

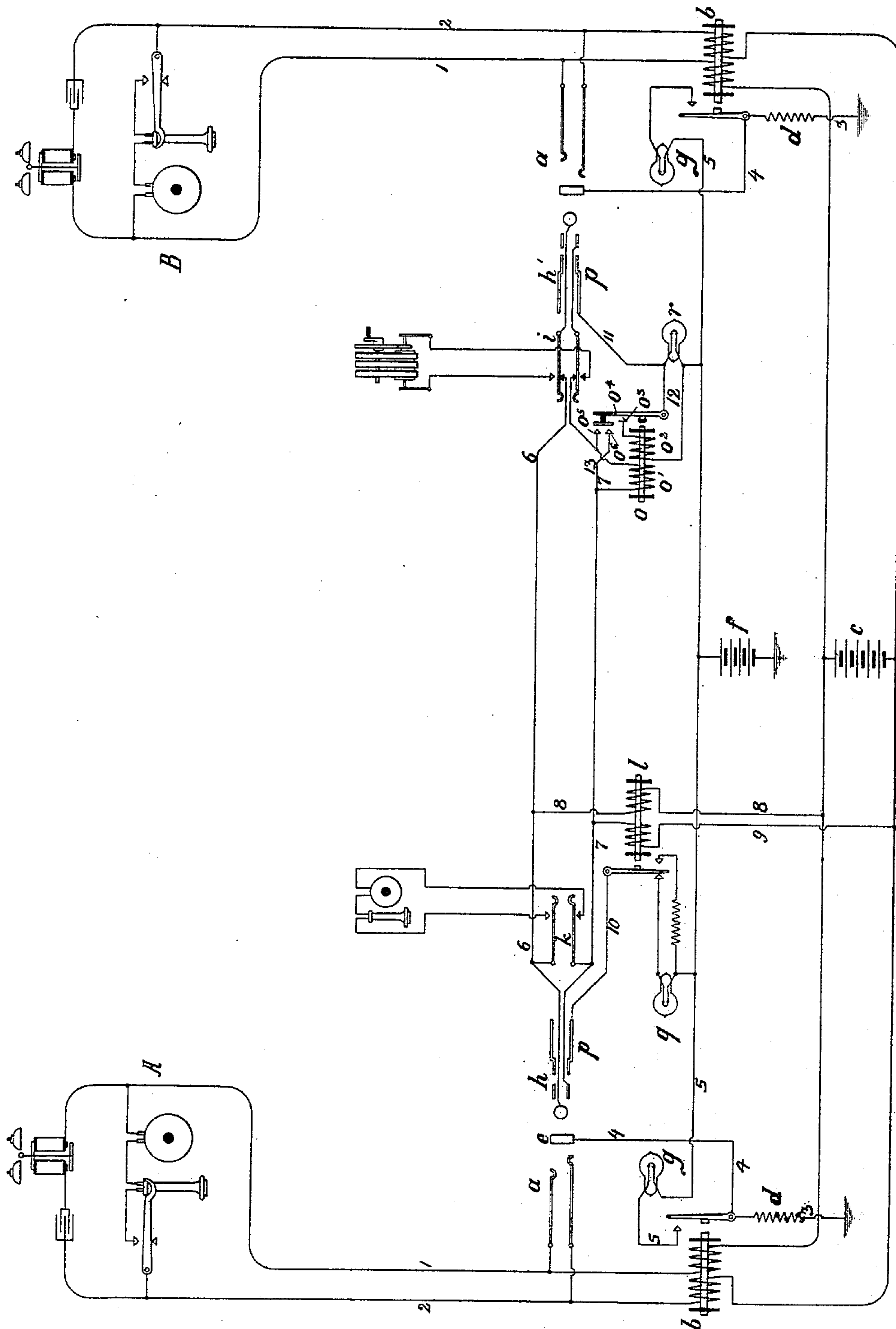
No. 618,137.

Patented Jan. 24, 1899.

C. E. SCRIBNER.
SIGNAL FOR TELEPHONE SWITCHBOARDS.

(Application filed Dec. 8, 1896.)

