(No Model.)

T. A. EDISON.

PROCESS OF MAKING CARBON FILAMENTS.

No. 390,462. Patented Oct. 2, 1888.

Fig. 1.

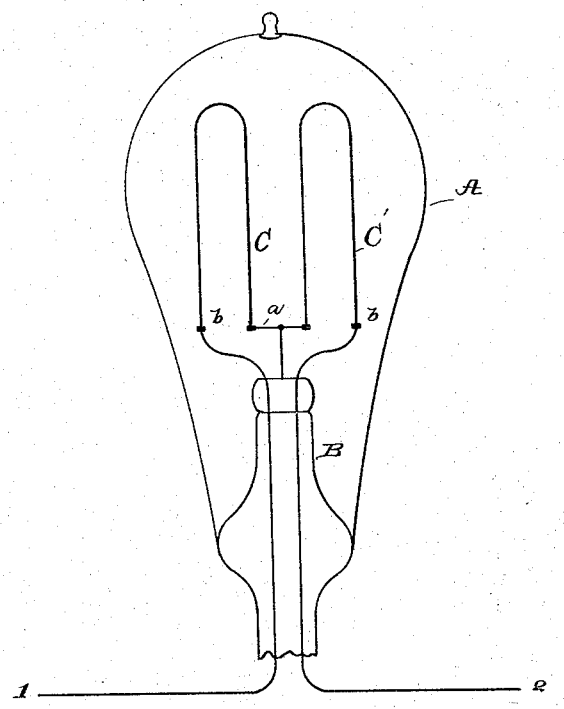

Fig. 2.

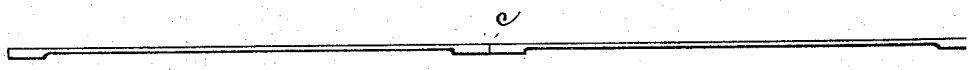

Fig. 3.

Witnesses
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UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PROCESS OF MAKING CARBON FILAMENTS.

SPECIFICATION forming part of Letters Patent No. 390,462, dated October 2, 1888.

Original application filed November 9, 1882, Serial No. 76,382. Divided and this application filed March 2, 1888. Serial No. 265,891. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Processes for Making Carbon Filaments, (Case No. 764, division of Case No. 510,) of which the following is a specification.

In my application for patent, Case No. 202, (Serial No. 2,180,) I describe an incandescing electric lamp having as the incandescing conductor two or more carbon filaments connected in series, the advantage of such a lamp being the exceedingly high resistance which is obtained by the use of two or more filaments in series and the consequent saving in conductors by reason of the higher electro-motive force that may be employed with such a lamp. It is essential in such a lamp that the two or more carbon filaments should have the same resistance per unit of radiating-surface in order that the filaments at every point in their length will be raised to the same degree of incandescence by the flow of the current therethrough. I have found that if it is attempted to produce this uniformity of resistance per unit of radiating-surface by "flashing" the filaments—that is, by raising them to incandescence when surrounded by hydrocarbon—the resistance of the filaments is enormously decreased and the advantage of using two filaments in series is substantially lost, since the increase in resistance which can be obtained by the use of two flashed carbon filaments is not sufficiently greater than the resistance of one unflashed filament to warrant the change to a more expensive form of lamp.

The object of my invention is to produce a method or process by which the two or more carbon filaments designed for use in series in one lamp-globe can be made of unflashed carbons and will have the same resistance per unit of radiating-surface.

My carbon filaments are made by carbonizing natural fibrous vegetable material, such as various woods, but preferably bamboo. In order to insure precise similarity in the two or more filaments intended for use in the same lamp, such filaments are made from a strip cut lengthwise of the fibers and of the total length of the two or more filaments, which strip is first reduced to the proper filamentary size and is then cut into lengths before or after carbonization. The two or more filaments are given the same cross-sectional area, and by being obtained from a continuous length of the same fibers they will have the same structural characteristics, or, in other words, will be of the same density, which might not be the case if the filaments were taken from laterally different parts of the material. The filaments should then be carbonized together and under precisely the same conditions of heat, strain, and pressure. This is accomplished by carbonizing them together in the same mold.

In the accompanying drawings, forming a part hereof, Figure 1 is a view of a lamp containing two similar unflashed carbon filaments connected in series, and Figs. 2 and 3 are views of strips from each of which two filaments are made.

In Fig. 1, A is the inclosing-globe, and B the inner stem of an incandescing electric lamp, and 1 2 are the leading-in wires sealed in the glass of the stem B. Two similar unflashed carbon filaments, C and C', are shown connected together in series at *a* and attached to the leading-in wires at *b b*. To produce such filaments a strip, Figs. 2 or 3, is cut lengthwise from the bamboo or other fibrous material employed, so that the same fibers of the bamboo shall run throughout the length of the two filaments. This strip is reduced to the proper size for the filaments, so that they will have a uniform cross-section throughout their incandescing portions, and then the strip is cut in two at the middle at the point *c*. The two filamentary blanks are then carbonized under the same conditions by placing them together in the same mold, or the filament may be divided by breaking it in two at the center after carbonization.

I do not claim in this application the combination, with the inclosing-globe and the leading-in wires of an incandescent electric lamp, of two or more unflashed carbonized filaments having the same resistance per unit of radiating-surface inclosed within such globe and connected in series with said leading-in

wires, since such a construction is covered by my application for patent, Case No. 510, Serial No. 76,382, of which this case is a division.

What I claim as my invention is—

The process herein described of producing similar unflashed carbon filaments for use in series as the incandescing conductor of an electric lamp, consisting in forming two or more filamentary blanks for carbonization by cutting from a natural fibrous vegetable material, lengthwise of the fibers thereof, a strip of the length of two or more of such blanks, reducing such strip to the proper filamentary size, carbonizing such blanks together under the same conditions, and dividing the blank transversely into two or more blanks before or after carbonization, substantially as set forth.

This specification signed and witnessed this 20th day of February, 1888.

THOS. A. EDISON.

Witnesses:

WILLIAM PELZER,

E. C. ROWLAND.