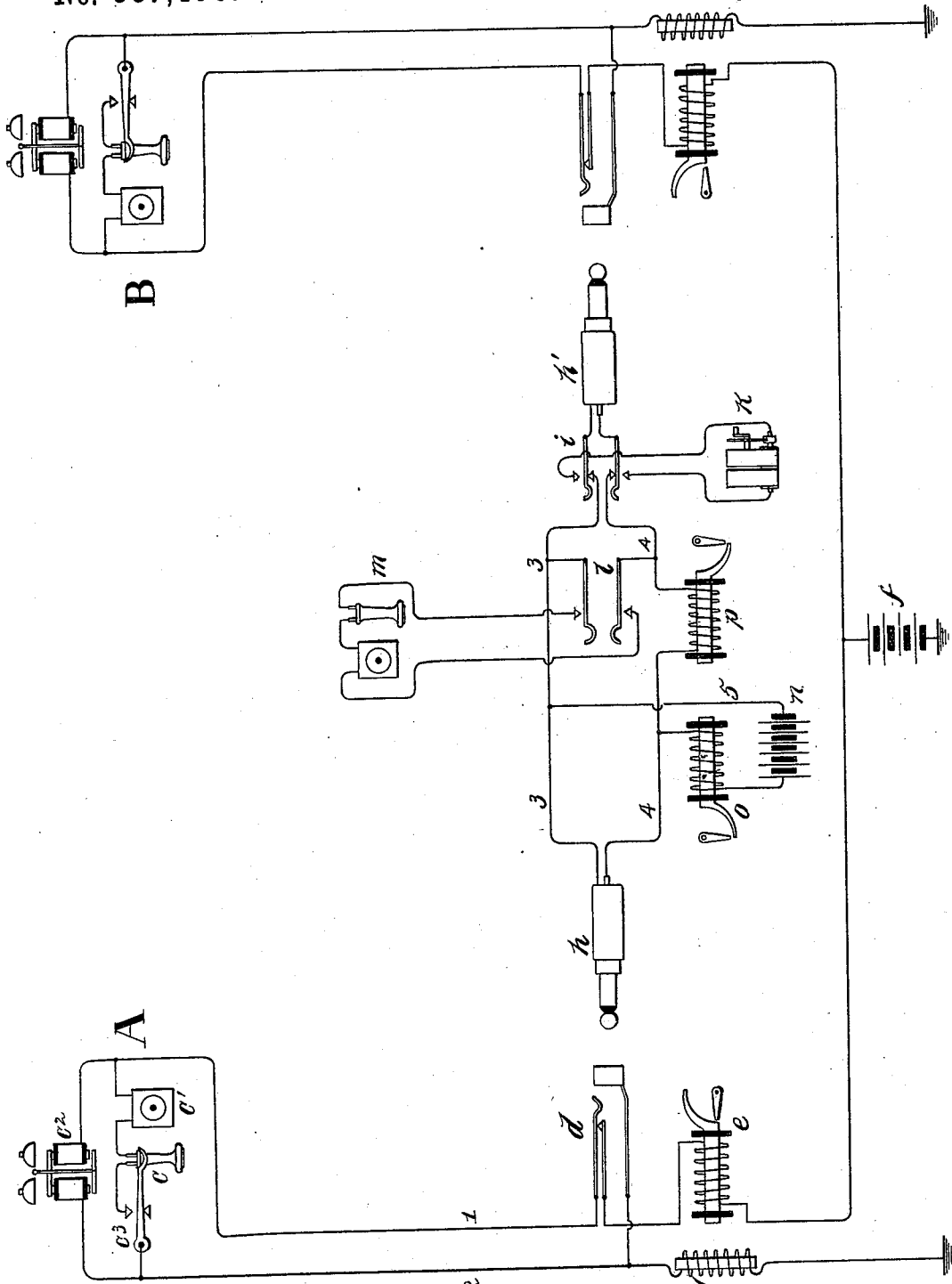


(No Model.)

C. E. SCRIBNER.
SIGNAL FOR TELEPHONE SWITCHBOARDS.

No. 587,405.

Patented Aug. 3, 1897.



Witnesses:
George H. Cragg
W. Clyde Jones.

Inventor:
Charles E. Scribner.
By Barton & Down
Attorneys.

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. 587,405, dated August 3, 1897.