(No Model.)



Witnesses:
L. M. C. Tanner
George L. Crapp

Inventor
Charles E. Scribner
by Barton & Brown his Att'ys.

UNITED STATES PATENT OFFICE.

CHARLES E. SCRIBNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE WESTERN
ELECTRIC COMPANY, OF SAME PLACE.

SIGNAL FOR TELEPHONE-SWITCHBOARDS.

SPECIFICATION forming part of Letters Patent No. 618,137, dated January 24, 1899.

Application filed December 8, 1896. Serial No. 614,875. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. SCRIBNER, 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 Signals for Telephone-Switchboards, (Case No. 435,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention pertains to signals for telephone-lines in telephone-switchboards designed to respond automatically to currents in the line determined by the condition of the station apparatus of use or disuse, and thus to inform the operator continuously of such condition.

It concerns particularly the supervisory signals, which are commonly associated with connecting-plugs provided for uniting lines in the switchboard and are intended to indicate to the operator the subscriber's response at the called substation and the discontinuance of conversation.

I have aimed to provide two signals having, respectively, the significations mentioned and to so organize the system that these signals shall be displayed only at the proper times, and thus shall have positive and definite meanings.

A further feature of the invention consists in a novel device for causing the effacement of the initial call-signal in the act of making connection with the line in response thereto.

It is usual in systems furnished with signals designed for automatic operation to construct and arrange the appliances at the station, so that the removal of the telephone from its switch for use shall close a normally open circuit, and thus permit a current to flow in the line-circuit from a central source of current, which excites a relay and determines the display of a subsidiary line-signal. The present invention is adapted for use in connection with appliances of this description. It consists in the combination, with the usual plug-circuit, of a relay in a branch therefrom, together with a source of current, a local circuit including a subsidiary clearing-out signal controlled by the relay, an-

other relay interposed serially in the conductor of the plug-circuit, a supervisory signal controlled by that relay, (being lighted when the relay is inert,) and a normally open local circuit containing a winding of this latter relay, together with switch-contacts, which close the break in the circuit when the relay is excited. Other switch-contacts also are provided upon the relay arranged to short-circuit the winding thereof, which is interposed in the telephonic circuit during the excitement of the local winding of the relay, so that its resistance is removed from the telephonic circuit. The current through the local circuit of the relay is controlled by suitable switch-contacts, which are open when the corresponding plug is returned to its normal condition of disuse. This special apparatus may be associated with the well-known form of switchboard in which a relay permanently connected with the line controls a local circuit, including a subsidiary line-signal, together with a resistance-coil, and having connections terminating in special contact-pieces of the spring-jacks of the line by which the subsidiary line-signal becomes shunted when a plug is inserted into a spring-jack. In adapting the appliances of the plug-circuit and supervisory apparatus of the present invention to the line apparatus of such a switchboard I choose to effect this shunting of the subsidiary line-signal to efface this signal displayed as an initial call-signal through the agency of a conductor including a resistance-coil and leading from the battery which excites that signal and terminating in a contact-piece of the answering-plug which registers with the before-mentioned special contacts of the spring-jack of the calling-line. In the case of the answering-line, or that line which is called for, I attain the same result—shunting the line-signal—by means of a lamp brought into parallel or shunt of the subsidiary signal, but controlled, as before stated, by means of the relay in the plug-circuit in conjunction with the line-relay. In the operation of this new system the removal of the station-telephone for use causes the display of the subsidiary line-signal, after which the response to the signal on the part of the operator by inserting a plug into the spring-

jack effaces this signal. The establishment of connection with the line called for causes the excitement of the supervisory signal, which remains excited until the called party has responded, but is hidden thereafter during the connection. The replacement of both station-telephones on their switches causes the display of the clearing-out signal.

The invention is shown in the attached drawing, which represents two substations connected by the usual line-circuits with signaling and switching appliances in a switchboard.

The telephones, bell, and telephone-switch at the substation are arranged, as before mentioned, to close the line-circuit through a path of comparatively low resistance during the use of the telephones, the circuit being open as to continuous current at other times, although it should permit the transmission of alternating calling-currents to operate the bell.

