

No. 659,768.

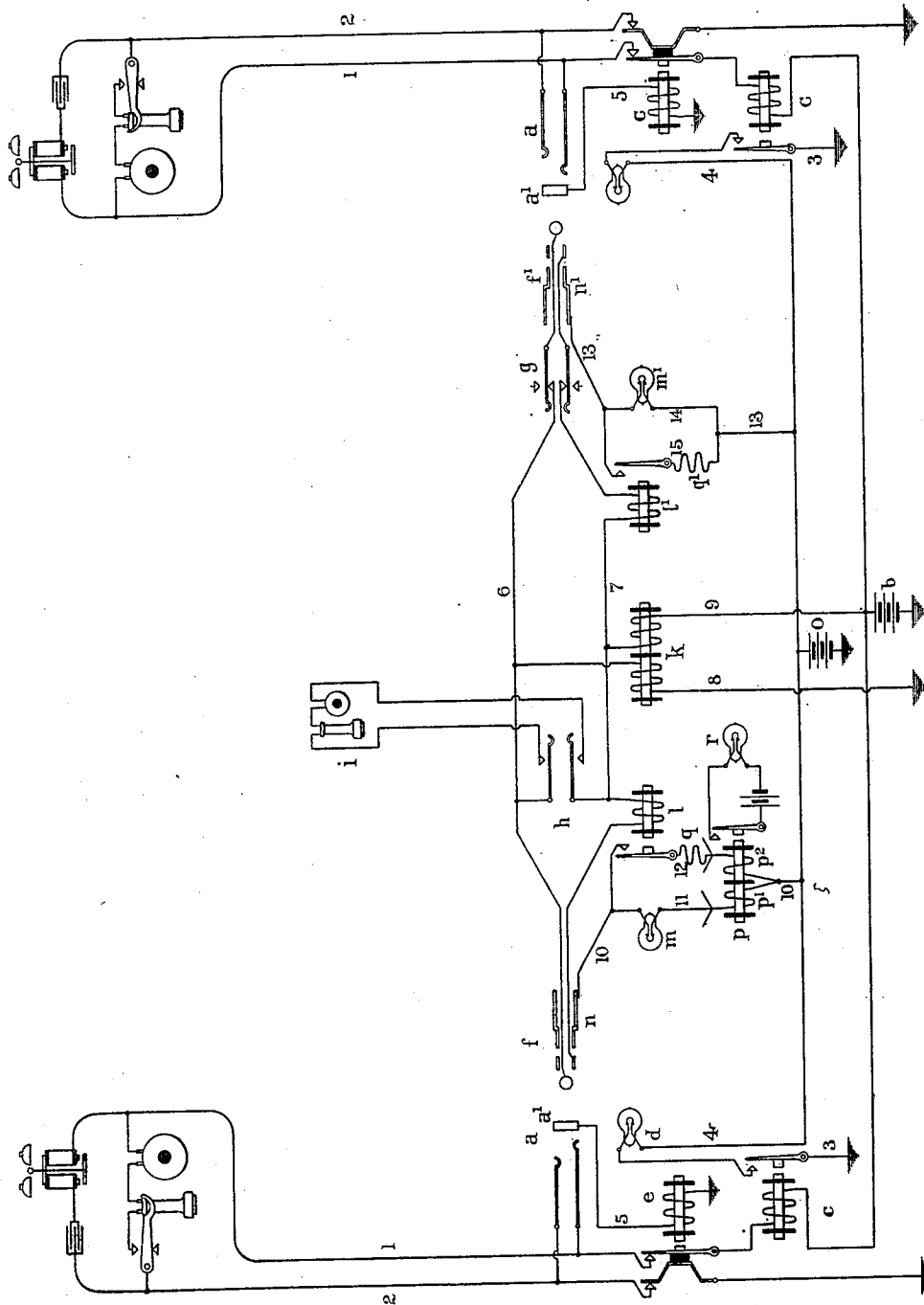
Patented Oct. 16, 1900.

C. E. SCRIBNER.

PILOT SIGNAL FOR TELEPHONE SWITCHBOARDS.

(Application filed Mar. 11, 1897.)

(No Model.)



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UNITED STATES PATENT OFFICE.

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PILOT-SIGNAL FOR TELEPHONE-SWITCHBOARDS.

SPECIFICATION forming part of Letters Patent No. 659,768, dated October 16, 1900.

Application filed March 11, 1897. Serial No. 626,955. (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 Pilot-Signals for Telephone-Switchboards, (Case No. 444,) 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.

This invention is a pilot-signal for use in switchboards of telephone-exchanges designed to be associated with the supervisory signals in the switchboard, the pilot-signal being an indicator common to a considerable group of supervisory signals and serving to attract the operator's attention to any supervisory signal which may become displayed, while avoiding the necessity for her constant observation of those signals.

