(No Model.)

J. T. MARSHALL.

INCANDESCENT LAMP FILAMENT.

No. 461,797. Patented Oct. 20, 1891.

Fig. 1.

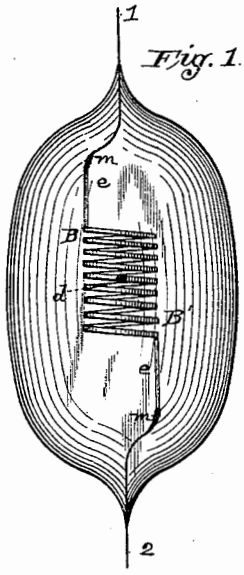


Fig. 2.

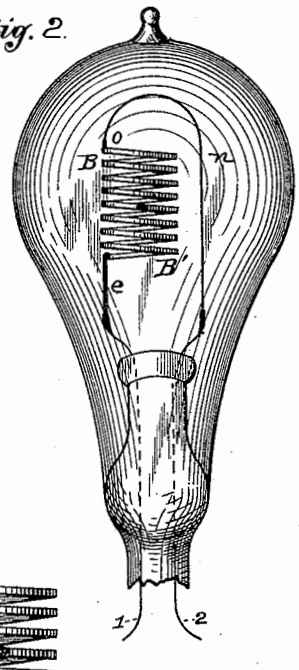


Fig. 3

Fig. 4.

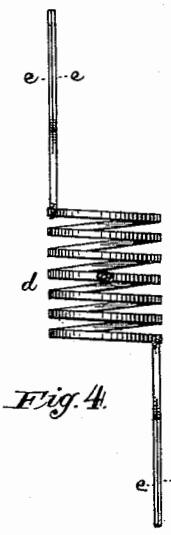


Fig. 5.

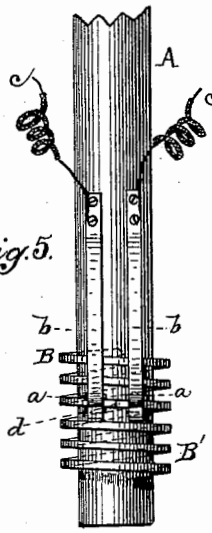


Fig. 7.

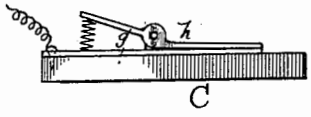
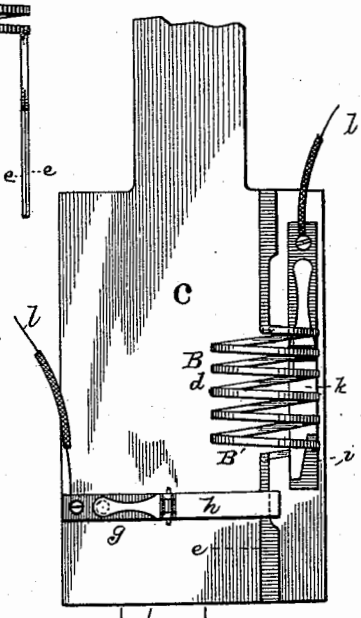


Fig. 6.



ATTEST:

E. C. Rowland.

Louis Riddle.

INVENTOR:

John T. Marshall

By Dyer & Seely

Attys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN T. MARSHALL, OF METUCHEN, NEW JERSEY, ASSIGNOR TO THE EDISON ELECTRIC LIGHT COMPANY, OF NEW YORK, N. Y.

INCANDESCENT-LAMP FILAMENT.

SPECIFICATION forming part of Letters Patent No. 461,797, dated October 20, 1891.

Application filed November 9, 1885. Serial No. 182,292. (No model.)

To all whom it may concern:

Be it known that I, JOHN T. MARSHALL, of Metuchen, in the county of Middlesex and State of New Jersey, have invented a certain new and useful Improvement in Incandescing Conductors for Electric Lamps, of which the following is a specification.

My invention relates to carbon conductors for incandescing electric lamps designed to produce a light of high candle-power and intensity, for use in light-houses, for example. Such conductors are usually of great length and made in spiral form, so that the light is concentrated in a small space. In the manufacture of carbons from bamboo conductors of this kind cannot well be produced, for the reason that the bamboo as imported from abroad never exceeds a certain length between the joints, and this length is insufficient to produce such conductors as are required in many cases. In making carbons from artificial substances, also, it is difficult or impracticable to produce filaments of the desired length.