The line conductors 1 and 2 from the substation are led to a spring-jack *a* in the switchboard. Thence they are extended through the windings of a relay *b* to the poles of a battery *c*, which is common to the different lines of the exchange. The armature-lever of this relay is connected to earth through a conductor 3, which includes a resistance-coil *d*, and is also connected by a conductor 4 with special contact-pieces *e* in the spring-jacks of the line. The contact-anvil of the relay forms the terminal of a wire 5, which is connected with the free pole of a grounded battery *f* and which includes a subsidiary line-signal *g*, (a small incandescent lamp,) associated with the spring-jack *a* in the switchboard.

The usual plugs *h* and *h'* are provided in the switchboards, their like line-contacts being connected together through conductors 6 and 7, which constitute the plug-circuit. A calling-key *i* and a listening-key *k* are furnished in connection with each plug-circuit. A wire 8 extends from conductor 6 of the plug-circuit to one pole of the battery *c* and another wire 9 extends from conductor 7 to the other pole of the same battery. Each of these wires includes a winding of the magnet of a relay *l*. The conductors are, in effect, a bridge of the plug-circuit, including the source of current *c*, together with these windings of the relay. The relay should have sufficient impedance to prevent the shunting of telephonic current from the plug-circuit through this path. The switch-contacts of this relay control the clearing-out signal through the medium of local-circuit connections, which will be described presently. A winding on the magnet *o'* of another relay *o* is interposed in the conductor 7 of the plug-circuit between the plug *h'* and the point of connection with the circuit of conductor 9.

The plugs *h* and *h'* have in addition to their usual line-contact other contact-pieces *p*, which are arranged to register with the thimbles *e* of spring-jacks, into which they are

inserted. The contact *p* of plug *h* forms the terminal of a wire 10, which leads to the free pole of the grounded battery *f*. It is interrupted, however, at switch-contacts controlled by the relay *l*. One portion of the conductor is connected with the lever of the relay. A branch from the other portion extends to the forward contact-anvil of the relay, including a resistance-coil, and a parallel branch from the same portion extends to the back contact of the relay and includes the clearing-out signal-lamp *q*. The contact-piece *p* of plug *h'* likewise forms the terminal of a wire 11, leading to the same pole of the battery *f*. This wire includes a supervisory-signal lamp *r*, which is associated with plug *h'* in the switchboard, being, if desired, located near the normal resting-place of the plug. About this lamp is a shunt-circuit 12, which includes an auxiliary winding *o''* of the relay *o*, together with a pair of switch-contacts *o'''* and *o''''*, controlled by that relay, arranged to be closed when the relay becomes excited. The armature-lever of the relay closes also other contact-pieces *o''''* and *o'''''*, which ordinarily create a break in a shunt-circuit 13 about the winding *o'* of the relay.

The operation of these different devices in the process of establishing connection between the two telephone-lines may now be traced. The removal of the receiving-telephone from its switch-hook at one of the substations—say at station A—permits the battery *c* to create in that line a current which excites the relay *b* and causes the display of the line-signal *g* in the switchboard. In response to this signal the attendant inserts an answering-plug *h* into the spring-jack *a* of the line, and at the same time brings her telephone into connection with the plug-circuit 6 7, and thus into communication with the calling subscriber by means of listening-key *k*. The insertion of plug *h* into the spring-jack brought the conductor 10 into parallel with the signal-lamp *g*, the two thus in multiple connection being in series in a circuit containing the battery *f* and the resistance-coil *d*. Under this condition the current divided between the two lamps would be insufficient to light either. It will be observed, however, that since the line-circuit at the substation was already closed for the use of the telephone in giving the order when the plug *h* was inserted into the spring-jack a current was produced from battery *c* through the windings of relay *l*, whereby the latter was excited and caused to close the conductor 10 through the resistance-coil, leaving the clearing-out lamp on open circuit. Thus in the act of making connection with the line the line-signal became extinguished, while the clearing-out signal *q* remained unlighted. Having received from the subscriber the order for the required connection, the operator inserts plug *h'* into the spring-jack *a* of the line to station B and operates the calling-key *i* to ring the bell at that station. The act of inserting this plug

