(No Model.)

E. H. JOHNSON.

INCANDESCING ELECTRIC LAMP.

No. 393,473. Patented Nov. 27, 1888.

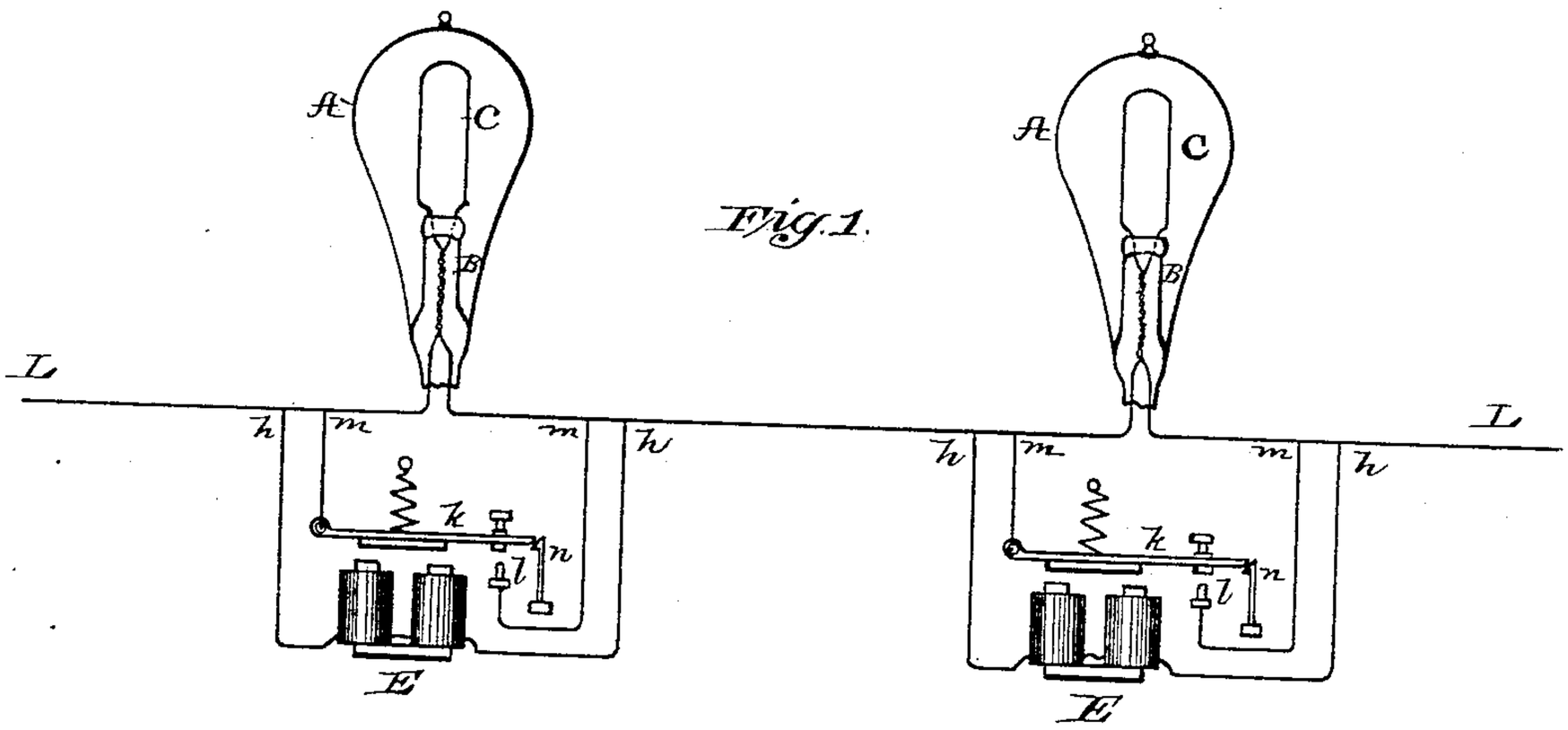

Fig. 1.

