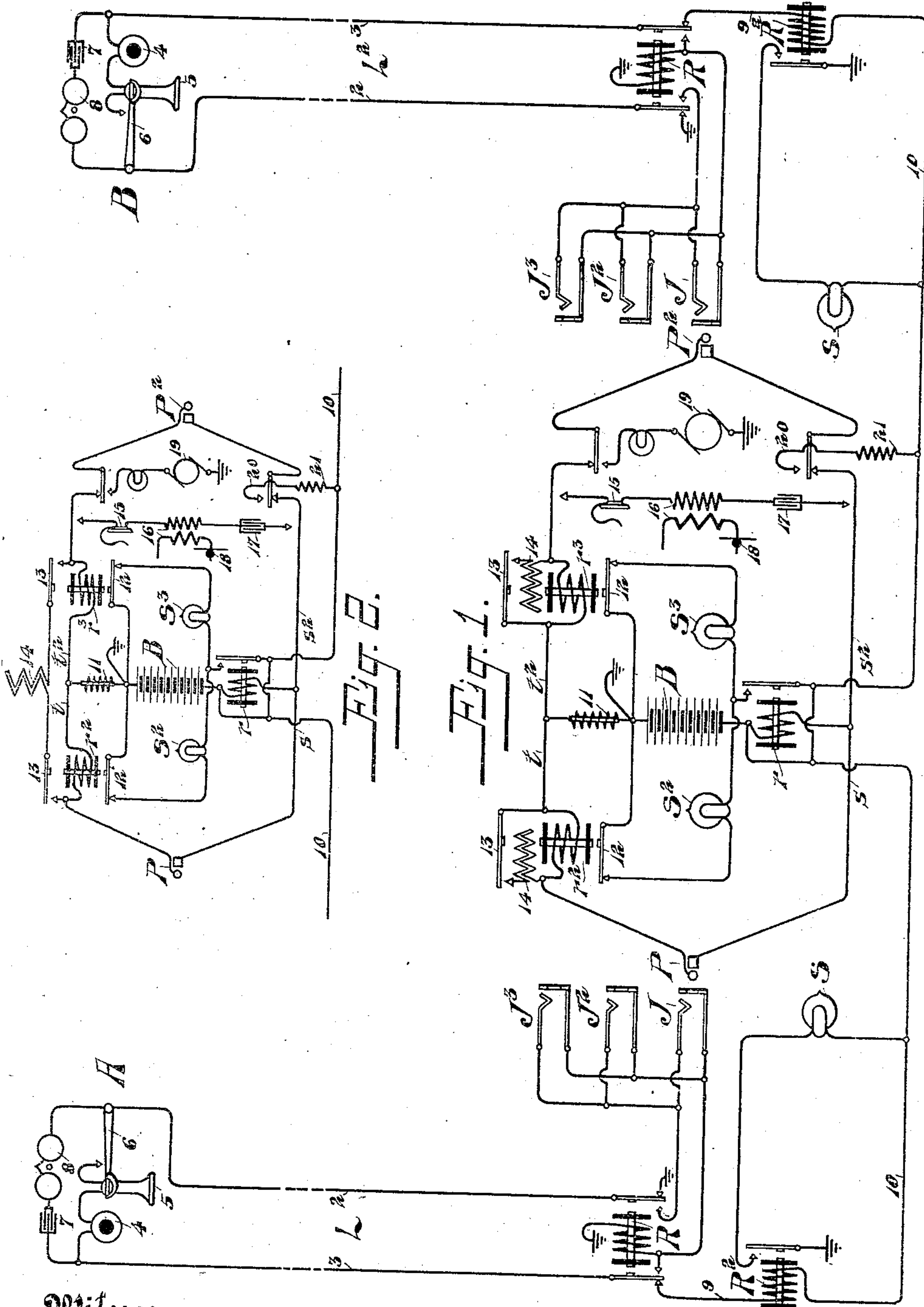


H. G. WEBSTER.
TELEPHONE SYSTEM.
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904,583.

Patented Nov. 24, 1908.



Witnesses.

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TELEPHONE SYSTEM.

No. 904,583.

Specification of Letters Patent.

Patented Nov. 24, 1908.

Application filed February 28, 1903. Serial No. 145,459.

To all whom it may concern:

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

My invention relates to improvements in telephone systems, and more particularly to means for shunting relays in the talking circuit by means of non-inductive shunts, and this without weakening or destroying the efficiency of such devices.

My invention may be particularly applied to supervisory relays in cord circuits used for looping subscribers' lines together for conversation, whereby when the relays are first actuated, their efficiency is unimpaired but as soon as energized non-inductive shunts are connected about them. This arrangement permits the passage of voice currents about the relays without hindrance therefrom.

My invention is illustrated in the accompanying drawing in which

Figure 1 shows a telephone system embodying my invention, and Fig. 2 represents a modification.

