whereby said signal is effaced.

4. A telephone system comprising a telephone line extending from a substation to a

central office, a line signal controlling relay, a resistance, a supervisory relay, a source of current, means under the control of the operator for closing a circuit including said source of current, said resistance and said relays, means for displaying a signal in response to the energization of said supervisory relay resulting from the closing of said circuit, means under the control of the subscriber for shunting current from said supervisory relay by closing a shunt path extending from a point intermediate of said resistance and supervisory relay out over said telephone line and back to another point in said circuit, whereby said signal is effaced.

5. A telephone system comprising a telephone line extending from a substation to a central office, a line signal controlling relay, a link-circuit adapted to make connection with said line, a supervisory relay, a source of current, a resistance, means operative upon the connection of said link-circuit to said line to close a circuit including a source of current, said resistance and said relays, means for displaying a signal in response to the energization of said supervisory relay resulting from the closing of said circuit, means under the control of the subscriber for shunting current from said supervisory relay by closing a shunt path extending from a point intermediate of said resistance and supervisory relay out over said telephone line and back to another point in said circuit, whereby said signal is effaced.

6. A telephone line extending from a substation to a central office, a two-strand link-circuit adapted to make connection with said line, an inductive device associated with said link-circuit for permitting the passage of voice currents and preventing the passage of signaling current, a source of current and a resistance normally associated with said link-circuit, a signal-controlling electromagnet bridged between said link-circuit strands on the said telephone-line side of said inductive device, means operative upon the connection of said link-circuit to said telephone line to complete a circuit through said resistance, source of current and electromagnet winding, means for displaying a signal upon the energization of said electromagnet by the closing of said circuit and means under the control of the subscriber for shunting current from said electromagnet whereby said signal is effaced.

7. A telephone line extending from a substation to a central office, a two-strand link-circuit adapted to make connection with said line, an inductive device associated with said link-circuit for permitting the passage of voice currents and preventing the passage of signaling current, a source of current and a resistance normally associated with said link-circuit, a signal-controlling electromagnet bridged between said link-circuit

strands on the said telephone-line side of said inductive device, means operative upon the connection of said link-circuit to said telephone line to complete a circuit through said resistance, source of current and electromagnet winding, means for displaying a signal upon the energization of said electromagnet by the closing of said circuit and means under the control of the subscriber for completing a path including the telephone line in shunt to said electromagnet winding whereby said signal is effaced.

8. A telephone line extending from a substation to a central office, a two-strand link-circuit adapted to make connection with said line, an inductive device associated with said link-circuit for permitting the passage of voice currents and preventing the passage of signaling current, a source of current and a resistance normally associated with said link-circuit, a signal-controlling electromagnet bridged between said link-circuit strands on the said telephone-line side of said inductive device, means operative upon the connection of said link-circuit to said telephone line to energize said electromagnet, means for displaying a signal in response to said energization and means under the control of the subscriber for shunting current from said electromagnet whereby said signal is effaced.

9. A telephone line extending from a substation to a central office, a two-strand link-circuit adapted to make connection with said line, an inductive device associated with said link-circuit for permitting the passage of voice currents and preventing the passage of signaling current, a source of current and a resistance normally associated with said link-circuit, a signal-controlling electromagnet bridged between said link-circuit strands on the said telephone-line side of said inductive device, means operative upon the connection of said link-circuit to said telephone line to energize said electromagnet, means for displaying a signal in response to said energization and means under the control of the subscriber for completing a path including the telephone line in shunt to said electromagnet winding whereby said signal is effaced.

10. A telephone line extending from a substation to a central office, a two-strand link-circuit adapted to make connection with said line, an inductive device associated with said link-circuit for permitting the passage of voice currents and preventing the passage of signaling current, a source of current and a resistance normally associated with said link-circuit, a signal-controlling electromagnet bridged between said link-circuit strands on the said telephone-line side of said inductive device, means operative upon the connection of said link-circuit to said telephone line to complete a circuit through said resistance, source of current and electromagnet

winding, means for displaying a signal upon the energization of said electromagnet by the closing of said circuit, means under the control of the subscriber for shunting current from said electromagnet whereby said signal is effaced, a call signal magnet associated with said telephone line and means for de-energizing the call signal magnet upon the connection of said link-circuit to said telephone line.

11. A telephone line extending from a substation to a central office, a two-strand link-circuit adapted to make connection with said line, an inductive device associated with said link-circuit for permitting the passage of voice currents and preventing the passage of signaling current, a source of current and a resistance normally associated with said link-circuit, a signal-controlling electromagnet bridged between said link-circuit strands on the said telephone-line side of said inductive device, means operative upon the connection of said link-circuit to said telephone line to complete a circuit through said resistance, source of current and electromagnet winding, means for displaying a signal upon the energization of said electromagnet by the closing of said circuit, means under the control of the subscriber for shunting current from said electromagnet whereby said signal is effaced, a call signal magnet associated with said telephone line and means for interrupting the current path through the call signal magnet upon the connection of said link-circuit to said telephone line.

