

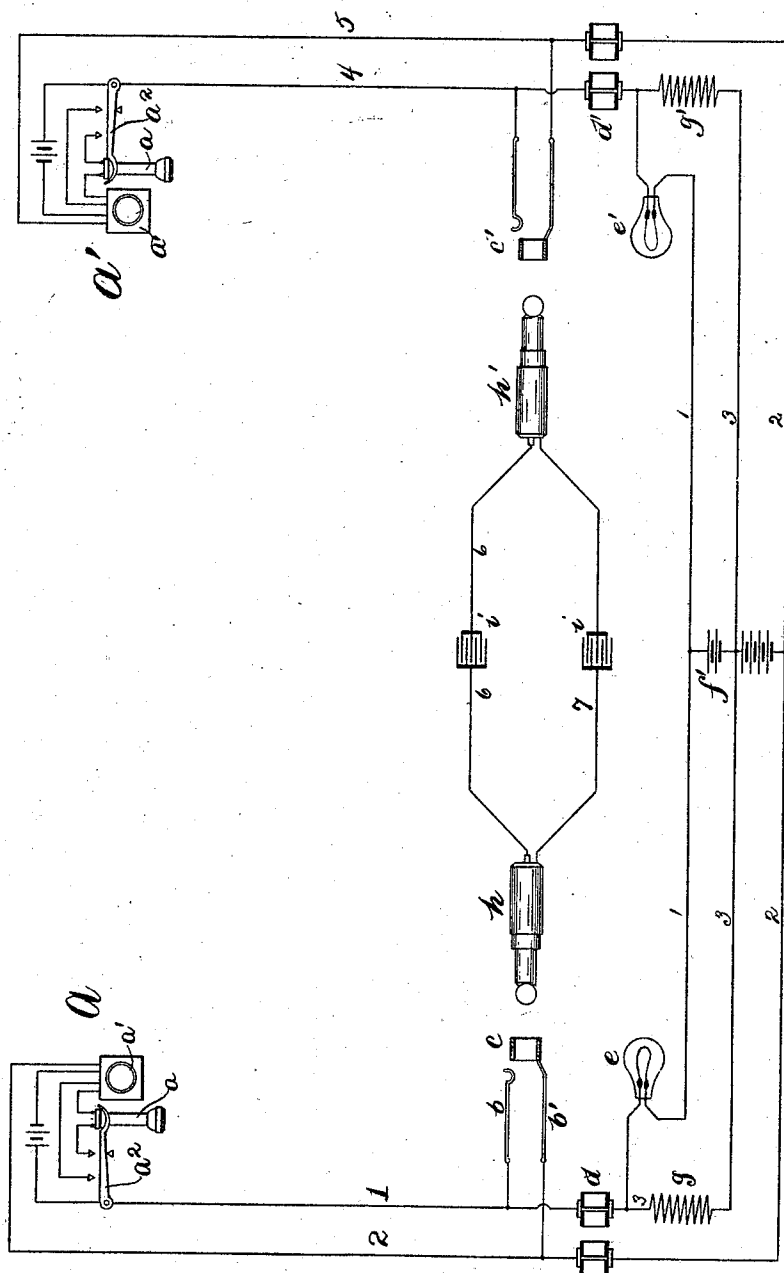
(No Model.)

C. E. SCRIBNER.

SIGNALING APPARATUS FOR TELEPHONE SWITCHBOARDS.

No. 550,765.

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UNITED STATES PATENT OFFICE.

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

SIGNALING APPARATUS FOR TELEPHONE-SWITCHBOARDS.

SPECIFICATION forming part of Letters Patent No. 550,765, dated December 3, 1895.

Application filed April 16, 1895. Serial No. 545,856. (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 Signaling Apparatus for Telephone-Switchboards, (Case No. 382,) 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 relates to the use of electric incandescent lamps or other incandescent conductors in transmitting signals, its object being to permit or cause the display of the signal with a comparatively slight variation of the signaling-current.