Application filed August 1, 1895. Serial No. 557,828. (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. 397,) 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 is a new arrangement of signals for use in telephone-switchboards, designed to indicate continuously to the attendant the condition of the apparatus at each of two connected substations.

In the operation of telephone-switchboards it is desirable that the attendant may have a signal under her observation which shall indicate the removal of the telephone from its switch-hook for use or its replacement on the switch at the substation of a line or at each substation of two connected lines. In practice these signals, which are known as "supervisory" signals, have been associated with the connecting-plugs furnished the operator for looping lines together. In order that the two supervisory signals, referring to the two terminal plugs of a pair, might respond independently to current in the line-circuits with which they were connected, it has heretofore been necessary either to place the signals serially in the telephonic circuit with a source of current connected to the circuit between them or to separate the two portions of the plug-circuit including the signals by an interposed condenser or repeating-coil.

In my invention I connect one signal in a branch or bridge of the plug-circuit, together with a source of current, and the other signal is interposed in the plug-circuit between that plug which is known as the "connecting-plug" and the point of junction of the other signal with the plug-circuit. During the use of the plug-circuit for looping two lines together the signals are excited and caused to give their indications when the circuit of the source of current through them is completed at the proper substation by the closing of the line-circuit there in the use of the telephone.

In the arrangement I have described as

constituting my invention that signal which is serially included in the plug-circuit will be excited only during the use of the correspondent telephone, or that of the answering subscriber. Hence if connection has been effected with a line and the substation-bell has been rung this signal will indicate the response of the called subscriber in removing his telephone from its switch-hook. After that it will be continuously excited until this telephone has been again replaced on its switch-hook. The signal in the bridge-conductor will, however, be excited as long as either telephone is absent from its switch-hook. Hence it will be displayed from the moment connection is made in answer to a call until, after the termination of conversation, both telephones have been replaced upon their switches. The supervisory signals thus impart to the operator this information: Upon making connection with a line in response to a call the excitement of the bridged signal shows that the telephone of the calling subscriber is off its switch-hook. Upon completing connection with a line called for the excitement of the serially-connected signal shows when the called subscriber responds and removes his telephone from its switch-hook. When the conversation is completed, the deenergization of both signals indicates that both telephones have been returned to their idle positions. If during the existence of the connection the correspondent or answering subscriber should replace his telephone upon its hook, the corresponding signal would be deenergized and would indicate the act of the subscriber. Only the return of both signals to their inert condition would be interpreted by the operator as constituting a signal for the removal of the connection. It will be understood that these signals may be of any suitable type—either incandescent lamps or electromagnetic signals. I prefer, however, that the excitement of the signals should prevent the display of their indicators, their return to an inert condition being shown by the display of the signals. Those acts which require attention on the part of the operator are thus signalized by positive indications of the supervisory signals rather than by the return of these signals to their normal state.

I have shown my invention in the accompanying drawing associated with well-known substation apparatus and the usual switching mechanism at a central station.

5 The substations A and B are furnished with the usual telephonic and signaling apparatus—a receiving-telephone *c*, a transmitting-telephone *c'*, a polarized signal-bell *c²*, and a switch *c³* for closing the telephone-circuit
10 when the receiving-telephone is removed from the hook of the switch. The bell *c²* should be of very high resistance—say of five thousand ohms. The normal resistance of the tele-
15 phones should be about one hundred or two hundred ohms.

The apparatus at station A is connected by line conductors 1 and 2 with signaling and switching mechanism in a telephone-switch-
20 board at a central station. Conductor 1, after extending through the switch-contacts of a spring-jack *d*, is led through a line annunciator or signal *e* to one pole of a battery *f*. Line conductor 2 passes through the helix of
25 an impedance-coil *g* to earth or to the other pole of the same battery.

Signal *e* is of well-known type, having a magnet with a light shutter of magnetic material so pivoted with relation to a prolonga-
30 tion of the magnet-pole that when the magnet is excited the shutter shall be raised into a vertical position, and thus shall be displayed.

Battery *f* may be common to the different lines of the exchange system.

35 Connecting-plugs *h h'* are furnished for the operator, adapted to fit the spring-jacks *d*. The sleeve-contacts of the connecting-plugs are united through a continuous conductor 3
40 of the plug-circuit, and the tips through the conductor 4. These conductors include the switch-contacts of the usual calling-key *i*,
45 which is constructed to separate plug *h'* from the other member of the pair and to connect its terminals with the poles of a generator *k* of signaling-current. A listening-key *l* is also
50 provided, by means of which the operator may connect her telephone set *m* with the plug-circuit 3 4.

