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H. P. CLAUSEN.

ELECTRICAL SIGNALING SYSTEM.

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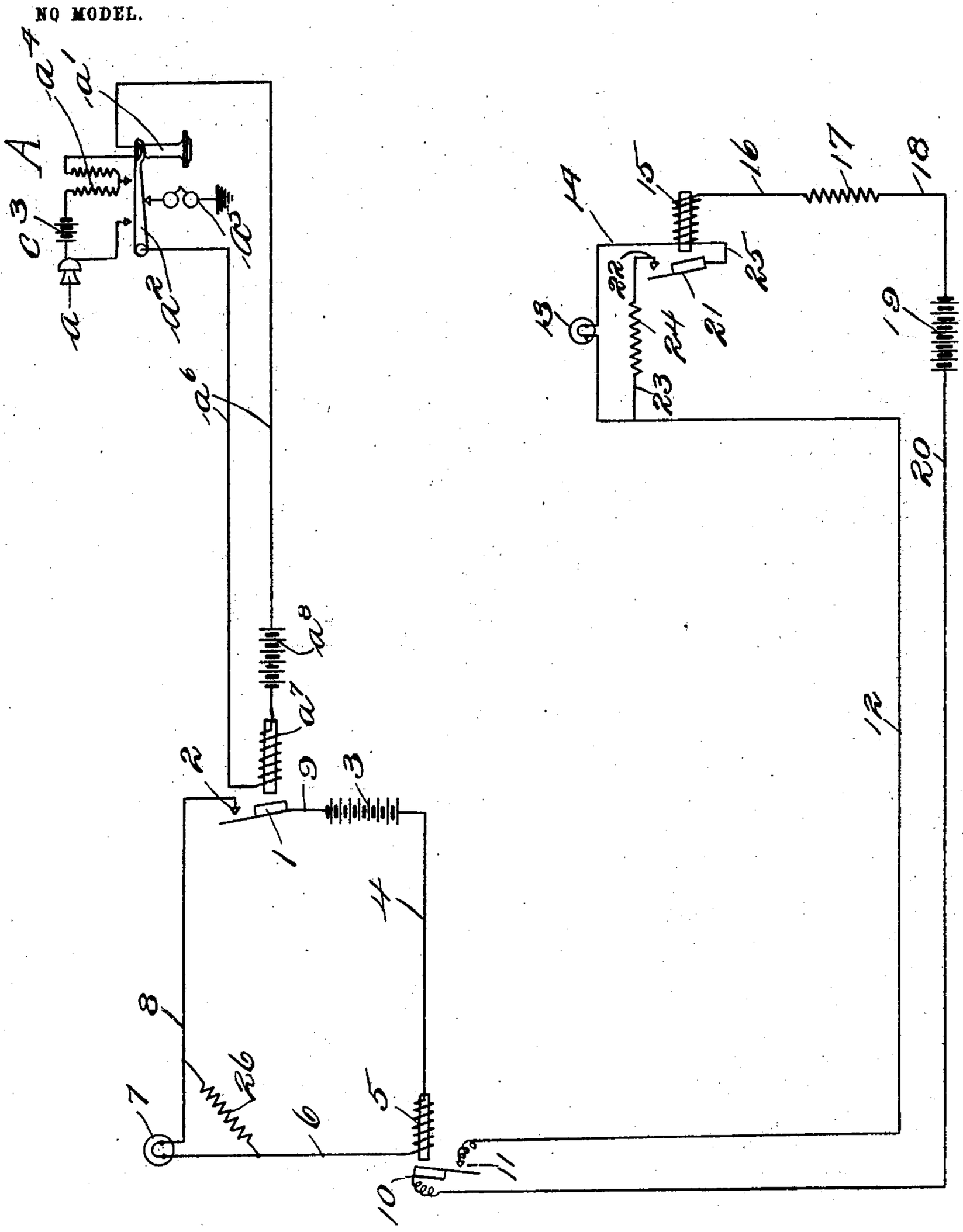
NO MODEL.