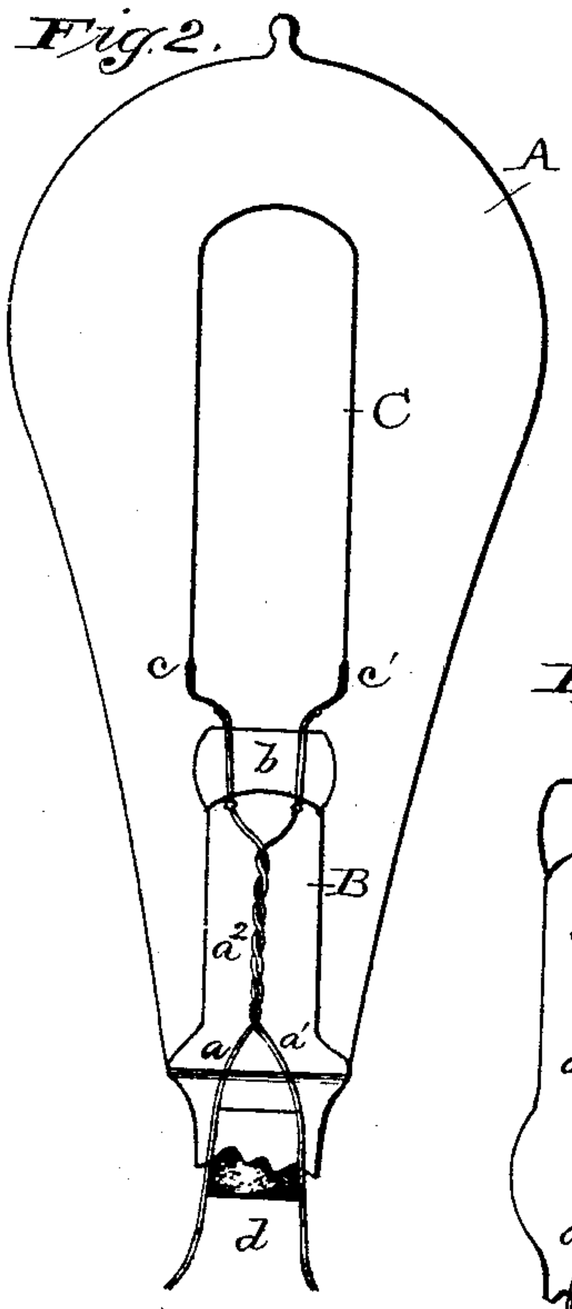

Fig. 2.

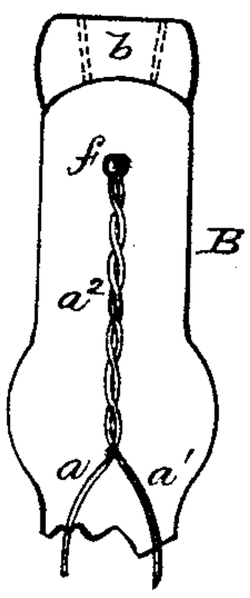

Fig. 3.

Fig. 4.

Fig. 5.

ATTEST:

E. A. Rowland.

Louis Iddle.

INVENTOR:

Edmund H. Johnson.

By Dyer Lacey.

Atty's.

UNITED STATES PATENT OFFICE.

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

INCANDESCING ELECTRIC LAMP.

SPECIFICATION forming part of Letters Patent No. 393,473, dated November 27, 1888.

Application filed January 9, 1886. Serial No. 188,091. (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 Incandescing Electric Lamps, of which the following is a specification.

When incandescent electric lamps are used in series with one another and with currents of high tension, and provided with cut-out devices of the ordinary kind for closing a shunt around each lamp when its carbon breaks, difficulty arises in the following way: If the carbon breaks, so that the current cannot pass through it, the high-tension current is apt to pass across the vacuous space within the lamp-globe from one side of the carbon below the point of breakage to the other side, forming an arc. This passage being provided for the current, the cut-out fails to act, and the arc therefore continues and follows down the carbon and the leading-in wires to the inner stem, which, being heated, becomes a conductor, and the arc or current then passes through the glass to the wires within the stem, and so on down to the socket and cut-out mechanism, so that the lamp, socket, and cut-out are all destroyed, as well as the continuity of the circuit.

The object of my invention is to provide means for stopping the arc when such occurs before it leaves the lamp; and to this end my invention mainly consists in placing the wires outside the vacuum-globe, such wires being insulated from each other so close together that when the arc reaches the point where the wires are so placed their fusion by the heat of the arc will cause them to be fused or soldered together, whereby a good connection is made between them and circuit is closed around the carbon of the lamp, so that the series circuit is completed to the other lamps independent of the cut-out, my device forming an automatic cut-out whose operation is effected by the arc itself; and my invention further consists in the various novel features and details of construction hereinafter described, and pointed out in the claims.