into the spring-jack brought conductor 11 into parallel with conductor 4, as in the case of the calling-line; but since the relay *b* of the called line is not excited and the circuit through the line-lamp *g* of that line is not complete current from battery *f* will flow through conductors 11, 4, and 3 sufficient to light the lamp *r*. This lamp will remain in this condition until the subscriber at the called substation responds to the call and removes his telephone from the switch for use. Then since the line-circuit will become closed through a path of low resistance at the substation current from battery *c* will flow through the windings of relay *l* and through conductor 7 of the plug-circuit, including the winding *o'* of relay *o* to the substation, returning through the other line conductor to battery *c*. The current through winding *o'* excites that relay and causes its armature to close both pairs of switch-contacts *o*³ *o*⁴ and *o*⁵ *o*⁶. The closing of the former pair of contact-points completes the shunt 12 about the supervisory lamp *r*, and thus brings about the extinction of this lamp. The current through this shunt excites the relay through the agency of auxiliary winding *o*², whereby the relay is put into a self-sustaining condition, which permits it to remain closed thereafter independently of current in the line-circuit. The closure of contact-points *o*⁵ *o*⁶ short-circuits the winding *o'* of the relay in the plug-circuit, and thus eliminates its resistance and impedance from the circuit. The line-lamp of the answering subscriber does not become illuminated, since it is at all times shunted by the conductor 11. The line-circuits and apparatus have now reached a condition which is maintained during the continuance of conversation. If the calling subscriber at station A should replace his telephone on its switch, the relay *b* of that line would become inert and would interrupt the circuit through the corresponding line-signal; but since the relay *l* would still be excited by current flowing out to the station B the clearing-out signal *q* would not be illuminated. If subscriber at station B should replace his telephone on its switch, the telephone at station A being still in position for use the supervisory signal *r* would not become lighted, since it would still be shunted by the closed circuit 12. At the termination of conversation the subscribers at both stations replace their telephones on their switches, and thus interrupt the line-circuits. The supervisory signal *r* remains still shunted by circuit 12, and hence does not become lighted. Current through relay *l* is now interrupted, however, so that this relay becomes inert and permits its armature to close the branch of conductor 10, including the clearing-out lamp *q*. The line-relay *b* of the calling-line having become inert, the circuit through line-lamp *g* is broken. Hence a sufficient current is created by battery *f* in conductors 10 and 4 to light the clearing-out lamp. The illumination of

this lamp constitutes an instruction to the operator to remove the connection between the lines. Thus the mechanism of this invention imparts a definite significance to each of the signal-lamps *q* and *r*. The former is never displayed excepting to call for a disconnection, while the latter is never displayed excepting when indicating that a called subscriber has not yet responded to the signal. The continued display of signal *r* demands another call to the substation or informs the operator that no response can be expected and that connection can be removed.

I claim as my invention and desire to secure by Letters Patent—

1. The combination with a telephone-line and means for producing current in the line while the telephone is in use, of a relay-magnet in the line, a local circuit including a supervisory signal, a normally open shunt about the signal controlled by the contact-points of the said relay, and a magnet-winding of the relay included in the shunt, substantially as described.

2. The combination with a telephone-line and means for producing current in the line in the use of the telephone, of a relay normally in the path of current in the line, a circuit and source of current therein, and switch-contacts for closing the circuit in making connection with the line, said circuit being controlled at a different point by switch-contacts of the said relay, a supervisory signal controlled by the relay and circuit connections of the said circuit including a winding of the relay completed in the closure of said circuit by the relay, whereby the condition of the supervisory signal remains unchanged after the initial response of the relay during connection with the line, as described.

3. The combination with a telephone-line and means for producing current therein, a spring-jack for the line and a plug and plug-circuit connected with the spring-jack, of a relay in the plug-circuit responsive to currents in the line, a normally open local circuit and switch-contacts of the plug and spring-jack adapted to put said circuit in operative condition during connection with the line, a supervisory signal in the local circuit and circuit connections of the relay with said local circuit controlling the current in the supervisory signal, and a winding of the relay associated with switch-contacts thereof adapted to bring the said winding into the local circuit in the response of the relay, as described.