The invention applies to switchboards of the type commonly known as "automatic signal-boards," in which individual-line signals and supervisory signals temporarily associated with united lines are operated automatically by current determined in the use of the substation-telephones. In a particular form of such switchboards described in a prior application, (Case 437,) filed December 8, 1896, Serial No. 614,877, I have disclosed a mode of controlling supervisory lamp-signals through the agency of relays associated with the plug-circuits and responsive to currents in them, the circuits of the signals being so arranged that the relays close shunts about the signal-lamps to prevent their display during the existence of current in the lines while the station-telephones are in use. The pilot-lamp of the present invention is designed to operate in conjunction with the apparatus of the former invention referred to, a single pilot-lamp signal and a relay controlling it being associated with all the plug-circuits assigned to a single operator.

The invention consists in a relay or other electromagnetic appliance controlling a pilot-signal and in circuit connections thereof with the group of supervisory signals and the group of shunt-circuits therefor, by which the electromagnet of the relay or other appliance is

excited while current exists in any lamp, but not in the shunt thereof, and is rendered inert during the existence of current in both the lamp and its shunt. One terminal of each of the lamps is led to a common conductor, which is connected with a pole of the exciting-battery through a winding of the magnet controlling the pilot-signal. A terminal of each of the shunts about the same lamps is led to another common conductor connected with the same source of current and including another winding of the relay arranged differentially with respect to the first-mentioned winding. Thus while any lamp remains lighted, its shunt being open and the pilot-controlling magnet being excited, the pilot-signal will be displayed; but when the shunts about all the lamps in use are closed the magnet is rendered inert and the pilot-signal is hidden.

The signal is preferably associated with the answering-plugs only of the operator's pairs of plugs, since the supervisory lamps belonging to those plugs are rarely lighted for any other purpose than to call for disconnection, so that the display of the pilot-signal may be accepted as indicating a call for disconnection on some pair of connected lines, the particular lines calling for disconnection being indicated by the display of the supervisory signals of the plug-circuit uniting them.

The invention is shown in the attached drawing, which represents two substations connected with the usual appliances for automatic signaling in a telephone-switchboard.

The apparatus and the arrangement thereof at the substation may be according to any of the several plans commonly used in switching systems furnished with automatic signals. The line-circuit may be completed through the substation call-bell, a condenser being interposed in the circuit to break its continuity as to continuous currents, while permitting the flow of the alternating calling-current, and the telephone-switch may be arranged to close a circuit of comparatively-low resistance through the substation transmitting and receiving telephones when the receiving-telephone is removed from it for use. The line-circuit 1 2 is led from the substation to the usual spring-jack *a* in the switch-

board, from whence the line conductors extend to a pole of a grounded battery b and to earth, respectively. The line conductor 1 includes the magnet of a signal-controlling relay c , which is adapted to close a local circuit 3 4 through the lamp-signal d , associated with the spring-jack a in the switchboard when the magnet is excited. The switch-contacts of a cut-off relay e are interposed in the line conductors 1 and 2. These are designed to sever the earth connections of the line during conversation, and to this end the magnet of the relay c is connected in a wire 5, leading to a special contact-piece a' in the spring-jack, which is constructed to cooperate with certain contact-pieces and circuits of the connecting-plug during the use of the line to cause the excitement of the magnet.

The usual plugs f and f' are furnished for the use of the operator in uniting lines. Each plug comprises three contact-pieces, which are properly placed to register with the three contact-pieces of a spring-jack when the plug is inserted into the jack. The first and second contact-pieces of the two plugs of a pair (those contacts which become connected with the line-springs of the spring-jack) are united through conductors 6 and 7, which constitute the plug-circuit. The usual calling-key g is interposed in this plug-circuit for looping a generator of calling-current into circuit with the plug f' , and a listening-key h is provided for bringing the operator's telephone i into a bridge of the plug-circuit. Wires 8 and 9 lead from the wires 6 and 7 to the pole of battery b and to earth, respectively, a winding of an impedance-coil k being interposed in each of the wires. These wires are, in effect, a bridge of the plug-circuit 6 7, which includes the source of current b , shunting of telephonic current through the bridge being prevented by the impedance of coil k . The magnets of two relays l and l' are interposed in the conductor 7 of the plug-circuit, one at each side of the wire 9. These relays serve to control the supervisory signals m and m' , which are associated with the plugs f and f' , respectively.

The third or sleeve contact n of plug f forms the terminal of a conductor 10, which is made up in part of the two wires 11 and 12, and which leads to the free pole of a grounded battery o . The former of these wires includes the supervisory signal-lamp m , referring to plug f , together with a winding p' of the pilot-controlling relay p . The latter conductor 12 includes a resistance-coil q , together with a winding p^2 of relay p , differential with respect to winding p' , and is controlled by the switch-contacts of relay l , being closed when the relay is excited. The relay p controls a local circuit including the pilot-lamp r , which should be placed in a suitable position to be directly under the operator's observation. The portion of conductor 10 which is connected with the battery o , together with those portions of wires 11 12 which traverse the

windings p' and p^2 of relay p , may be common to all the plug-circuits assigned to an operator. Branches have been shown emanating from the wires 11 and 12, which represent conductors extending to the lamps and to the shunts, respectively, of other pairs of plugs. The relay p is thus common to a large number of pairs of plugs.