In a bridge 5 of the plug-circuit are included a battery *n* and a signal *o*. The signal
55 is of the same type as line-signal *e* except that its target hangs displayed while the magnet is inert and is drawn into a horizontal or concealed position when the magnet becomes excited. A similar signal *p* is included
60 directly in the conductor 4 of the plug-circuit. If desired, the electromagnet of this signal may be shunted by a non-inductive resistance-coil of higher resistance than that
65 of the magnet, this device being a well-known contrivance for preventing the obstruction of telephonic currents by an electromagnet in a telephone-circuit.

The operation of the system shown is as follows: The current from battery *f* through
70 signal *e* and bell *c²*, while the apparatus is not in use, is insufficient to operate the signal on account of the high resistance of the

bell. When the subscriber at station A, for example, removes his receiving-telephone
70 from its switch-hook, the latter closes the circuit through the comparatively-low-resistance telephone instruments, and thus permits sufficient current to flow to excite signal *e* and cause the display of its indicator.
75 Answering the call thus transmitted the operator inserts the answering-plug *h* into spring-jack *d*, at the same time throwing her listening-key *l* into position to bring her telephone set *m* into connection with the plug-circuit 3 4. By the insertion of the plug into
80 the spring-jack the signal *e*, together with battery *f*, is disconnected from line conductor 1, but the wire 5, including battery *n* and signal *o*, is brought into a bridge of the line-circuit 1 2. Current now flows through con-
85 ductor 5 and through the line-circuit, exciting signal *o* and causing its target to be concealed. This indicates to the operator that the subscriber calling is in readiness to answer. She receives the order for the required
90 connection in the usual way. She then inserts plug *h'* into the spring-jack of line to station B—assuming this to be the connection demanded—and operates the key *i* to send a call-signal. No operative circuit as
95 yet exists from battery *n* through signal *p*, since the high-resistance bell *c²* at substation B prevents the excitement of the signal. This condition remains until the subscriber,
100 responding to the call, removes his telephone from the switch-hook. Then signal *p* also becomes excited and conceals its indicator. As long as both signals remain thus hidden
105 the operator knows that both telephones are off the switch-hooks *c³* and assumes that conversation is being carried on. If the subscriber at station B should temporarily hang up his telephone, this will be indicated by signal *p*, but the display of this signal will
110 not be interpreted as indicating a call for disconnection, the target-signal *o* being still concealed. Only when, upon the replacement of the receiving-telephones at both substations, both signals *o* and *p* become displayed
115 will the operator assume that the conversation has been terminated. She will then withdraw the connecting-plugs *h h'* to disconnect the lines from each other.

The prior art is exemplified in Letters Patent No. 518,331 of John I. Sabin and William
120 Hampton, dated April 17, 1894, for a telephone-exchange system.

I claim as new—

1. In combination, two terminal plugs of a pair and the plug-circuit thereof, means for
125 connecting a generator of signaling-current with one of the plugs, a bridge of the plug-circuit, a source of current and a signal in the bridge, and another signal included in a conductor of the plug-circuit between the
130 said bridge and that plug with which the generator of signaling-current may be connected, as described.

2. In combination, two telephone-lines

5 united by a plug-circuit, one of said lines being closed and the other open at its substation, a bridge of the plug-circuit, a source of current and a signal included in the bridge,
10 another signal included serially in the circuit between the said bridge and that station at which the line-circuit is interrupted, and a switch for closing the line-circuit there during the use of the telephone, as described.
15 3. The combination with two telephone-lines and a pair of cords and plugs adapted to unite the said lines together, of a bridge-circuit across the cords in which bridge are included a signal device and a source of current, a source of signaling-current and a switching device adapted to connect the said source of signaling-current into the cord-circuit be-

tween the said bridge and the connecting-plug *h'* and a signaling device, as *p*, placed serially in one of the cords of the said connecting-plug between the said bridge and said connecting-plug, whereby the signal in the bridge indicates the continued use or activity of either subscriber's telephone, and the connecting-plug signal *p* indicates when the called subscriber responds to signaling-current sent over the line.

In witness whereof I hereunto subscribe my name this 13th day of June, A. D. 1895.

CHARLES E. SCRIBNER.

Witnesses:

ELLA EDLER,
MYRTA F. GREEN.