

(No Model.)

T. A. EDISON.  
MANUFACTURE OF CARBON FILAMENTS.

No. 525,007.

Patented Aug. 28, 1894.

FIG. 1.

b - Successive Layers of Carbonizable Material.  
a - Soluble Base.

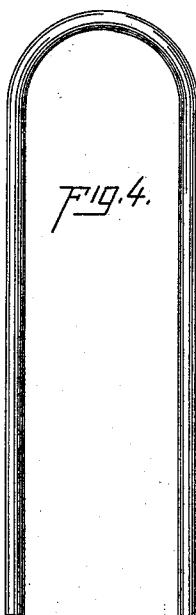
FIG. 2.

b - Soluble Tube for Base.

FIG. 3.

b - Completed Filament.

FIG. 4.



ATTEST:

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# UNITED STATES PATENT OFFICE.

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## MANUFACTURE OF CARBON FILAMENTS.

SPECIFICATION forming part of Letters Patent No. 525,007, dated August 28, 1894.

Application filed December 15, 1886. Serial No. 221,583. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain 5 new and useful Improvement in the Manufacture of Carbon Filaments, (Case No. 707,) of which the following is a specification.

The object of my invention is to produce incandescent conductors for electric lamps 10 which shall be of even texture or structure throughout and of high electrical resistance.

In accomplishing my invention I first form a filament of a substance which is readily soluble by solvents which do not affect the 15 carbonizable substance which is to be placed thereon. For instance I may take boric acid which when heated may be readily drawn out into smooth cylindrical filaments and such filaments I then prefer to bend into the arched 20 or looped form which I have found to be preferable for incandescent conductors. I then coat such filaments with several concentric layers of carbonizable material which I preferably accomplish by immersing them in a 25 solution of asphaltine dissolved in benzole, allowing the coating to dry, which it does quickly, then again immersing and drying, and repeating these steps as many times as desired. Each layer may be made very thin, 30 the thickness depending on the strength of the solution. After the desired thickness of carbonizable material is obtained—which may depend on the resistance desired for the conductor, the filament may be placed in water 35 which will dissolve the base of boric acid without affecting the carbonizable substance. This forms a hollow filament composed of numerous concentric layers. Such filaments are carbonized in the usual or any suitable 40 manner. The benzole which is the solvent for the asphaltine being volatile is rapidly removed by the carbonizing heat. Being hollow their electrical resistance is high and they therefore may be used with unusual economy 45 in the amount of metal required for the conductors supplying current to them. Another way of forming filaments of this character is to take tubes of boric acid and draw the asphaltine or other carbonizable solution 50 through them at intervals whereby successive layers are formed on the inside of the tube.

The boric acid can then be very readily dissolved, the result being as before a hollow carbonizable filament composed of concentric layers. I have mentioned boric acid and asphaltine as suitable substances but it is evident that many others may be used without departing from the principle of my invention. 55 As another instance, I may employ melted rosin, which may be drawn into filaments and 60 these coated concentrically with layers of licorice dissolved into gum dextrine, gum arabic or gum tragacanth, and the rosin may then be dissolved out by spirits of turpentine. If rosin is used however it need not be dissolved out for it is itself carbonizable. I prefer to dissolve it however, so as to form hollow 65 filaments.

In the accompanying drawings, Figure 1, is an exaggerated section of a filament before 70 the removal of the soluble base; Fig. 2, a similar section before the removal of the soluble tubular base; Fig. 3, a similar section of the completed carbonizable filament; and Fig. 4, an enlarged view in elevation of the same. 75

In Fig. 1, on a soluble base *a* are placed successive layers *b b* of carbonizable substance; in Fig. 2, a soluble tube *c* has its interior coated with such layers; Fig. 3 shows either form with the soluble filament or tube removed, the concentric layers *b b* remaining. 80

What I claim is—

1. The method of making filaments for incandescent electric lamps which consists in forming a core of a substance soluble in water, coating the core with one or more layers of carbonizable material, dissolving the core in water and finally carbonizing the hollow filament, substantially as described. 85

2. The method of making filaments for incandescent electric lamps which consists in forming a core of boric acid, coating the core with a solution of asphaltine in benzole, dissolving the core and finally carbonizing the hollow filament, substantially as described. 90

This specification signed and witnessed this 6th day of December, 1886. 95

THOS. A. EDISON.

Witnesses:

W. M. PELZER,  
E. C. ROWLAND.