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No. 749,982. Patented January 19, 1904.

UNITED STATES PATENT OFFICE.

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ELECTRICAL SIGNALING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 749,982, dated January 19, 1904.

Application filed December 19, 1901. Serial No. 86,485. (No model.)

To all whom it may concern:

Be it known that I, HENRY P. CLAUSEN, a citizen of the United States of America, and a resident of Chicago, Cook county, Illinois, have invented certain new and useful Improvements in Electrical Signaling Systems, of which the following is a specification.

My invention relates to electrical signaling circuits and devices, and more particularly to signaling circuits or devices for telephone systems.

In telephone systems comprising substations and a central station it is usually the practice to provide a calling-signal at the central station, so that a subscriber at one of the substations can signal the central station, and to also provide at said central station an extension or pilot signal, which is usually located at the desk of the manager or chief operator. The said calling-signal is usually located on the switchboard, so as to enable a subscriber at one of the substations to attract the attention of the switchboard operator. With this arrangement the calling-signal responds directly to a call sent in from the substation, and this signal is then extended to the extension or pilot signal at the desk of the manager or chief operator. In this way when the system is in its normal condition both the switchboard operator and the manager or chief operator are advised or made aware of every call that comes into the exchange or central station. It will often happen that the calling-signal will not respond to a call, and for this reason each calling-signal is usually provided with a shunt, whereby the extension or pilot signal at the manager's desk will operate regardless of whether the calling-signal operates or not. Both the calling-signal on the switchboard and the extension or pilot signal at the desk of the manager are preferably in the nature of incandescent lamps which light up or glow when a call is sent in, so as to advise the switchboard operator and also the manager that the subscriber at the substation to which the calling-signal is allotted desires connection with some other substation. With the provision of the said shunt the lamp at the desk of the manager will always light up or glow regardless, as stated, of whether the calling-signal lamp at the switchboard is burned out or not. In a telephone system of this character it also often happens that certain of the devices are improperly operated and that the circuits are only closed momentarily and not for a period long enough to make the calling-signal and the extension-signal respond to the call. For example, an impatient subscriber at a substation may operate or vibrate the switch so rapidly that the lamp-circuits only close for an instant, and in such case the lamps do not glow or respond to the call or at most glow but feebly and only for an instant. This is for the reason that the current-supply for each lamp is ordinarily only sufficient to light the lamp, and the momentary closing of the circuit does not, therefore, permit the current to light the lamp. It is evident, then, that the signaling devices at the central station as ordinarily constructed and arranged will not operate under some conditions, and particularly in case of a rapid vibration of the switch or circuit-closing device at the substation.

It is the object, therefore, of my invention to provide suitable devices and a circuit arrangement whereby a signaling-lamp will always light up and respond to a signal regardless of whether the circuit of such lamp is closed for some time or only for an instant. In other words, I make provision whereby a signaling-lamp is enabled to respond instantly to a call or other signal and whereby said lamp will light up or glow to its full candle-power simultaneously or practically simultaneously with the closing of its circuit. In this way the said extension or pilot signal lamp, for example, can be rendered capable of responding to a call regardless of the manner in which the subscriber operates the switch or circuit-closing device at the substation and regardless of whether the lighting-circuit for such lamp is closed for some time or only for a brief instant. This I preferably accomplish by providing an abnormally strong current-supply for the lamp—that is to say, by providing an arrangement whereby considerably more than the amount of current

