(No Model.)

E. P. THOMPSON.

PROCESS OF MANUFACTURING FILAMENTS FOR INCANDESCENT ELECTRIC LAMPS.

No. 370,995. Patented Oct. 4, 1887.

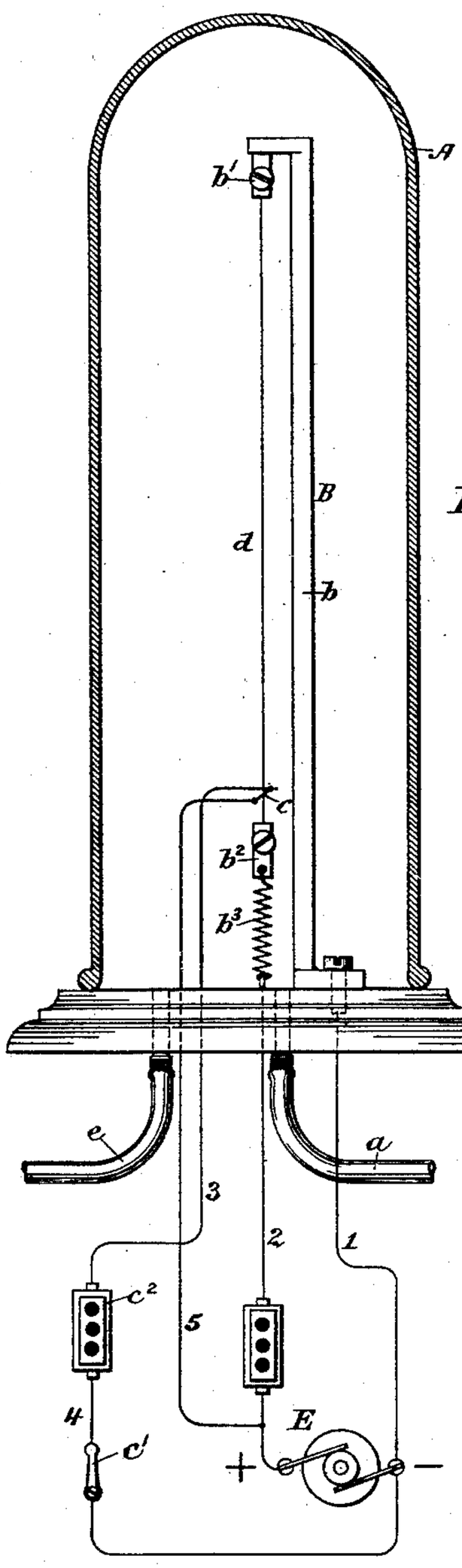

Fig. 1.

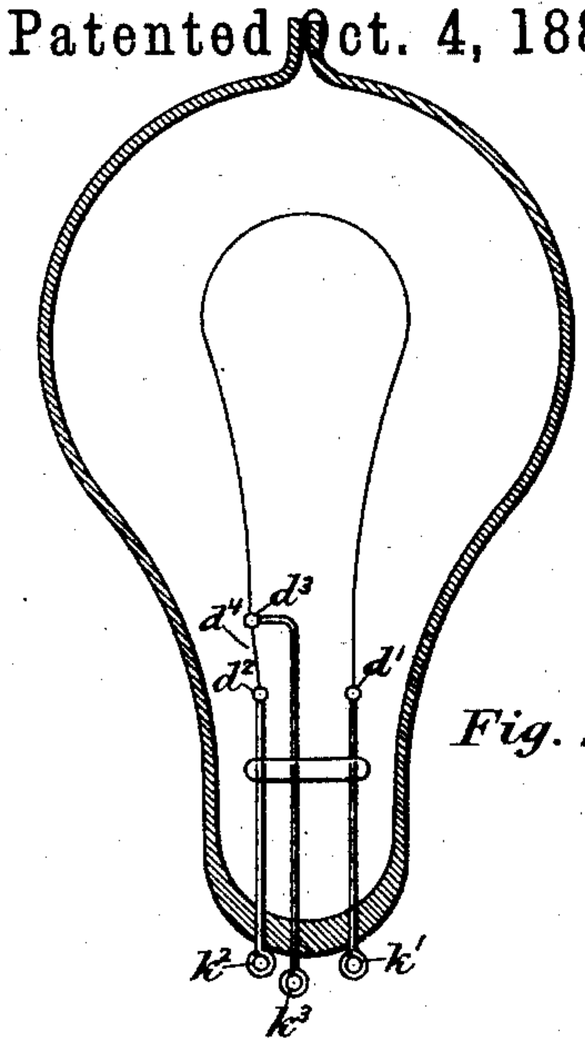

Fig. 2.

