

No. 652,494.

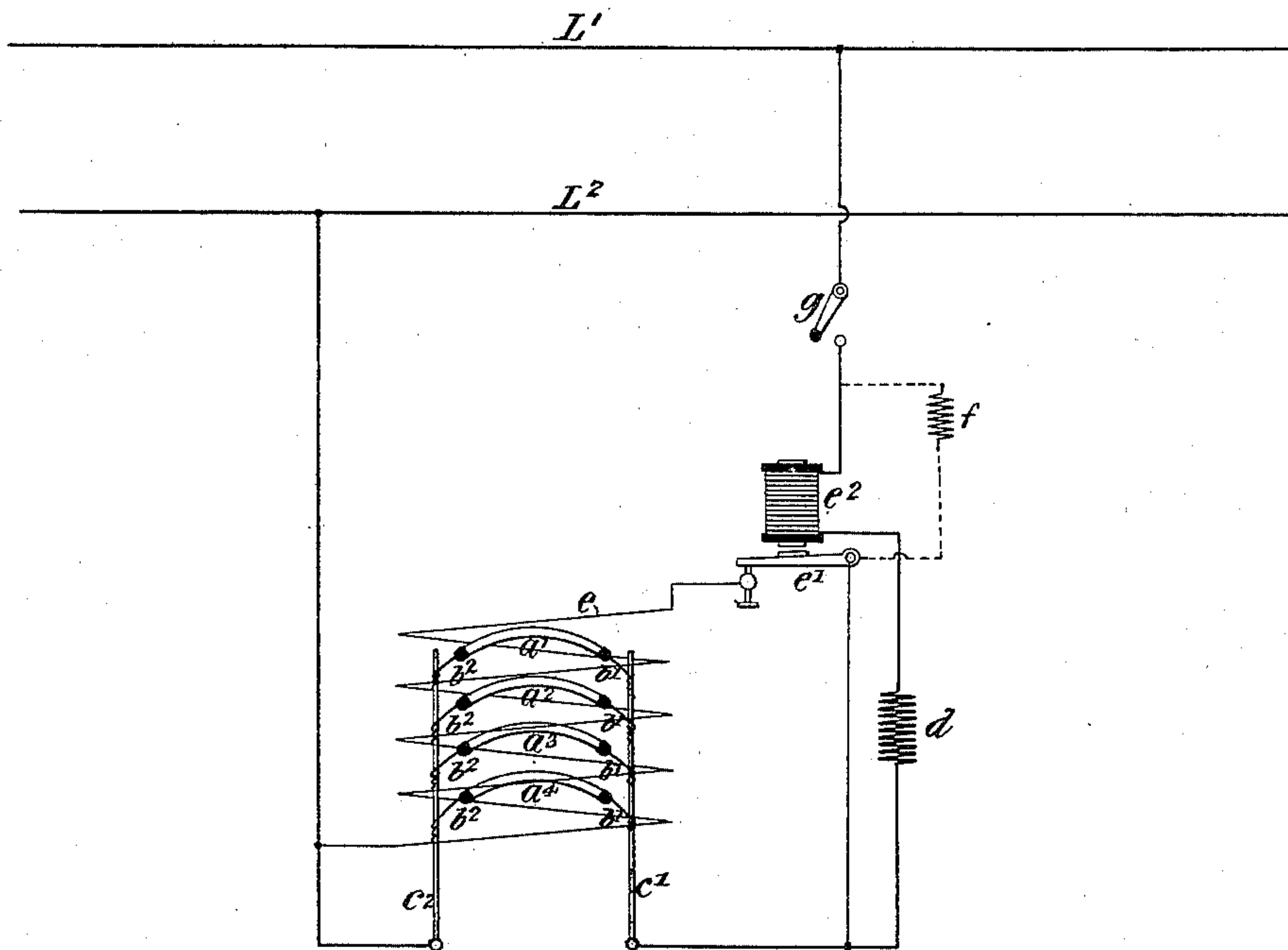
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C. A. TERRY.

ELECTRIC LIGHTING APPARATUS.