To insulate the wires from each other, I prefer to employ upon one or upon each of them a thin covering of cotton or similar fabric, which becomes carbonized by the heat of the arc, and thereby assists in forming a good electrical connection between the wires. I may inclose both wires in a small tube of lead, tin, or other readily-fusible metal which will melt and itself act to solder the wires together. I prefer to twist the wires together for a short distance within the glass tube or stem; but they may instead be simply placed side by side, and if necessary held together by the tube placed around them or by any suitable wrapping or binding.

When the lamps constructed substantially as above described are connected in series, I prefer to employ in connection with each lamp electro magnetic cut-out mechanism, so that if the carbon breaks without any arc being formed across it, which often occurs, such cut-out mechanism will act to close a shunt around the lamp and complete the series circuit.

My invention is illustrated in the annexed drawings, in which—

Figure 1 is a diagram of a portion of an electric-lighting system embodying my invention; Fig. 2, a view of a lamp with wires twisted together; Fig. 3, a larger view of the inner stem of this lamp after the arc has been formed and stopped; Fig. 4, a view of a lamp in which a metal tube is placed around the wires, and Fig. 5 an enlarged view showing the two wires as twisted together.

Like letters refer to corresponding parts in all the figures.

A is the sealed inclosing-globe of an Edison incandescing electric lamp.

B is the inner tube or stem, through which pass the leading-in wires *a a'*, such wires being sealed in the glass of the stem at *b*.

C is the carbon filament, which forms the incandescing conductor. It is secured at *c c'* to the leading-in wires in any well-known or desired manner, preferably by electroplated joints. The lower end of the stem is closed by a cork stopper, *d*, which keeps the wires in place.

In the form shown in Fig. 2 the wires *a a'* are twisted together in the tube B, as shown at a^2, so as to bring them close together for a considerable portion of their length. One or both of these wires are covered with insulating material, *e*, as shown in Fig. 5, which insula-

tion is a light one, preferably of cotton or other carbonizable material, which will act in the manner already explained.

Fig. 3 shows the stem after the arc has been formed and stopped, the wires *a a'* down to the point at which they were twisted together having been consumed by the arc; but at this point they are soldered together, as shown at *f*, by the fusion of the metal, and the circuit is therefore closed around the carbon, as has been set forth.

In the form shown in Fig. 4 the insulated wires are simply placed side by side in contact and are inclosed by a tube, *g*, of lead, tin, or other readily-fusible metal. The operation or effect of this arrangement has already been clearly explained, the metal tube melting and assisting to solder the wires together.

In connection with the lamps constructed as described I prefer to employ a suitable electro-magnetic cut-out device, which may be such as is shown in Fig. 1. In this figure, L L is the line-circuit, in which any suitable number of lamps, A, are placed in series. Around each lamp is a shunt, *h h*, including the coils of an electro-magnet, E, whose spring-retracted armature-lever *k* is adapted to make and break at *l* another shunt, *m m*. When the carbon filament breaks, if an arc across the filament should not be formed the magnet E is energized and its armature-lever closes circuit *m m* around the lamp, so as to maintain the line-circuit to the other lamps. The catch *n* locks the lever down upon *l*, so that the shunt is kept closed until the broken lamp is replaced by a new one, when the catch is withdrawn by hand and the armature-lever is brought away from contact by its spring. It is evident that any other convenient and efficient form of cut-out mechanism may be substituted for that shown and described.

My invention thus provides for both of the two contingencies which arise in the use of lamps in the manner explained.

If the carbon breaks and no arc is formed, the electro-magnetic cut-out closes circuit around the lamp. If the arc is formed, it itself causes a short circuit within the stem of the lamp.

What I claim is—

1. In an incandescent electric lamp, the leading-in wires twisted one around the other and insulated electrically from each other at a point outside the vacuum, substantially as set forth.

2. In an incandescent electric lamp, the leading-in wires twisted one around the other and insulated electrically from each other at a point between the vacuum-chamber and the extremity of the lamp, substantially as set forth.

3. In an incandescent electric lamp, the leading-in wires twisted one around the other and insulated electrically from each other within the glass stem of the lamp, substantially as set forth.

4. In an incandescent electric lamp, the leading-in wires situated in soldering or fusing proximity and electrically insulated from each other at a point outside the vacuum, substantially as set forth.

5. In an incandescent electric lamp, the leading-in wires situated in soldering or fusing proximity at a point outside the vacuum and insulated from each other by carbonizable material, substantially as set forth.

This specification signed and witnessed this 2d day of January, 1886.

EDWARD H. JOHNSON.

In presence of—
A. W. KIDDLE,
E. C. ROWLAND.