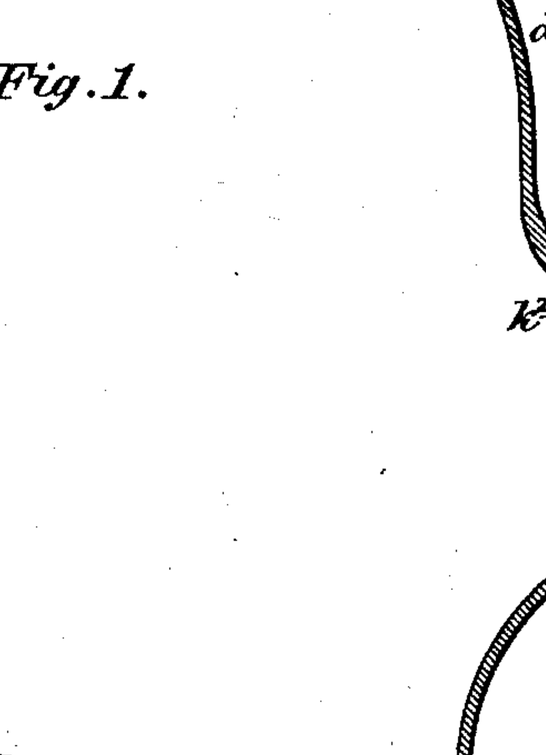

Fig. 4.

Fig. 3.

Witnesses

Geo. W. Breck.

George H. Sheehy Jr.

By his Attorneys

Inventor

E. P. Thompson

Pope & Edgecomb

UNITED STATES PATENT OFFICE.

EDWARD P. THOMPSON, OF ELIZABETH, NEW JERSEY.

PROCESS OF MANUFACTURING FILAMENTS FOR INCANDESCENT ELECTRIC LAMPS.

SPECIFICATION forming part of Letters Patent No. 370,995, dated October 4, 1887.

Application filed January 22, 1887. Serial No. 225,114. (No model.)

To all whom it may concern:

Be it known that I, EDWARD P. THOMPSON, a citizen of the United States, residing in Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in the Process of Manufacturing Filaments for Incandescent Electric Lamps, of which the following is a specification.

The invention relates to a process of manufacturing the filaments of incandescent electric lamps.

The object of the invention is to produce a filament which shall be as incombustible as possible, and which will therefore have a longer life and be less destructible than the ordinary filaments as heretofore prepared.

In an application filed by me September 15, 1886, Serial No. 213,570, there is described a method of producing a permanent set of the molecules in a filament; and the present invention relates in some particulars to the invention there described.

The invention consists, in general terms, in first carbonizing the filament in a straight form, placing the carbonized filament under tension, and surrounding it with an atmosphere of hydrocarbon, then subjecting it to heat by passing a current through it, and while thus heated causing it to break at a predetermined point. This treatment causes the molecules to be drawn into close proximity to each other and the strain causes the pores to be closed, while the atmosphere of hydrocarbon occasions a deposit, rendering the filament dense.

The method of determining the point at which the filament shall break preferably consists in heating that particular point beyond the other portions of the filament. After the filament has been thus treated it is formed into the required shape by first bending it, and while it is so bent subjecting it to heat. The filament is then mounted in the lamp in the usual manner, with the exception that it is provided with three supports or leading-in wires. Two of these are applied to the respective terminals in the usual manner, while the third is applied at a point slightly removed from one terminal. At one terminal there is formed a point of high resistance. The evacuation is then effected in the usual manner, and the filament is heated until it breaks at this point of high resistance during the process of evacuating. The desirability of causing the filament to thus be broken between the two points of support is threefold. In the first place, it insures that a perfect filament will not be destroyed by reason of the heat to which it is subjected by breaking at some other point in its length, for the reason that the point of high resistance will be the point which will first yield to the heat; second, that in case the filament is defective it will break at some other place than this point, and, third, the points thus separated will serve as discharge-points for the lamp when in use. This latter feature is described in applications for Letters Patent, Serial Nos. 213,572 and 213,571, filed by me September 15, 1886, and in an application of even date herewith.

In the accompanying drawings, Figure 1 is an elevation of an apparatus for treating the filaments in an atmosphere of hydrocarbon. Fig. 2 illustrates the filament as placed in the lamp during the process of evacuation. Figs. 3 and 4 illustrate a modified form.

Referring to Fig. 1, A represents a bell-jar or other suitable receiver designed to be charged with an atmosphere of hydrocarbon, which may conveniently be led through a tube, *a*. In this receiver there is placed a tension clamping device, B, consisting of an arm, *b*, having at its upper end the clamp *b'* for receiving one end of the filament *d*. At the lower portion of the receiver a second clamp, b^2, receives the other end of the filament. This lower clamp is supported upon a tension-spring, b^3, which serves to place the filament under strain.

There extends within the chamber A to a point a short distance above the clamp b^2 a conductor, *c*, of platinum or other suitable material, designed to almost touch against the filament at a point beyond the clamp.