required to light the lamp is available upon the initial closing of the circuit. With this arrangement the initial closing of the circuit subjects the lamp to an abnormally strong current, thereby causing the lamp to respond instantly to such closing of the circuit and making the lighting up or glowing of the lamp and the closing of the circuit practically simultaneous. An automatic shunt arrangement is also provided whereby as soon as the circuit is closed a portion of the current-supply is shunted around said lamp, and in this way the circuit can be held closed without causing the current to burn out the lamp. In other words, I connect the lamp in parallel with a normally open connection, whereby an initial closing of the circuit momentarily subjects the lamp to an abnormally strong current and whereby the supply of current through the lamp is then reduced to its normal or proper character by the automatic closing of the said normally open connection. In this way I employ an abnormally strong current for promptly and instantly lighting the lamp and secure this desirable result without danger of burning out the lamp. With my improved arrangement the lamp lights instantly to its full candle-power even though the circuit be closed only for an instant, and if such closing of the circuit be continued the shunting arrangement reduces the current through the lamp before the lamp can burn out, and the lamp then continues to glow or burn at its proper candle-power. The nature and advantages of my invention will, however, hereinafter more fully appear.

The accompanying drawing is a diagram of a telephone system embodying the principles of my invention.

In said diagram the telephone apparatus at substation A can be of any known or approved form. For example, the said apparatus may consist of a transmitter a, a receiver a', a receiver hook or switch a^2, a battery c^3, and an induction-coil a^4. It will also be observed that a bell a^5 is provided. The line a^6 for this substation is shown as terminating at a central-station exchange, at which latter place are located the relay a^7 and the battery a^8. With this arrangement it will be seen that when the receiver at said substation is lifted from its hook or switch the latter will then close the circuit and energize the said relay a^7. The energization of this relay will operate the armature 1, causing the latter to make contact with the contact-point 2. The contact between this armature and the said contact-point will operate to complete a local circuit from the battery 3 through conductor 4, thence through the coil or relay 5 to conductor 6, from the latter through the lamp to conductor 8, and thence through contact-point 2 and armature 1 to conductor 9, and finally back to said battery 3. The closing of this local circuit will of course energize the relay 5 and cause the armature 10 to be attracted and make contact with the contact-point. This contact between armature 10 and contact-point 11 will operate to close a second local circuit consisting of a conductor 12, lamp 13, conductor 14, a coil or relay 15, conductor 16, resistance 17, conductor 18, battery 19, conductor 20, and the said armature 10 and contact-point 11. The closing of this second local circuit operates to energize the coil or relay 15, thereby causing the armature 21 to make contact with the conductor 22. This, it will be seen, closes a parallel or shunt connection composed of the conductor 23, resistance 24, the said contact-point 22 and armature 21, and a conductor 25. Thus when a call is sent in from the said substation the first local circuit is first closed to light the calling-signal lamp 7, which is preferably located on the switchboard, and the second local circuit then closes to light the lamp 13, which may be located at the desk of the manager or chief operator. It will also be observed that a shunting connection 26 is provided in the first local circuit, whereby such circuit may always close and energize the relay 5 regardless of whether the lamp 7 is burned out or not. As stated, the said lamp 7 can be located on the switchboard, and when a call is sent in the lighting up or glowing of this lamp attracts the attention of the switchboard operator, and the latter then communicates with the subscriber at the substation for the purpose of finding out the number of the other substation with which the subscriber desires connection. As also stated, the lamp 13 can be located at the desk of the manager or chief operator, and when so located serves as an extension or pilot signal for keeping the manager advised of every call that comes into the exchange. Should the lamp 7 burn out, a call sent in from the substation would not attract the attention of the switchboard operator, but with the provision of the shunt 26 the circuit would nevertheless be closed and the signal would be extended to the desk of the manager. In this way the manager or chief operator is always advised of a call whether the switchboard operator is so advised or not. The character of the resistance 26 is preferably such that the current will pass through the lamp 7 when the latter is not burned out, but is also of such character as to insure the passage of sufficient current to energize the relay 5 when the said lamp becomes broken or burned out. While provision is thus made whereby the manager's signal will always respond to a call even though the switchboard signaling devices are out of order, it will be seen that it is also desirable to provide an arrangement whereby one of said signals will always respond to a call regardless of certain other conditions—for example, a rapid or improper vibration of the hook or switch a^2 at the substation. For in-