As is well known in the art to which my invention pertains, an incandescent lamp or other incandescing conductor when traversed by a current somewhat less than its normal current, is not illuminated. In other words, a current which is a comparatively large fraction of the current required to bring the filament or incandescing conductor to full illumination may be passed through the conductor without perceptibly illuminating it. For example, a filament or a conductor which requires for its full illumination three-tenths of an ampere will remain dark when traversed by two-tenths of an ampere. I have made use of this characteristic of incandescent lamps by providing means for continuously exciting the lamp with a current which is barely insufficient to cause an illumination which shall constitute a signal, the lamp being included in the signaling-circuit in which at will an additional current may be created sufficient to cause the full illumination of the lamp—the display of the signal. Thus the signal-lamp may be excited to give its signal by a current in the signaling-circuit which is much less than the full current necessary to illuminate the lamp and which may be produced in a circuit of comparatively high resistance or with current of low electromotive force.

My invention is designed to apply particularly in telephone-exchange systems in which a signal-lamp is included directly in each line-circuit for the purpose of indicating sig-

naling-current in the telephone-line created by or during the use of the telephone. Such lines are frequently of high resistance and the different lines of an exchange system are of widely-different resistances. In adapting my invention to this use I connect in the line-circuit or in a branch from it at the central station a signaling-battery and a small signal-lamp, the sub-station apparatus being adapted to close the line-circuit only during the use of the telephone. I connect a shunt-circuit about the lamp and such a portion of the signaling-battery that the current created by the battery through the lamp is barely insufficient to illuminate the lamp. This shunt should contain a slight resistance, a resistance approximately equal to that of the lamp being sufficient. When then the line-circuit is completed at the sub-station, the lamp is traversed by sufficient additional current to cause its illumination, and thus to display the signal. Obviously if the lamp-signaling circuit be of comparatively low resistance, so that a considerable current is created in it by closing the circuit at the sub-station, the current in the local circuit formed by the lamp and its shunt need not be large, or when the lines of the exchange system of different resistances are to be supplied from a common signaling-battery or from equal batteries the normal currents through the different signal-lamps may be so adjusted as to strength that the lamps shall be uniformly illuminated when displayed.

I have illustrated my invention in the accompanying drawing, which represents two telephone-lines connecting sub-stations with a central station and including signal-lamps, together with the usual mechanism for establishing electrical connection between different lines.

The sub-stations A and A' are represented as being equipped each with a telephone-receiver *a* and a transmitter *a'* and with a telephone-switch *a*², which operates to close the local circuit of the transmitter and to close the line-circuit through the telephone when the latter is removed from the switch-hook. The apparatus of station A is connected by line-wires 1 and 2 with the contact-pieces *b* and *b'* of a spring-jack *c*, located in a tele-

phone-switchboard. The line conductor 1 is extended through an impedance-coil d and a lamp-signal e to one pole of a battery or other source f' of current. The line conductor 2 is connected through an impedance-coil with the other pole of the same battery. The signal-lamp e may be located near the spring-jack c , so as to be associated with the spring-jack. In shunt of the lamp and of a portion of the signaling-battery a conductor 3 is connected, its terminals being connected with conductor 1 intermediate of the impedance-coil and the lamp-signal and with the battery or other source of current at such a point as to receive a suitable electromotive force. The conductor 3 includes a resistance-coil g , having a resistance which may be approximately equal to that of the lamp. The relation between the resistance of the lamp plus that of the resistance-coil g and the electromotive force of the battery f' , included in the circuit formed by the shunt 3 and the portion of the line 1, including the lamp, should be such that a current is maintained in this local circuit not quite sufficient to illuminate the lamp e .

The apparatus of sub-station A' is connected by other line conductors 4 and 5 with a spring-jack c' and a line-lamp e' in the same switchboard. The line conductors are extended to the poles of the common signaling-battery f . A similar local or shunt circuit is arranged for the signal-lamp to maintain it near the point of illumination.

The switchboard is equipped with a pair of double connecting-plugs h and h' whose like contact-pieces are united by two conductors 6 and 7, respectively. In each of these conductors of the plug-circuit a condenser i may be included for the purpose of maintaining the independence of the line-signals of two connected lines—that is, of preventing the closing of the line-circuit at one sub-station from operating the signal-lamp of the other line. The plug-circuit 6 7 may also be provided with the usual calling-key and source of calling-current for operating a subscriber's bell and with a listening-key for connecting an operator's telephone set with the plug-circuit to enable her to communicate with the subscribers. This apparatus is well known, being in general use, and need not be described or illustrated.

