(No Model.)

T. A. EDISON.

FILAMENT FOR INCANDESCENT LAMPS.

No. 430,933. Patented June 24, 1890.

Fig. 1.

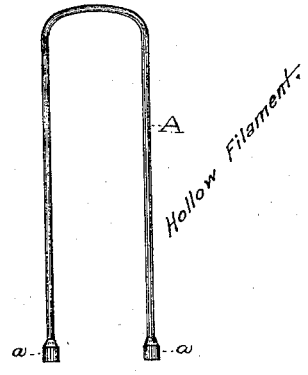
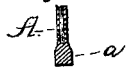


Fig. 2.

Fig. 3.



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UNITED STATES PATENT OFFICE.

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FILAMENT FOR INCANDESCENT LAMPS.

SPECIFICATION forming part of Letters Patent No. 430,933, dated June 24, 1890.

Application filed November 9, 1882. Serial No. 76,385. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Menlo Park, in the county of Middlesex and State of New Jersey, have invented a new and useful Improvement in Incandescing Conductors for Electric Lamps, (Case No. 514,) of which the following is a specification.

The object I have in view is to produce incandescing conductors for electric lamps which shall be of high resistance and at the same time have small radiating-surface. This I accomplish by making such incandescing-conductor (which is preferably a flexible carbon filament) hollow, so that its mass is decreased and its resistance consequently raised. To make a hollow flexible filament of carbon, I coat a wire or filament of any suitable material with carbonizable substance, and after pressing to consolidate the fiber of the latter I remove the wire or filament in any suitable way, the result being a hollow flexible filament of carbonizable material, which may be carbonized in the usual manner under pressure or strain, or both, the filament being bent into the desired shape before or after carbonization. The material which is coated with the carbonizable substance may be metal which can be withdrawn or eaten out by acid; or filaments formed of resins, hard pitch, or celluloid may be used, which can be dissolved by suitable solvents. The wires or filaments may be wrapped with tissue or other paper or coated with paper-pulp or cellulose.

If it is desired to use filaments of gelatinized cellulose, as set forth in my application Serial No. 74,786, a metal wire may be coated with cellulose and such cellulose gelatinized by hydrofluoric acid, the metal being removed in any suitable way. Where metal is used as the base of the filament, it might be allowed to remain until carbonization, when the heat required to carbonize will fuse the metal and cause it to run out, leaving the carbon filament hollow. After carbonization, if desired, the enlarged ends of this filament may be plugged up with carbon, so that such ends will be solid.

It is evident that flexible filaments of any desired shape, either square, round, or oval in cross-section, may be produced, according to the shape of the core used.

In the accompanying drawings, Figure 1 is a view in elevation of a round carbon filament formed according to my invention; Fig. 2, a cross-section of the same, and Fig. 3 a vertical section of an enlarged end made solid.

A is the filament, having enlarged ends *a a*, which may be either solid, as seen in Fig. 3, or hollow, the filament being hollow throughout its length, as seen in Fig. 2.

What I claim is—

1. A tubular incandescing conductor for an electric lamp, substantially as set forth.

2. A tubular filament of carbonizable material for forming the incandescing conductor of an electric lamp, substantially as set forth.

3. A tubular flexible carbon filament for the incandescing conductor of an electric lamp, substantially as set forth.

4. The method of forming hollow carbon filaments, consisting in coating a wire or filament with a carbonizable substance, removing such wire or filament, and carbonizing the hollow filament thus formed, substantially as set forth.

5. A filament for incandescent electric lamps the entire incandescing portion of which is in the form of a tube, substantially as described.

6. A filament for incandescent electric lamps the incandescing portion of which is in the form of a tubular arch, substantially as described.

This specifiation signed and witnessed this 3d day of November, 1882.

THOMAS A. EDISON.

Witnesses:

H. W. SEELY,

EDWARD H. PYATT.