stance, should the subscriber at substation A become impatient, as is often the case, and vibrate the hook or switch rapidly the circuits are then closed intermittently and at each time for only an instant. In such case it will be seen that it is desirable to have either one or both of the lamps arranged so as to be capable of responding instantly to the closing of the circuits. In other words, if the call is to attract the attention of any one of the operators at the exchange or central station one or more of the lamps must be capable of lighting up or glowing to its full candle-power or practically to its full candle-power at the very instant the circuit is closed. As a simple and effective arrangement for accomplishing this instantaneous lighting of a signal-lamp the circuit for the lamp 13 can, for example, be of such character as to when closed momentarily subject such lamp to an abnormally strong current. With this arrangement the momentary contact between the armature 10 and the contact-point 11 will cause the said lamp 13 to respond or light up instantly. With this arrangement it is also desirable to make provision whereby the lamp will not burn out should the relay 5 continue to be energized and the circuit for the lamp 13 thereby maintained in a closed condition. As a simple and effective arrangement for automatically reducing the current through the said lamp I provide the aforedescribed shunting connection consisting of the conductor 23, the resistance 24, contact 22, armature 21, and conductor 25. The said lamp is thus arranged in parallel with a normally open connection. With this normally open shunt connection the effect is of course to reduce the current through the lamp, part of the current going through the lamp and the remainder through the said shunt. In this way an abnormally strong current can be employed and made available for the lamp 13, so as to enable said lamp to respond more quickly to the closing of the circuit, and at the same time this current can be automatically prevented from burning out the lamp. For example, the battery 19 can be a forty-volt battery and the resistance 17 can be of such character as to permit a flow of only enough current to light two lamps to candle-power. With such arrangement the lamp 13 can be a twelve-volt lamp, and the resistance 24 can be of such character as to make the shunt connection and the said lamp equal or the same with respect to voltage. In other words, the lamp and the normally open shunt can be arranged in parallel and of the same resistance. When, therefore, the circuit is closed, the lamp 13 is first subjected to the entire current-supply, which, it will be seen, is just the amount required to light the lamp to its full candle-power. This causes the lamp to light or glow instantly to its full candle-power even though the contact between armature 10 and contact-point 11 be of such character as to only close the circuit for an instant. This would of course operate to burn out the lamp but for the practically instantaneous closing of the shunt connection due to the energization of the relay 15. As stated, the entire volume or strength of the current is first made available to the lamp 13; but as soon as the armature 21 makes contact with the contact-point 22 a part of the current is then directed through the shunt connection and the current through the lamp thereby reduced to its proper proportion. Thus the subscriber at substation A may vibrate the hook-switch a^2 very rapidly and in a manner which would ordinarily prove ineffectual in attracting the attention of the operators at the central exchange; but with my improved circuit arrangement the lamp 13 at the manager's desk will flash or glow to its full candle-power each time the substation line-circuit is closed, though it be for only an instant. Suppose the lamp 7 becomes broken or burned out. The subscriber at substation A takes down the receiver a' and awaits a response from the switchboard operator. The lamp 7 being burned out, however, the call does not attract the attention of the operator at the switchboard. The subscriber then attempts to attract attention by rapidly vibrating the hook or switch a^2, and ordinarily even the manager's lamp 13 would not then respond to such signaling; but, as explained, with the abnormally strong current-supply and with my improved circuit arrangement the manager's light 13 flashes or closes intermittently and lights up or glows to its full candle-power each time the hook or switch a^2 closes the line-circuit even though such closing be for only an instant. With the usual and ordinary arrangement the current-supply available would only be sufficient to light the lamp 13, and with such arrangement the closing of the circuit for only an instant would fail to light the lamp, or, at most, the latter would glow but feebly and not to an extent to attract the attention of the manager. With an abnormally strong current available upon the initial closing of the circuit, however, the lamp flashes or glows instantly and practically simultaneously with the closing of the circuit. With the provision of the parallel shunting connection the current supply through the lamp is then practically instantaneously cut down or reduced to its proper proportion, so as to permit the circuit to be maintained in a closed condition without danger of burning out the lamp. Of course if the hook-switch at the subscriber's station is vibrated rapidly it may be that both the main circuit and also the local circuits at the exchange will be closed for such a short period of time that the relay 15 will not be energized sufficiently to close the shunt around the lamp 13. In such case, however, it will be seen that there is still no liability of the lamp 13 being injured by the abnormally large or