L and L² indicate subscribers' lines extending from the respective substations A and B to the central office, where they are fitted with line signals and connecting jacks in the usual manner. At the substations, for example station A, the transmitter 4 and receiver 5 are placed in a bridge whose normal discontinuity is maintained by means of the hook switch 6, while a condenser 7 and bell 8 are placed in a permanent bridge of the line conductors 2 and 3. This apparatus is intended merely to typify any suitable substation outfit.

At the central office a cut-off relay R is provided for the line which normally grounds conductor 2 through one of its springs and connects line conductor 3 through another of its springs with the conductor 9 leading to the line relay R² which is joined upon its other side by means of conductor 10 with the live pole of a central and common battery B. The line relay R² controls the local circuit of the individual line signal S. The forward contacts of the springs of the cut-off relay R are connected with the switchboard section of the line ex-

tending to the answering jack J and the multiple jacks J² and J³. The winding of the cut-off relay R is grounded from the sleeve conductor of said jacks. The operator is provided with a plurality of cord circuits to loop the subscribers together for conversation, and which comprise a plug P and P² provided with tip and sleeve contact surfaces adapted to register with the corresponding contact surfaces of the spring jacks of the lines. The tip contacts of the plugs are connected together by flexible strands *t* and *t*² of the cord circuit and the sleeve contacts are joined by the strands *s* and *s*² thereof. The battery B has its grounded pole connected through an impedance coil 11 with the tip strands and its live pole connected through its supervisory relay *r* with the sleeve strands. A supervisory relay *r*² is interposed in the strand *t* and a similar relay *r*³ is interposed in the strand *t*². The relay *r* serves through its normally open contacts to control current to the supervisory signals S² and S³ associated with the calling and answering plugs P and P² respectively while the individual local circuits of said lamps are controlled through the normal contacts and springs 12 of said supervisory relays *r*² and *r*³.

Each of the relays *r*² and *r*³ are provided with additional normally open contacts 13 which are adapted when attracted to include the non-inductive resistances 14 in the circuit in parallel with the winding of the corresponding relay. By this arrangement when the contacts 13 are open, the relays *r*² respond in the ordinary manner and with the usual efficiency to current flowing through them but as soon as actuated the non inductive shunts are connected about them, which permits a free path for the voice currents and at the same time sufficient current passes through the windings to maintain them actuated.

The operator's outfit is adapted to be connected in a bridge of the cord circuit by means of any suitable listening key, said outfit comprising the receiver 15, secondary winding of the operator's induction coil 16 and a condenser 17. The operator's transmitter 18 is preferably actuated from the same battery B. A ringing generator 19 is adapted to be connected with the cord circuit to call the wanted subscriber, and to maintain the cut-off relay actuated during

ringing, the sleeve contact of said L^1 completes an auxiliary path over conductor 20 and through resistance 21.

In making a call the subscriber takes his receiver off its hook and completes a path for current over the metallic line from the battery B and through the line relay R^2 thus closing the local circuit of signal S and lighting the same. In response to the call the operator inserts the plug P in the answering jack J thereof and completes a path for current from the battery B over the sleeve strand s of the cord circuit and through said cut-off relay R to ground. The actuation of the cut-off relay renders the line signal inoperative and completes a metallic line for talking. Current now flows over the metallic line and through the supervisory relay r^2 which is energized to open the local circuit of supervisory signal S^2 and prevent its action. As soon as the said relay r^2 operates it connects through its armature 13 the non-inductive shunt 14 to the same, so that the voice currents are not hindered by the impedance of the winding of the relay. The supervisory relay r is also actuated to close circuit through the said supervisory signals. Voice currents are prevented from being short circuited through the battery B by the impedance coil 11 and the relay r . Upon learning the order the calling plug P^2 is employed to test the condition of the wanted line in the usual manner. Upon finding the line idle, the plug is inserted and the ringing key actuated to call the subscriber. After calling the subscriber and before his response current from the battery B is flowing over the sleeve conductor s^2 of the cord circuit and through the winding of the cut-off relay to ground. The cut-off relay actuates to render the line signal inoperative and the supervisory signal S^3 is also lighted to indicate the fact of the non-response of the subscriber to the operator. Upon his response, however, current flows through the supervisory relay r^3 which is actuated to open the circuit of and extinguish lamp S^3 and also to complete the non-inductive shunt about said relay. Conversation can now take place between the subscribers and without hindrance from the impedance coil due to the presence of the supervisory relays in the talking circuit. It will be noted that the shunt is inoperative at the point of least efficiency of the relay, but is closed and brought into circuit only when the relay armature is at its point of greatest efficiency, in consequence of which arrangement the operative relay winding can be made very much higher and the shunt winding very much lower than in present practice. At the termination of the conversation, and replacement of the receivers upon the hooks, deenergizes the supervisory relays r^2 and r^3 ,

which closes the circuit of the supervisory lamps s^2 and s^3 , which are lighted to indicate to the operator that conversation has ceased, who then proceeds to take down the connection and restore all parts to normal condition.