(Application filed July 14, 1898. Renewed Dec. 16, 1899.)

(No Model.)



Witnesses:

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ELECTRIC-LIGHTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 652,494, dated June 26, 1900.

Application filed July 14, 1898. Renewed December 16, 1899. Serial No. 740,607. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. TERRY, a citizen of the United States of America, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Electric-Lighting Apparatus, of which the following is a specification.

My invention relates to certain improvements in the class of electric-lighting apparatus in which the illuminant or glower is composed of materials commonly known as "conductors of the second class"—that is to say, materials which when in a conducting condition are believed to conduct current by electrolytic action. Such materials are usually termed "non-conductors," as at ordinary temperatures they offer so great a resistance to the passage of electricity as to be practically insulators. When they are heated to a sufficient temperature, however, they become conductors and if subjected to a proper difference of potential currents will traverse them, which not only cause them to give off light, but under proper conditions maintain them in their heated conductive condition. The conductivity of this class of glowers, within certain limits, at least, increases with their temperature, so that in some instances it is necessary to provide means for checking an increase of current beyond predetermined limits; otherwise the increasing temperature due to increments of current might permit such an increasing flow of current that the glower would become destroyed by excessive heat. By placing a proper restraining device—such, for instance, as a resistance having a proper temperature coefficient in series with the glower—a proper balance may be obtained, so that under the influence of a predetermined difference of potential a predetermined current will be caused to traverse the glower. In the case of alternating-current circuits either a resistance or a suitable reactive coil may be used.

The object of my invention is to utilize certain of the peculiar characteristics of this class of glowers to produce a lamp having a long life.

The invention involves an organization in which when the lamp is connected in circuit the current shall select a path through one

or another of two or more glowers and continue to operate that glower until either the current is withdrawn therefrom or the glower is destroyed, and in the latter case another glower shall be automatically substituted as the active one. To accomplish this, two or more glowers are connected in parallel with each other and in series, with a proper restraining device for controlling the flow of current therethrough. Owing to the fact that the conductivity of the glower increases with increasing temperature, that particular glower which offers the least resistance to the flow of current will, in the presence of the restraining device, rob the other glowers of current, and hence one only of the several which are connected in parallel will be operative. The same glower may or may not chance to be the operative one at each successive turning-on of the lamp, inasmuch as the selection of the particular glower through which the current shall flow depends largely upon the initial temperature given, other things being equal. It is possible, however, to so adjust the relative resistances and characteristics of several glowers as to cause them to become operative in a predetermined order of succession. In case a glower which is operating should break or become destroyed the circuit may be automatically reestablished through one of the other or reserve glowers, and in this manner the practical life of a given lamp may be very great.

In the accompanying drawing I have illustrated diagrammatically the application of my invention.

Referring to the drawing, a' a^2 a^3 a^4 represent any desired number (in this instance four) of glowers of the character hereinbefore referred to and which are now known as the "Nernst" glower. These are composed of earth oxids or mixtures thereof—for example, oxids of yttrium, thorium, zirconium, and other earth oxids having similar characteristics. A mixture of the oxid of yttrium and oxid of zirconium of German production in the proportions of thirty and seventy per cent. produces excellent results. The glowers are prepared by thoroughly mixing proper proportions of the oxids and forming them into a pasty mass by means of some suitable binding material—such, for instance, as starch paste—

and then by means of molds or presses forming thin strips or threads, which are subsequently thoroughly baked. Proper lengths of these strips are then mounted between suitable supporting-wires b^1 and b^2 , the ends being secured in any suitable manner—as, for instance, by being clamped and cemented by a paste of the same material as the glower, such paste being itself baked in position. The glowers thus constructed are connected in parallel, as shown in the drawing, the wires b^1 being all connected with a conducting-support c^1 , and the wires b^2 with a similar support c^2 . A suitable steadying or compensating resistance d is connected in series with all of the glowers of a given lamp.