strong current, inasmuch as the closing of the lamp-circuit in this manner for a brief instant does not give the current time to do any injury. Thus the arrangement may be such that the lamp is subjected to an abnormally large current for extremely short periods of time—as, for example, by means of a rapidly-vibrating switch or circuit-changing device. Again, as explained, the arrangement can be such that the lamp-circuit can be not only closed and then instantly broken, but also of such character that should the switch or circuit-changing device maintain the lamp-circuit in a closed condition for a dangerous length of time a portion of the current will then be shunted around the lamp.

Broadly considered, therefore, my invention contemplates an electric lamp which in lighting is primarily or initially subjected to an unduly-strong current—that is to say, a lamp and a source of current so combined and connected that the lamp is momentarily subjected to a flow of current sufficient to burn it out or injure it should such flow continue, whereby a quick and practically instantaneous glowing of the lamp is obtained as distinguished from the slow response which the lamp would manifest if initially subjected to a current such as would be employed to light it continuously. It will also be seen that my invention further contemplates an electric lamp arranged in parallel with a normally open shunt or connection, whereby the abnormally strong current for the lamp is automatically reduced or cut down to its proper proportion before the current can operate to burn out or injure the lamp.

I claim to be the first to so combine a signal-lamp with a source of current that the lamp in lighting, whether for an instant or for some time, is either momentarily or initially subjected to such a large or powerful flow of current as would injure or burn out the lamp should such flow be allowed to continue after the lamp is brought up to full candle-power.

What I claim as my invention is—

1. An electric lamp, a source of current-supply, a normally open circuit including said lamp and source of current-supply, said circuit and source of current-supply being capable of furnishing an abnormally strong current to said lamp, a normally open shunt or parallel connection extending around said lamp, and a relay for automatically closing said normally open shunt or parallel connection, so as to reduce the current through said lamp.

2. An electric lamp, a source of current-supply, a normally open circuit including said lamp and source of current-supply, suitable resistance in said circuit for permitting the passage of more than enough current to light said lamp, and a suitable relay and normally open shunt for automatically reducing the current through said lamp upon the closing of said circuit.

3. An electric lamp, a source of current-supply and a normally open circuit capable of supplying said lamp with more than enough current to light the latter, a normally open shunt of suitable resistance connected in parallel with said lamp, and a relay adapted and arranged to close said shunt upon the closing of the said circuit including the lamp and source of current-supply, said shunt when closed operating to reduce the current through the lamp.

4. The combination of an electric lamp, a source of current-supply, a normally open circuit including said lamp and source of current-supply, a relay for automatically closing said circuit and initially subjecting said lamp to an abnormally strong current, and an automatic switch or circuit-changing device connected and arranged for automatically reducing the current for said lamp upon the closing of said circuit.

5. An electric lamp provided with a normally open and automatically-closing shunt, the resistance of said lamp and said shunt being equal, or substantially the same, and a source of current connected and adapted for supplying an abnormally large current to said lamp, the said shunt closing before the current burns out the lamp.

6. An electric lamp provided with a normally open shunt, a source of current-supply and a circuit for said lamp, said circuit being capable of furnishing an abnormally strong current to said lamp, and a relay for automatically closing said shunt upon the closing of the lamp-circuit, the resistance of said shunt being suitable for reducing the current for said lamp, so as to prevent the latter from burning out when the lamp-circuit is maintained in a closed condition.

