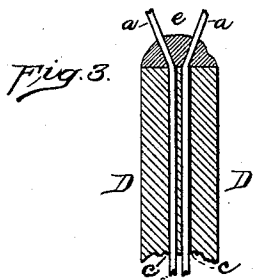
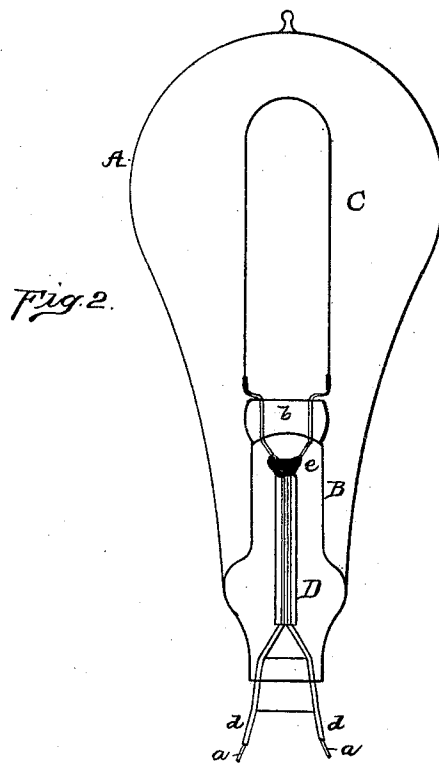
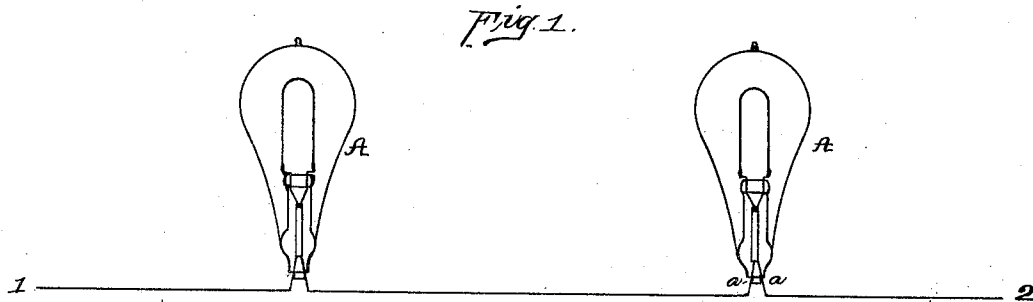


(No Model.)

E. H. JOHNSON.
AUTOMATIC THERMAL CUT-OUT FOR INCANDESCENT ELECTRIC LAMPS.
No. 509,036.

Patented Nov. 21, 1893.



ATTEST:
Ed. Rowland,
J. W. Fiddle.

INVENTOR:
Edward H. Johnson,
By S. J. L. L. L.

UNITED STATES PATENT OFFICE.

EDWARD H. JOHNSON, OF NEW YORK, N. Y., ASSIGNOR TO THE EDISON
ELECTRIC LIGHT COMPANY, OF SAME PLACE.

AUTOMATIC THERMAL CUT-OUT FOR INCANDESCENT ELECTRIC LAMPS.

SPECIFICATION forming part of Letters Patent No. 509,036, dated November 21, 1893.

Application filed April 3, 1886. Serial No. 197,626. (No model.)

To all whom it may concern:

Be it known that I, EDWARD H. JOHNSON, of New York city, in the county and State of New York, have invented a certain new and useful Improvement in Incandescent Electric Lamps, of which the following is a specification.

My invention relates to incandescent electric lamps designed to be used in series with currents of high electro-motive force. When lamps are so used if the carbon filament of a lamp breaks, one of two things occurs. Usually an arc forms across the terminals of the filament, which proceeds down the wires into the stem or tube and if no means for stopping it are provided continues down into the socket and destroys the same and finally breaks the series circuit. Means for remedying this difficulty are set forth in my application, Serial No. 188,091, filed January 9, 1886. Sometimes however when the filament breaks the arc does not form and the continuity of the series circuit is therefore at once destroyed. Heretofore an electro-magnetic cut-out device has been provided for each lamp to close a shunt around it under these circumstances.

The object of my present invention is to so construct the lamp itself that both these conditions will be provided for therein and the electro-magnetic cut outs, which are bulky, inconvenient and expensive, thereby dispensed with. I accomplish this by bringing the wires into such proximity within the stem of the lamp that they will be soldered or fused together by the heat of an arc across them whereby when an arc occurs across the broken filament it will be stopped at this point and the filament will be cut out; and by joining the wires where they are thus brought together by a connection of such resistance that practically no current will pass across it so long as there is a circuit for it through the lamp but that with the increased difference of potential which arises at this point when the filament is broken and the arc does not form current will pass across said connection and start an arc by which the wires will be fused together. Thus a simple cut-out is provided within the lamp itself which will act to maintain the circuit whenever the filament

breaks whether the arc across the filament is formed or not.