L^1 and L^2 represent the supply-wires of a constant-potential electric circuit, and in case continuous currents are employed the device d may consist of a coil of resistance-wire, such as German silver or other suitable material, having such a coefficient of resistance that when the current flowing through any one of the glowers has reached a predetermined amount the increment of resistance offered by the resistance-wire to the flow of a greater current will be sufficient to prevent any further increase of current. In case the wires L^1 L^2 are supplied with a constant-potential alternating current, either a resistance d of the character described or a suitable reactive coil may be employed, as found desirable. In either case this device acts to protect the glowers against an undue flow of current.

Any suitable means may be employed for imparting the preliminary heating to the glowers and causing them to reach such a temperature as to become conductors when subjected to the normal difference of potential of the circuit. A convenient device consists of a coil e of platinum wire or other suitable electric conductor placed in proper relation to the glowers, so that when traversed by an electric current it will impart sufficient heat to the glowers to bring them to their conductive temperature. This coil e may be connected directly or indirectly in the circuit L^1 L^2 and may be automatically cut out of circuit when the current has been established through one of the glowers—as, for instance, by means of a switch e^1 , operated by a magnet e^2 , which is shown as being connected in series with the glowers. When the lamp is not in operation, the switch closes a shunt-circuit around the glowers from the conductor c^1 to the conductor c^2 through the coil e .

When the circuit of the lamp is closed—as, for instance, by a switch g —a current is caused to flow through the heating-coil e , and heat is imparted to the glowers. When any one of these glowers has become sufficiently conductive to permit the flow of current through itself, the current flowing through the coils of the magnet e^2 will cause its armature to be attracted, and thus open the circuit through the heating-coil. The circuit will remain

complete through the magnet and the steadying resistance d and the particular glower a^1 , a^2 , a^3 , or a^4 , which has received current to the exclusion of the others. Thereafter the circuit will remain completed and the current will continue to flow through that particular glower until either the circuit is externally interrupted—as, for instance, by opening the key g or by the breaking of the glower. Thereupon the magnet will release its armature and the previous condition of the switch e^1 will be reestablished, and if the circuit is still complete through the heating-coil another glower will be brought into operation in place of the one destroyed. In case two or more of the glowers shall simultaneously arrive at such a conductive condition as to be traversed by current when the lamp is first turned on, one of them by offering less resistance to the current than the others will receive more current than the others, and thus offer a still better path for the flow of that current, and therefore ultimately receive all of the current flowing through the branch circuit to the exclusion of the other glowers. In some cases it may be desirable to connect the heating-circuit with the conductor leading to the magnet e^2 , as shown by dotted lines, so that the magnet shall not be traversed by the current passing to the heater. A resistance f may be inserted for reducing the potential of the current applied to the terminals of the heater. Various other different ways of heating the glowers may be employed.

I do not limit myself to the particular means illustrated for carrying out my invention.

I claim as my invention—

1. The combination of two or more glowers, whose conductivity increases within normal limits with increments of temperature, connected in parallel with each other and a current-restraining device connected in series therewith.

2. The combination of two or more glowers composed of conductors of the second class connected in parallel with each other and a current-restraining device connected in series therewith.

3. The combination with a constant-potential electric circuit, of two or more glowers which are non-conductors when cold but conductors when hot having a negative temperature coefficient and a steadying resistance or reactive coil in series therewith.

4. The combination with two or more glowers composed of earth oxides and connected in parallel with each other, of a steadying resistance or reactive device connected in series therewith and means for giving said glowers an initial temperature sufficient to render one or more of the same conductive, substantially as described.

5. The combination with two or more glowers whose resistance decreases, within limits, with increments of temperature, connected in parallel with each other, and a single heating device for simultaneously imparting heat

to all of said glowers, and means for automatically stopping the operation of said heating device by the flow of current through any one of said glowers.

- 5 6. The combination with two or more glowers composed of earth oxids connected in parallel, means for simultaneously heating all of the same, an electric-current-restraining device connected in series with the glowers and
10 an electromagnetic circuit-controlling device operating to cut out the heating device from

operation when a circuit has been established through one of the glowers and automatically reinserting the heating device upon the cessation of current through all of said glowers. 15

Signed by me at New York, N. Y., this 13th day of July, 1898.

CHARLES A. TERRY.

Witnesses:

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