7. The combination of an electric lamp, a relay and a battery and suitable resistance connected up in series, a circuit-closing device also in series with said lamp and battery, a resistance and a circuit-closing device connected up in parallel with said lamp, said relay being arranged to operate the circuit-closing device in said parallel connection, the said battery and lamp circuit being capable of initially subjecting the lamp to an abnormally strong current, and said relay and parallel connection operating to then automatically reduce the current through the lamp before the latter burns out.

8. In a telephone system, the combination of a substation and a central station and suitable line connection between the same, a source of current-supply, a calling-signal and suitable circuit connections for operating the same at the central station, an extension or pilot signal and suitable circuit connections for operating the same at the central station, the source of current-supply and the circuit for said extension or pilot signal being capable of furnishing the latter with an abnormally strong current, and a current-reducing device for automatically reducing the current for said ex-

tension or pilot signal, the said extension or pilot signal thereby being initially subjected to a current of undue strength and then automatically relieved of a portion of said current before injurious effects are caused.

9. In a telephone system, the combination of a substation and a central station and suitable line connection between the same, a signaling device at the substation and a signal at the central station capable of responding to such device, a source of current-supply and a circuit capable of furnishing an abnormally strong current to said signal, and a current-reducing device for automatically reducing the current through said signal, whereby the signal is initially subjected to an abnormally strong current, and whereby the current for the signal is then automatically and instantly reduced before injurious or harmful effects are caused.

10. In a telephone system, the combination of a substation and a central station and suitable line connection between the same, a signaling device at the substation and a signal-lamp at the central station adapted to be operated by said signaling device, a source of current-supply and a normally open circuit for said lamp, said source of current-supply and said circuit being capable of furnishing an abnormally strong current to said lamp, a relay and switch or circuit-changing device adapted and arranged to automatically reduce the current for said lamp, the lamp thereby being primarily or initially subjected to an abnormally strong current, and the relay and switch or circuit-closing device operating to then automatically and instantly reduce the current for the lamp before injurious or harmful effects are caused.

11. In a telephone system, the combination of a substation and a central station and suitable line connection between the same, a calling-signal lamp on the switchboard at the central station, a shunt for said lamp, a relay included in the circuit with the said lamp, an extension or pilot signal also located at said central station, a normally open circuit for said extension or pilot signal lamp adapted to be closed by said relay, a normally open shunt for said extension or pilot signal lamp, and a relay for automatically closing said shunt upon the closing of said normally open circuit, the said extension or pilot signal thereby being initially subjected to an abnormally strong current, and the said shunt when closed operating to then automatically and instantly reduce the current through said extension or pilot signal.

12. In a telephone system, the combination of a plurality of stations and suitable line connection between the same, a signaling device at one station, a lamp-signal at another station adapted to be operated by said signaling device, a source of current-supply and a normally open circuit capable of furnishing an abnormally strong current to said lamp-signal, whereby said lamp will respond fully and instantly when said signaling device is operated, and a current-reducing device and connection adapted to automatically reduce the current for said signal-lamp before injurious or harmful effects are produced by said abnormally strong current.

13. An electrical signaling system, comprising an incandescent lamp, a source of current and suitable connections for supplying current of a strength to burn out said lamp if permitted to continue flowing therethrough, and suitable means including one or more relays for momentarily subjecting said lamp to said current during the initial glowing of the lamp and for then reducing the current flowing through the lamp to proper proportions, whereby current of sufficient strength to burn out the lamp may be employed to produce a quick and practically instantaneous glowing of the lamp without danger of causing the lamp to burn out.

Signed by me at Chicago, Cook county, Illinois, this 12th day of December, 1901.

HENRY P. CLAUSEN.

Witnesses:

ARTHUR F. DURAND,

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