My invention is illustrated in the annexed drawings.

Figure 1 is a diagram showing two lamps embodying my invention connected in series; Fig. 2, a view in elevation of one of said lamps; and Fig. 3, an enlarged vertical section of the tube employed to inclose the wires.

A is the glass vacuum chamber, B the glass stem or support, and C the carbon filament secured to the leading in wires *a a* which are sealed in the glass of the stem at *b*.

D is a double glass tube or one having two perforations *c c*. The wires *a a* in the stem B are passed through such perforations and are thus brought close together. They are bent apart at the ends of the tubes. The wires above the tube D are preferably bare and below the tube I prefer to cover them with shellac *d* or other thin but high insulation.

Just without the upper end of the tube where the wires are close together I place upon them in such manner as to connect them together a small quantity of a substance *e* having the characteristics above set forth. That is to say it is of such resistance that it will not conduct the current across so long as a circuit exists in the lamp. It is evident however that if the passage of current through the lamp ceases, the difference of potential between the leading in wires will be enormously increased, and the material *e* is such that the current due to this difference of potential will be conveyed by such material from one wire to the other. I prefer to use a mixture of peroxide of lead and a suitable sticky or glutinous substance. The peroxide of lead is the conducting substance and the sticky substance enables the mass to be attached to the wires, and at the same time brings the electrical resistance up to the desired point. I may employ any soluble gum. A mixture of mucilage and peroxide of lead gives good results. By changing the proportions the arc may be made to form at such potential as may be desired. I prefer to place the substance upon the wires after the lamp is completed with the exception of its plaster base, by means of a fine brush inserted in the lower end of the stem. The shellac upon the lower por-

tion of the wires prevents the arc from ever forming at that point.

The operation is as follows:—When the carbon filament breaks, if no arc is formed across its terminals the increased difference of potential between the leading in wires at once causes current to pass across the bridge formed by material *e* and such material at once fuses or volatilizes and an arc is formed, so that the wires being in soldering proximity to each other are at once fused together by the melted metal of one wire being carried over to the other. If, however, upon the breaking of the filament an arc springs across from below the break to the opposite terminal, there is still a passage for the current other than the bridge *e* and the difference of potential is not increased so as to permit any practically appreciable current to cross such bridge. The arc then continues down the wires, the current passing through the heated glass of the stem, until the point is reached where the wires are in soldering proximity, when they are at once fused together.

In Fig. 1 two lamps are shown in series in a circuit 1, 2, each provided with my invention, whereby when one lamp breaks the circuit is completed by the soldering together of its leading in wires to the rest of the series.

I do not claim in this application the combination in a continuous metallic electric light circuit of two conductors so separated electrically that normally the electric current passes through such conductors without forming an arc between them, but that when an arc does form between such conductors they will be fused or soldered together; for this feature is claimed in my prior application filed August 13, 1884.

What I claim is—

1. The combination with an incandescent electric lamp, of wires leading to the filament

thereof, such wires being bridged by a mixture of a conducting material and a gum or equivalent sticky non-conducting material, substantially as set forth.

2. In a safety cut-out, the combination with two poles of a circuit, of an interposed mass of material consisting of a substance which is normally an insulator but which by heat is reduced to a metallic or conducting state, substantially as set forth.

3. The combination with an incandescent electric lamp, of wires leading to the filament thereof, such wires being situated in soldering proximity to each other and bridged by an interposed mass of material consisting of a substance which is normally an insulator but which by heat is reduced to a metallic or conducting state, substantially as set forth.

4. The combination with an incandescent electric lamp, of wires leading to the filament thereof, such wires being bridged by a mixture of peroxide of lead, and a gum or equivalent sticky non-conducting material, substantially as set forth.

5. In an incandescent electric lamp, the combination with the leading in wires of a double glass tube inclosing and separating said wires, insulating material upon said wires below said tube, and a connection between said wires above said tube of such resistance that practically no current will be conveyed by it so long as a circuit exists in the lamp, but that current will pass when circuit is broken within the lamp, whereby an arc will be formed and the wires fused or soldered together, substantially as set forth.

This specification signed and witnessed this 27th day of March, 1886.

EDWARD H. JOHNSON.

Witnesses:

A. W. KIDDLE,
E. C. ROWLAND.