The object of my invention is to provide filaments for incandescent lamps in a convenient and efficient manner, with enlarged ends for attachment to the leading-in wires.

In the accompanying drawings, Figures 1 and 2 are views of incandescing electric lamps having conductors embodying my invention. Fig. 3 is an enlarged side view of one of said carbons; Fig. 4, a similar edge view thereof; and Figs. 5, 6, and 7 are views of tools employed in the manufacture of such conductors.

In carrying out my invention I form strips or filaments of carbonizable material into spirals by coiling upon a hot mandrel. These spirals are then carbonized, being packed with powdered charcoal in the mold that they may maintain their shape during carbonization. To make the long carbon conductors, two or more of these carbon spirals are united together in the following manner: The apparatus shown in Fig. 5 is employed, consisting of a tubular wooden stem A, having upon it two metal plates *a a* and two springs *b b*, whose ends rest upon the plates. Wires *c c* from a suitable source of electricity extend to the springs. The two carbon spirals B and B′ are both wound upon stem A in such manner that their ends touch at *d* between the plates. The springs are raised to permit the spirals to be placed in position and being then released the ends of the spirals are held by the springs in contact. The tool is then placed in a bath of hydrocarbon liquid, so that the ends of the carbons are submerged, and current being applied at *c c* the ends are heated by the passage of the current and carbon is deposited upon them uniting them firmly together at *d* by an electro-deposited carbon joint. If it is desired to make a still longer conductor, one or more other spirals may of course be united in the same way. I further unite the enlarged ends to the carbon conductor by a carbon deposit. I prefer to form each enlarged end of two flat pieces of carbon *e e*, which are placed together in a suitable clamp and united by electro-deposition of carbon. This piece is attached to the filament also by electro-deposition. To perform this attachment, I make use of the device shown in Figs. 6 and 7. Fig. 6 is a plan view of the apparatus, and Fig. 7 a side view of one of the clamps.

C is a wooden plate. *g* is a flat metal strip upon it, to which is secured a pivoted spring-holder *h*. At right angles to this are another plate *i* and a similar spring-holder *k*. Holder *h* is for the enlarged end piece *e*, the same being clamped under the end of said holder, as shown. Holder *k* is for the spiral and holds the end thereof against the end of *e*. Circuit connections *l l* are made to the two holders, and they are then immersed in the hydrocarbon-bath and the enlarged end united to the spiral by the carbon deposit. The spiral is then turned around and a similar piece *e* is attached to the other end thereof. The incandescing conductor thus formed is placed in the lamp-globe D or E.

As shown in Fig. 1, the enlarged ends are attached at *m m* by electroplating or by any suitable clamps to leading-in wires 1 2, entering the globe from opposite ends. The spiral B B′ alone becomes incandescent, the parts *e e* being too large to become heated by the passage of the current.

A different form of conductor is shown in Fig. 2. Here the spiral B B′ has only one enlarged end *e*, while at its other end the fila-

ment *n* is attached by electro-deposition of carbon at *o* and extends around to the leading-in wire 2, while enlarged end *e* is attached to wire 1. The whole of the carbon loop thus formed becomes incandescent, the part *n* being of the same size as the carbon of the spiral. It might of course be made larger, so that only the spiral would furnish the light; but in this case it would obscure the light of the spiral.

What I claim is—

1. A carbon conductor for an electric lamp, having in combination a filament, enlarged ends for said filament, each composed of two pieces, electro-deposits of carbon uniting such pieces together, and electro-deposits of carbon uniting said enlarged ends to said filaments, substantially as set forth.

2. A carbon filament for an electric lamp, consisting of a carbon spiral, enlarged ends for said spiral, each composed of two pieces of carbon laid face to face, and electro-deposits of carbon uniting such pieces together, substantially as set forth.

This specification signed and witnessed this 5th day of November, 1885.

JOHN T. MARSHALL.

Witnesses:

JOHN W. HOWELL,

REUBEN J. WHITEHEAD.