12. A telephone line extending from a substation to a central office, a two-strand link-circuit adapted to make connection with said line, an inductive device associated with said link-circuit for permitting the passage of voice currents and preventing the passage of signaling current, a source of current and a resistance normally associated with said link-circuit, a signal-controlling electromagnet having its terminals directly connected to said link-circuit strands on the said telephone-line side of said inductive device, means operative upon the connection of said link-circuit to said telephone line to energize said electromagnet, means for displaying a signal in response to said energization, means under the control of the subscriber for causing the effacement of said signal, a call signal magnet associated with said telephone line and means for deenergizing the call signal magnet upon the connection of said link-circuit to said telephone line.

13. A telephone line extending from a substation to a central office, a two-strand link-circuit adapted to make connection with said line, an inductive device associated with said link-circuit for permitting the passage of voice currents and preventing the passage of signaling current, a source of current and a resistance normally associated with said link-

circuit, a signal-controlling electromagnet having its terminals directly connected to said link-circuit strands on the said telephone-line side of said inductive device, means operative upon the connection of said link-circuit to said telephone line to energize said electromagnet, means for displaying a signal in response to said energization, means under the control of the subscriber for causing the effacement of said signal, a call signal magnet associated with said telephone line and means for interrupting the current path through the call signal magnet upon the connection of said link-circuit to said telephone line.

14. A telephone line extending from a substation to a central office, a two-strand link-circuit adapted to make connection with said line, a source of current having one pole normally connected to one strand of said link-circuit, a single-winding signal-controlling electromagnet having its terminals directly connected to the strands of said link-circuit, means operative upon the connection of said link-circuit to said telephone line to energize said electromagnet, means for displaying a signal in response to said energization and means under the control of the subscriber for causing the effacement of said signal.

15. A telephone line extending from a substation to a central office, a two-strand link-circuit adapted to make connection with said line, a source of current having one pole normally connected to one strand of said link-circuit, a resistance, a signal-controlling electromagnet bridged between the strands of said link-circuit, means operative upon the connection of said link-circuit to said telephone line to complete a circuit through said resistance, source of current and electromagnet winding, means for displaying a signal upon the energization of said magnet by the closing of said circuit and means under the control of the subscriber for shunting current from said electromagnet whereby said signal is effaced.

16. A telephone line extending from a substation to a central office, a two-strand link-circuit adapted to make connection with said line, a source of current having one pole normally connected to one strand of said link-circuit, a resistance, a signal-controlling electromagnet bridged between the strands of said link-circuit, means operative upon the connection of said link-circuit to said telephone line to complete a circuit through said resistance, source of current and electromagnet winding, means for displaying a signal upon the energization of said magnet by the closing of said circuit and means under the control of the subscriber for completing a path including the telephone line in shunt to said electromagnet winding whereby said signal is effaced.

17. A telephone line extending from a substation to a central office, a link-circuit adapted to make connection with said line, a source of current having one pole normally connected to one strand of said link-circuit, a single-winding signal-controlling electromagnet having its terminals directly and permanently in bridge of the strands of said link-circuit, means operative upon the connection of said link-circuit to said telephone line to energize said electromagnet, means for displaying a signal in response to said energization and means under the control of the subscriber for causing the effacement of said signal.

18. A telephone line extending from a substation to a central office, a link-circuit adapted to make connection with said line, a source of current having one pole normally connected to one strand of said link-circuit, a resistance, a signal-controlling electromagnet in bridge of said link-circuit, means operative upon the connection of said link-circuit to said telephone line to complete a circuit through said resistance, source of current and electromagnet winding, means for displaying a signal upon the energization of said magnet by the closing of said circuit and means under the control of the subscriber for shunting current from said electromagnet whereby said signal is effaced.

19. A telephone system comprising a telephone line extending from a substation to a central office, a call signal associated with said line, electrically actuated means for removing the substation control of said call signal, a link-circuit, means operative upon the connection of said link-circuit to said telephone line for closing a circuit to cause the operation of said electrically actuated means, means operated upon the closure of said circuit to close a second circuit by which said electrically actuated means is maintained in its operated position, an electrically operated supervisory signal normally displayed upon the connection of said link-circuit to said telephone line, and means under the control of the subscriber for shunting current from said signal to cause its effacement.