The contact-sleeve n' of plug f' forms the terminal of a conductor 13, made up in part of wires 14 and 15, the former of which includes lamp m' and the latter of which includes a resistance-coil q' and is controlled by the switch-contacts of relays l' .

In the idle condition of the switchboard apparatus all the lamp-signals are dark, the magnet of relay p is inert, and the local circuit of pilot-lamp r is open.

The removal of the telephone at a substation for use permits the switch at the station to connect the line conductors 1 and 2 through a path of low resistance, whereby the relay c is excited and the lamp d is illuminated. Responding to the call-signal, the operator inserts plug f into spring-jack a , whereby the plug-circuit and through its agency her telephone are brought into connection with the calling-line. At the same time a circuit of battery o is completed through the conductor 10, contact-pieces n and a' of the plug and spring-jack, and wire 5, whereby the cut-off relay is excited and the normal ground connections of the line are severed, the lamp d being thereby deprived of current. The completion of local circuit 10 5 supplies current for illuminating supervisory lamp m ; but the same act of the operator brings the relay l into a circuit of battery b , which is closed through the telephones at the calling substation, so that the relay being excited closes the shunt-wire 12. The closing of this shunt diverts sufficient current from the circuit 11 to put out the lamp m . The currents through windings p' and p^2 of relay p should now neutralize each other's effect upon the core of the relay, leaving the core inert. The pilot-lamp r will then remain dark.

Having learned the calling subscriber's order, the operator may make connection with the called line by inserting plug f' into the spring-jack a of that line. Until the telephone is removed from its switch at the called substation the supervisory signal m' will be lighted. In the subscriber's response to the call the lamp will become dark. At the termination of conversation between the substations both telephones will be replaced on their switches and both relays l and l' will be thereby deprived of exciting-current. Their armatures will be released and will open the shunts 12 and 15 about the lamps m and m' , so that these lamps will become lighted, their simultaneous illumination being a signal for disconnection. When through the breaking of the shunt-wire 12 the equilibrium between the magnetizing effects of windings p' and p^2 of relay p is disturbed, the core of the relay

is magnetized and the local circuit, including lamp *r*, is closed. The illumination of the pilot-lamp immediately calls the operator's attention to the displayed supervisory signals *m* and *m'*, whereupon she removes the connection between the lines.

It is obvious that since the presence of current in both wires 11 and 12 to each answering-plug *f* leaves the magnet *p* inert the magnet is free to indicate the cessation of current in the shunt-wire 12 to any plug with which it is associated. Hence the pilot-signal *r* will be dark as long as the telephones at all calling-stations are in use, but will become lighted when the receiving-telephone at any calling-station is hung upon its switch. It will be apparent that other arrangements of circuits and apparatus might be made by which the closure at the same time of the two circuits through the lamp and through its shunt might render the pilot-signal inert, the signal being displayed only in consequence of the presence of current in the lamp-circuit and not in its shunt. Hence I do not desire to be limited to the precise construction here shown.

I claim as my invention—

1. The combination with a signal-circuit and a visible supervisory signal contained therein, a shunt about the signal and a switch controlling the shunt, of an electromagnet and a pilot-signal controlled thereby, said electromagnet having two differential windings, one of which is interposed in said shunt and the other of which is included in a circuit of the said supervisory signal, substantially as described.

2. The combination with a group of signal-circuits, a supervisory visible signal in each circuit, a shunt-circuit about each signal and a switch controlling the shunt, of an electromagnet and a pilot-signal controlled thereby, said electromagnet having differential windings, one of said windings being interposed in a conductor common to said shunts and the other winding being interposed in a conductor common to the said supervisory signals, substantially as described.

3. The combination with the plug-circuits

of a telephone-switchboard, a relay in each plug-circuit responsive to current in the plug-circuit determined in the use of a station-telephone, of a line with which the plug is connected, a local signaling-circuit for each plug including a supervisory signal, and a shunt about each lamp controlled by the switch-contacts of the relay in the corresponding plug-circuit, of an electromagnet and a signal controlled thereby, said electromagnet having differential windings, one of said windings being interposed in a conductor common to said shunts and the other winding being included in a conductor common to said lamps within the shunts, substantially as described.

4. The combination with telephone-lines and link conductors for uniting them, of a signal-controlling magnet in the circuit of the link conductors adapted to be brought into association with the calling-line, means for preventing the control of said signal-controlling magnet from the called line, a signal controlled by the magnet, a local circuit common to all link conductors controlled by one of the magnets, and a common pilot-signal in the local circuit, substantially as described.

5. The combination with pairs of plugs and their plug-circuits adapted for uniting lines having means for determining the flow of current in the lines during the use of the telephones, a supervisory relay in each plug-circuit responsive to such current, a supervisory signal in a local circuit and a shunt of the signal controlled by the relay, of a pilot-signal-controlling electromagnet in a conductor common to several local circuits, and circuit connections of the shunts and the signals adapted to cause the excitement of the pilot-signal-controlling magnet when either is closed but to render it inert when both are closed, as described.

In witness whereof I hereunto subscribe my name this 3d day of February, A. D. 1897.

CHARLES E. SCRIBNER.

Witnesses:

ELLA EDLER,
FRANK R. MCBERTY.