Fig. 2 shows a slightly different arrangement in that the supervisory relays r^2 and r^3 act together to close the non-inductive resistances 14 about both of said relays, and which non-inductive resistance is preferably of about 3000 ohms resistance. In this modification the relays would necessarily be adjusted to operate on a margin so as to give double supervision. It is apparent that the invention may be applied to any relay in the talking circuit of a telephone line or system, although of particular advantage in connection with supervisory relays.

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

1. In a telephone system, the combination with a suitable source of current, of a relay in the path of voice currents when a connection is established for conversation, a non-inductive resistance in a normally-open shunt of said relay, adapted to be connected in parallel with the winding of said relay and in the path of talking current by the actuation of the relay, said relay being adapted to be maintained actuated by current over the telephone line, whereby the talking currents and the direct current from said source are provided with suitable parallel paths during conversation, substantially as described.

2. In a telephone system, the combination with a suitable source of current, of a relay permanently connected in the metallic line when a connection is established for conversation and being under the control of the subscriber, a non-inductive resistance in a normally-open shunt about the windings of said relay, said shunt being adapted to be connected in parallel with said windings in the path of talking current by the energization of said relay, whereby the talking currents and the direct current from said source are provided with suitable parallel paths during conversation, substantially as described.

3. In a telephone system, the combination with a telephone line, of a cord circuit for connecting the line for conversation, a supervisory relay in the cord circuit, under the control of the subscriber during the connection of the cord circuit with the line, a suitable source of current, a non-inductive resistance in a normally-open shunt of said relay, said shunt being adapted to be connected in the path of voice currents by the energization of said relay, whereby the impedance of the coils of said relay is removed from the path for talking current, said re-

lay constituting a parallel path for the control of the supervisory signals, substantially as described.

4. In a telephone system, the combination with a telephone line, of a cord circuit associated therewith for making connections for conversation, a supervisory relay in the cord circuit, under the control of the subscriber during the connection of the cord circuit with the line, a signal controlled by said relay, a non-inductive resistance constituting a normally-open shunt about said relay, said resistance being adapted to be connected in parallel with the windings of said relay when said relay is energized, whereby direct current from said source finds a path through the winding of said relay and the talking currents are provided with a suitable parallel path through said resistance, substantially as described.

5. In a telephone system, the combination with a telephone line, of a cord circuit associated therewith, a suitable source of current, a supervisory relay associated with the cord circuit in a normally-closed circuit, a non-inductive resistance in a normally-open shunt of said relay, said shunt being adapted to be closed by said relay when a connection is established for conversation to remove the impedance of said relay from the path of talking currents, said relay and said shunt providing parallel paths for direct current from said source over the telephone line and through the subscriber's transmitter, substantially as described.

6. In a telephone system, the combination with a telephone line, of a cord circuit, a supervisory relay associated with the cord circuit and under the control of the subscriber during the connection of the cord circuit with the line and a normally-open shunt about said relay, adapted to be closed when said relay is actuated to provide a path for talking current, substantially as described.

7. In a telephone system, the combination with a telephone line, of a line signal therefor, a cut-off relay for the line, a cord circuit to establish connections therewith for conversation, a source of current associated with cord circuit and line, supervisory relays associated with the cord circuit in the path of direct current from said source, and actuated over the telephone line to the substation, and means for closing a shunt about both said relays by the actuation thereof to provide a parallel path for talking currents during conversation, substantially as described.

8. In a telephone system, the combination with a telephone line, of a cord circuit adapted to be connected therewith for conversation, a supervisory relay in said cord circuit having its coil normally in series with the telephone line when a connection has been established therewith, a non-inductive shunt in open circuit about said relay, said shunt being adapted to be placed in parallel with the coil of the relay when the subscriber's telephone is in position for conversation, the direct current supply for said telephone line passing through the coil of said relay alone before its actuation and through the coil and its non-inductive shunt in parallel after the actuation of the relay, substantially as described.

9. In a telephone system, the combination with a telephone line, of a cord circuit adapted to be connected therewith for conversation, a relay having a single actuating coil in the path of current over the telephone line to the subscriber's station and a shunt for said relay coil adapted to be included about the relay by its own energization whereby the entire current in the line is available for the actuation of the relay but whereby only the portion necessary to maintain the actuation flows through its coil after the actuation, substantially as described.

10. In a telephone system, the combination with a central source of current, of a transmitter at the substation energized by current from said source, a relay at the central office actuated by current from said source through said transmitter, and a shunt circuit closed about the coil of said relay by its own actuation, whereby the electric energy of the circuit is initially sufficient for the actuation of the relay and is thereafter sufficient for the proper operation of the transmitter.

11. In a telephone system, the combination with a telephone line, of a cord circuit adapted to be connected therewith for conversation, a relay associated with the cord circuit and energized over a path including the substation, said relay by its actuation placing a non-inductive shunt about its own winding whereby the voice currents may pass without the obstruction of the impedance, substantially as described.

Signed by me at Chicago, county of Cook, State of Illinois, this 26th day of February 1903.

HARRY G. WEBSTER.

Witnesses:

ROBERT LEWIS AMES,
GAZELLE BEDER,