It is designed that the filament be placed in an electric circuit with a suitable source of electricity, E, by connecting one pole of a conductor, 1, with the clamping device B

and the other pole by a conductor, 2, with the spring b^3, supporting the clamp b^2. A third conductor, 3, leads to the conductor *c*. This conductor *c* preferably consists of a thin platinum wire, one end of which is connected by means of conductors 3 and 4 with one pole of the source of electricity and the other end by a conductor, 5, with the other pole. By closing the switch c' a current may be sent through the wire *c*, and the strength of this current may be regulated by an adjustable resistance, c^2.

In treating the filaments it is preferred first to exhaust the air by means of a pump connected through a tube, *e*, or in any other suitable manner, and then to charge the jar with an atmosphere of hydrocarbon through the tube *a*. The filament is then heated by means of a current from the source E, and at a sufficiently high temperature it is caused to break at a point where the conductor *c* almost touches the filament by passing the current through that conductor. The breaking of the filament necessarily interrupts the connections through the filament, and this produces a sudden intense increase of the electro-motive force, serving to throw off the loose particles of carbon from the filament by reason of the charge the filament receives. The filament is then removed from the jar and is bent into the proper shape by any of the well-known processes, and the filament, after being properly shaped, is mounted upon three supports, as shown in Fig. 2. In this instance the respective terminals d' and d^2 of the filament are provided with leading-in wires k' and k^2, respectively, while the other wire, k^3, leads to a point, d^3, a little above the terminal d^2. The filaments having been placed in the globe in the usual manner, the globe is exhausted, and during the process of exhausting the filament is raised to a high temperature by passing a current through it.

At a point, d^4, intermediate between the points d^2 and d^3 there is formed in any convenient manner a point of high resistance. The filament may therefore be raised to a high heat by passing a current through it from leading-in wire k' to the leading-in wire k^2. The portion between the points d^2 and d^3 may be covered or left untreated during the process described in connection with Fig. 1, so that it will be of greater resistance; or a nick or point of high resistance may be mechanically effected afterward. When the lamp is nearly exhausted, a current is transmitted from the wire k' to the wire k^2 of sufficient strength to cause the filament to break at the point d^4. In this manner the filament will have been twice subjected to an intense heat, and, as already stated, a filament which has thus been raised to a high heat is capable of greater endurance than those which have been treated at a moderate temperature. The filament having thus been broken, the lamp is sealed off in the usual manner, leaving the discharge-points between the conductors k^2 and k^3. Across these points the static discharge of the lamp may take place upon the closing and breaking of the circuit when in use. To this end conductors k' and k^3 are connected with the respective supply-conductors, while the conductor k^2 may be connected with the earth or a neutral conductor, as shown in Fig. 3.

In Fig. 2 the filament is represented as having the points d' and d^2 at corresponding positions within the globe, so that the resultant filament is longer on one side of the loop than upon the other. In Figs. 3 and 4 the portion including the point d^4 of high resistance constitutes a prolongation of the corresponding limb of the filament, and therefore the resultant filament will be symmetrical.

I claim as my invention—

1. The hereinbefore-described process of treating filaments, which consists in placing a carbonized filament under tension, surrounding it by an atmosphere of hydrocarbon and simultaneously transmitting a current of electricity therethrough, in causing the filament to break at a predetermined point while thus treated, and in subsequently causing the filament to be traversed by an electric current and again heated, and in breaking it at a second point.

2. The hereinbefore-described process of treating filaments, which consists in causing the same to be traversed by a current of electricity while under strain in an atmosphere of hydrocarbon, breaking the filament while at a high temperature, placing the filament thus prepared within a globe, exhausting the atmosphere, raising the filament to a high temperature, and ultimately breaking it at a second point while at a high temperature.

3. The hereinbefore-described process of treating filaments for incandescent lights, which consists in subjecting the same to strain and heat simultaneously, breaking the filament while traversed by a current of electricity, bending the same into the proper form, placing it within a receptacle and rarefying the atmosphere therein, including it while in such rarefied atmosphere in an electric circuit, expelling the occluded gases therefrom by means of an electric current, and ultimately transmitting a current of sufficient strength to break the filament a second time.

4. In an incandescent electric lamp, a filament, two leading-in wires applied to the respective terminals thereof, and a third wire leading to a point near one terminal, the portion of the filament between the two last-named terminals being of higher relative resistance than the remainder of the filament.

5. In an incandescent electric lamp, the combination, with the filament, of leading-in wires connected with the respective terminals thereof, a conductor leading to a point in the vicinity of one of said terminals, and discharge-points extending from this point and from said conductor toward each other, which dis-

charge-points consist, respectively, of a prolongation of the filament and a detached portion of the filament.

6. The hereinbefore-described process of treating filaments, which consists in heating a filament to approximately its point of rupture during the latter part of the process of evacuating, and thereupon automatically removing the source of heat therefrom.

In testimony whereof I have hereunto subscribed my name this 19th day of January, A. D. 1887.

EDWARD P. THOMPSON.

Witnesses:
DANL. W. EDGECOMB,
CHARLES A. TERRY.