4. The combination with a telephone-line and an extension therefrom through a spring-jack, plug and plug-circuit, a source of current connected with the plug-circuit, and means for closing the line at the station during the use of the telephone, of a relay having its magnet included in the plug-circuit, a local circuit closed in registering contact-pieces of the plug and spring-jack and including a supervisory signal associated with

the plug, a shunt of the supervisory signal, and a winding of the relay included in said shunt, the continuity of said shunt being controlled by switch-contacts of the relay closed 5 when it is excited, substantially as described.

5. The combination with a telephone-line and means for producing current therein while the telephone is in use, of a relay having one winding interposed in the telephone- 10 circuit, a supervisory signal controlled by the relay, a local circuit and an auxiliary winding of the relay included in said circuit together with a source of current, said local circuit being controlled by switch-contacts 15 of the relay to be closed when the relay is excited, a normally broken short circuit of said first-mentioned winding, and other switch-contacts of the relay closed when the relay is excited to complete said short circuit; whereby the supervisory signal is effaced 20 and the winding of the relay interposed in the telephone-line is short-circuited when the telephone is brought into use, as described.

6. The combination with telephone-lines 25 provided with switches adapted to close the lines during the use of the telephones and united through spring-jacks, plugs and a plug-circuit, of a source of current connected in a branch from the plug-circuit, an electromag- 30 net in said branch controlling a clearing-out signal, being adapted to display the signal when the magnet is inert, a relay-magnet interposed in the line-circuit to the called station, and a supervisory signal controlled there- 35 by, a local circuit including a winding of the said magnet and normally broken at two points, switch-contacts closed by the relay to complete one of said breaks, and registering switch-contacts in the plug and spring-jack 40 completing the other of said breaks, whereby the supervisory signal is made indicative of the disuse of both telephones while the supervisory signal is adapted to signalize the use of the telephone at the called station, as de- 45 scribed.

7. The combination with a telephone-line and means for producing current in the line during the use of the telephone, a line-relay responsive to currents in the line, a local cir- 50 cuit controlled thereby, and a subsidiary signal in said local circuit, of an extension from

the line through a spring-jack, plug and plug-circuit, a magnet having a winding interposed in the plug-circuit, a conductor closed through registering contact-pieces of the 55 spring-jack and plug in shunt of the said subsidiary line-signal, a supervisory signal included in the said conductor, and a shunt about the supervisory signal controlled by the said magnet in the plug-circuit, substan- 60 tially as described.

8. The combination with a telephone-line, means for producing current in the line during the use of the telephone, a relay connected with the line responsive to current 65 therein, and a spring-jack and plug for making connection with the line, of a local circuit including a source of current and a resistance-coil divided into two parallel branches, one of said branches being controlled by the 70 line-relay and including a secondary signal, and the other of the branches being closed in registering contacts of the spring-jack and plug, a supervisory signal and a resistance-coil, and a relay adapted to interpose the 75 supervisory signal or the resistance-coil alternately into the second-mentioned branch, as described.

9. The combination with a telephone-line, a source of current in the line, a switch at the 80 substation for closing the circuit in the use of the line, and a plug and spring-jack forming a part of the circuit of the line, of a relay in the line and a signal controlled thereby, circuit connections controlled by the said re- 85 lay adapted to remove the resistance of the relay from the line when the relay is excited, other local-circuit connections including a winding of the relay, and switch-contacts of the relay adapted to close the said local cir- 90 cuit at one point controlled by the relay, to be closed when the relay is excited, and other switch-contacts controlling the said local circuit closed in registering contacts of the plug and spring-jack, substantially as described. 95

In witness whereof I hereunto subscribe my name this 5th day of November, A. D. 1896.

CHARLES E. SCRIBNER.

Witnesses:

ELLA EDLER,
DUNCAN E. WILLETT.