20. A telephone system comprising a telephone line extending from a substation to a central office, a call signal associated with said line, electrically actuated means for removing the substation control of said call signal, said means comprising a divided winding, a link-circuit, means operative upon the connection of said link-circuit to said telephone line for closing a circuit through one portion of said winding to cause the operation of said electrically actuated means, means operated upon the closure of the circuit through the first portion of said winding to close a circuit through the second portion of said winding by which said elec-

trically actuated means is maintained in its operated position, an electrically operated supervisory signal normally displayed upon the connection of said link-circuit to said telephone line, and means under the control of the subscriber for shunting current from said signal to cause its effacement.

21. A telephone system comprising a telephone line extending from a substation to a central office, a call signal associated with said line, electrically actuated means for removing the substation control of said call signal, said means comprising a divided winding, a link-circuit, means operative upon the connection of said link-circuit to said telephone line for closing a circuit through one portion of said winding to cause the operation of said electrically actuated means, means operated upon the closure of the circuit through the first portion of said winding to close a circuit through the second portion of said winding short circuiting said first portion by which said electrically actuated means is maintained in its operated position, an electrically operated supervisory signal normally displayed upon the connection of said link-circuit to said telephone line, and means under the control of the subscriber for shunting current from said signal to cause its effacement.

22. A telephone system comprising a telephone line extending from a substation to a central office, a connection terminal therefor, a call signal associated with said line, electrically actuated means for removing the substation control of said call signal, said means having a divided winding, one portion of which is included permanently in circuit with one of the limbs of said telephone line, a link-circuit, means operative upon the connection of said link-circuit to said telephone line for closing a circuit through that portion of said winding included in the limb of said telephone line, whereby said electrically actuated means is operated, means operated upon the closure of said circuit to close a second circuit through the second portion of the winding of said electrically actuated means, whereby said means is maintained in its operated position, an electrically operated supervisory signal normally displayed upon the connection of said link-circuit to said telephone line, and means under the control of the subscriber for shunting current from said signal to cause its effacement.

23. A telephone system comprising a telephone line extending from a substation to a central office, a call signal associated with said line, electrically actuated means for removing the substation control of said call signal, a link-circuit, means operative upon the connection of said link-circuit to said telephone line for closing a circuit to cause the operation of said electrically actuated means, means operated upon the closure of

said circuit to close a second circuit by which said electrically actuated means is maintained in its operated position, means for simultaneously excluding said winding from the talking circuit, an electrically operated supervisory signal normally displayed upon the connection of said link-circuit to said telephone line, and means under the control of the subscriber for shunting current from said signal to cause its effacement.

24. A telephone system comprising a telephone line extending from a substation to a central office, a call signal associated with said line, electrically actuated means for removing the substation control of said call signal, said means comprising a divided winding, a link-circuit, means operative upon the connection of said link-circuit to said telephone line for closing a circuit through one portion of said winding to cause the operation of said electrically actuated means, means operated upon the closure of the circuit through the first portion of said winding to close a circuit through the second portion of said winding by which said electrically actuated means is maintained in its operated position, means for simultaneously excluding said winding from the talking circuit, an electrically operated supervisory signal normally displayed upon the connection of said link-circuit to said telephone line, and means under the control of the subscriber for shunting current from said signal to cause its effacement.

25. A telephone system comprising a telephone line extending from a substation to a central office, a connection terminal therefor, a call signal associated with said line, electrically actuated means for removing the substation control of said call signal, said means having a divided winding, one portion of which is included permanently in circuit with one of the limbs of said telephone line, a link-circuit, means operative upon the connection of said link-circuit to said telephone line for closing a circuit through that portion of said winding included in the limb of said telephone line, whereby said electrically actuated means is operated, means operated upon the closure of said circuit to close a second circuit through the second portion of the winding of said electrically actuated means, whereby said means is maintained in its operated position, means for simultaneously excluding said winding from the talking circuit, an electrically operated supervisory signal normally displayed upon the connection of said link-circuit to said telephone line, and means under the control of the subscriber for shunting current from said signal to cause its effacement.

In witness whereof, I hereunto subscribe my name this 2nd day of Dec., A. D., 1905.

HARRY G. WEBSTER.

Witnesses:

CAROLYN WEBER,
O. H. DYSON.

It is hereby certified that in Letters Patent No. 930,516, granted August 10, 1909, upon the application of Harry G. Webster, of Chicago, Illinois, for an improvement in "Telephone Systems," errors appear in the printed specification requiring correction, as follows: Page 3, line 122, the reference-numeral "12" should read *12'*, and page 4, lines 34 and 42, the word "stand" should read *strand*; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 5th day of October, A. D., 1909.

[SEAL.]

C. C. BILLINGS,

Acting Commissioner of Patents.