In the normal condition of the apparatus the plugs are withdrawn from the spring-jacks. The telephones at the sub-stations rest on the switch-hooks a^2 , whereby the line-circuits are interrupted at the contact-points of the switch. The portion f' of the signaling-battery included in the local circuit through each signal-lamp maintains in each lamp a current which does not illuminate the lamp—say two-tenths of an ampère.

Assume that subscriber at station A wishes to communicate with subscriber at station A' . The first-mentioned subscriber by removing his telephone from its switch-hook closes to-

gether the line conductors 1 and 2 and thus completes the circuit of battery f , the path of the current at the sub-station being through the induction-coil of the telephone-transmitter a' , the telephone a , and the switch a^2 . The greater portion of the current thus created by the battery f flows through the signal-lamp e , the current being in effect added to that already existing in the lamp-circuit. Assuming that the additional current thus created amounts to a little more than one-tenth of an ampère, the line-lamp will now be fully illuminated. Observing the illumination of the lamp e , the operator answers the call and receives the subscriber's order in the usual way, and finally completes the desired connection between the stations A and A' by inserting the plugs h and h' into the spring-jacks c and c' , respectively. When the subscriber at station A' has removed his telephone in order to communicate with his correspondent, the signal-lamp e' in that line also is illuminated. The lamps remain illuminated until, the conversation being terminated, the telephones are replaced on their switch-hooks. The extinguishing of both signal-lamps is interpreted by the attendant at the switchboard as a signal that the lines may be disconnected. If the resistance of the line-circuit 4 5 should be different from that of the circuit 1 2, the resistance of the coil g' should be adjusted so as to give such a current in the local circuit through the lamp e' that the latter will be illuminated by the additional current in the line-circuit 4 5, to the same degree that the signal-lamp e is illuminated when its line is closed. For example, if the line-resistance of lines 3 4 were such that the signal-battery alone was capable of creating a current of two-tenths of an ampère through the lamp then the current normally traversing this lamp through the local circuit might be reduced by the resistance-coil g' to one-tenth of an ampère. Obviously the same adjustment of current-strength might be attained by adjusting the electromotive force in the local circuit, the number of cells f' included within the local circuit being suitably varied.

Although I have described my invention in connection with telephone-lines and for signaling purposes therein, it is clearly applicable for numerous other purposes and in other combinations.

I claim as new and desire to secure by Letters Patent—

1. The combination with an electric signaling circuit including a source of current and a signaling instrument adapted to be displayed when excited by a predetermined current, of a shunt about the signaling instrument forming, with a portion of the signaling circuit, a closed local circuit through the signaling instrument including a source of current, the current in the local circuit being almost sufficient to display the signal, substantially as described.

2. The combination in a signaling circuit

including a source of signaling current and divided at one point into two parallel branches, of an electric incandescent lamp in one branch, a resistance coil in the other branch, and a source of current in one of the branches, the normal current through the lamp being adjusted to be insufficient to illuminate the lamp, substantially as described.

3. The combination with a telephone circuit, of a source of current permanently included in the circuit, and means at the substation for closing a normal interruption of the circuit, the signaling circuit being divided at one point into two parallel branches, an incandescent lamp included in one of said branches, a resistance coil in the other branch, a source of current in one of the branches, the strength of the current produced in the local circuit formed by the two branches being so adjusted with relation to the signaling current in the entire signaling circuit that when both circuits are closed the current through the lamp is sufficient to illuminate it, substantially as described.

4. The combination with several telephone lines having different resistances, each includ-

ing a source of electric current and normally open at a substation, and each divided at one point into two parallel branches, of a signal lamp in one of each pair of parallel branches and a resistance coil in the other, and a source of current in one branch of each pair, the resistance and electromotive force in each local circuit through a signal lamp being so adjusted to each other that the normal currents through the different lamps and the signaling currents in the corresponding lines illuminate the different lamps to the same degree, substantially as described.

5. The combination with a telephone circuit extending between central and substations, of a partially excited signaling instrument in the circuit at the former station, and means actuated by the removal of the telephone from its support for the complete excitation and operation of the said signal.

In witness whereof I hereunto subscribe my name this 3d day of April, A. D. 1895.

CHARLES E. SCRIBNER.

Witnesses:

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