

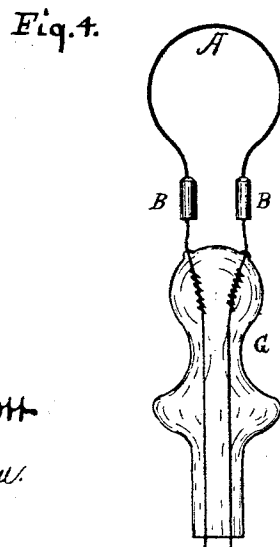
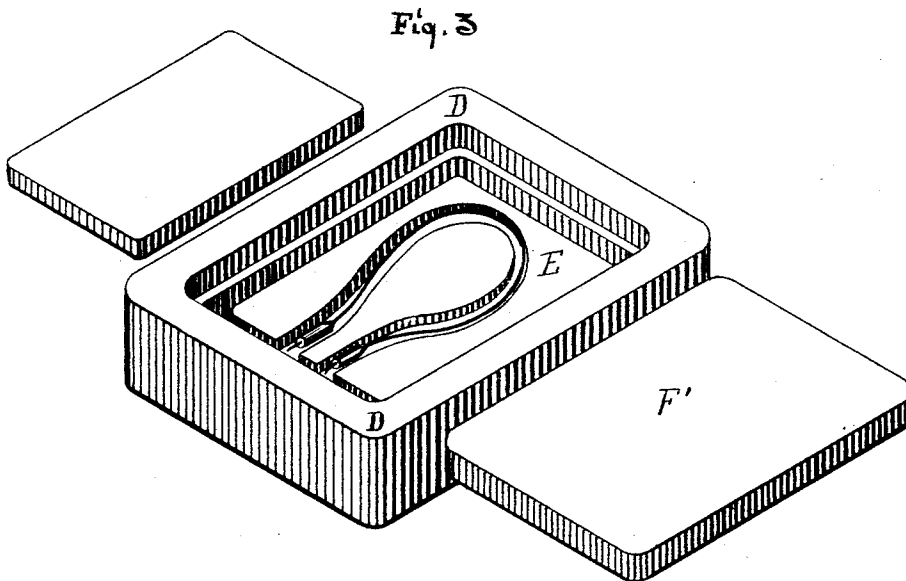
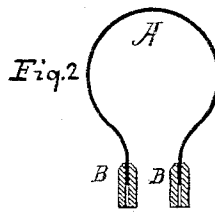
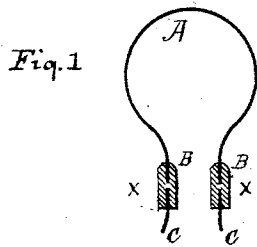
(No Model.)

T. A. EDISON.

MANUFACTURE OF CARBONS FOR ELECTRIC LAMPS.

No. 525,888.

Patented Sept. 11, 1894.



Attest =

Samuel D. Mott  
James A. Payne.

Inventor =

T. A. Edison  
per  
Oyer & Melber  
Attys

# UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF MENLO PARK, NEW JERSEY, ASSIGNOR TO THE  
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## MANUFACTURE OF CARBONS FOR ELECTRIC LAMPS.

SPECIFICATION forming part of Letters Patent No. 525,888, dated September 11, 1894.

Application filed March 20, 1880. (No specimens.) Patented in England September 16, 1880, No. 3,765; in Italy November 6, 1880, No. 12,315; in Canada November 11, 1880, No. 11,968; in Belgium November 15, 1880, No. 52,890; in Victoria December 13, 1880, No. 2,936; in Austria-Hungary January 7, 1881, No. 31 and No. 50; in Queensland February 7, 1881; in New Zealand March 7, 1881, No. 510; in Portugal March 31, 1881, No. 661; in New South Wales April 2, 1881; in Spain April 26, 1881, No. 1,284, and in France June 10, 1881, No. 141,976.

### *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  
5 useful Improvement in the Manufacture of Carbons for Electric Lamps, (for which patents have been granted in Great Britain, No. 3,765, dated September 16, 1880; in Italy, No. 12,315, dated November 6, 1880; in Canada, No.  
10 11,968, dated November 11, 1880; in Belgium, No. 52,890, dated November 15, 1880; in Victoria, No. 2,936, dated December 13, 1880; in Austria-Hungary, No. 31 and No. 50, dated January 7, 1881; in Queensland, dated February  
15 March 7, 1881; in New Zealand, No. 510, dated March 7, 1881; in Portugal, No. 661, dated March 31, 1881; in New South Wales, dated April 2, 1881; in Spain, No. 1,284, dated April 26, 1881, and in France, No. 141,976, dated  
20 June 10, 1881; and I do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

25 As before explained in prior applications for patents for inventions of mine relating to lighting by electricity, it is essential that the incandescing conductor should be of high resistance, and that great advantages result  
30 from the increase of resistance, when such increase can be obtained, without increase in the extent of the radiating surface. In such applications means of increasing the resistance with a given radiating surface were  
35 shown. I have discovered however, that an incandescing conductor of very high resistance in comparison to the radiating surface may be made of such natural fibers as are capable of carbonization, especially those which  
40 are large, filamentary and cellular in character, such as jute, bast, manila, hemp, &c. These fibers are of endogenous growth and are made up of parallel filamentary fibers running lengthwise of the main fiber and not inter-  
45 lacing or radiating from the center to the exterior. I call these "natural" fibers, because they are by the nature of their growth compact and filamentary bundles of elementary

fibers, the bundles being separated from each other or surrounded by pith, which can be  
50 readily removed, leaving a fiber approximately of the size required for the filament of my incandescent electric lamp. Hence these natural fibers only require a slight external shaping, in order to make them suit-  
55 able for carbonization for forming carbon filaments, no splitting of the fiber being required and the natural structure being left undisturbed. These natural fibers make exceedingly good carbon filaments and the cost of  
60 producing filaments from them is less than where wood is used, which requires several operations of splitting, shaving and forming, in order to give it the proper shape and size.

My present invention relates to the use of  
65 such fibers, and the means and methods of fitting them for use.

In the drawings—Figures 1 and 2 show fibers prepared for carbonization. Fig. 3 shows a carbonizing flask with a fiber in  
70 position; and Fig. 4 shows the fiber carbonized, and secured to its support, ready for introduction into a lamp.

A is any natural fiber capable of carboni-  
75 zation. A preferable fiber, I find is a fibrous grass from South America called "monkey bast fiber," each blade of which is generally round, and is composed of a great number of elementary fibers cemented together by a  
80 material, which carbonizing locks all the elementary fibers together into a homogeneous filament. These blades vary somewhat in size and also are slightly tapering. It being  
85 necessary that the conductors should be of uniform size I reduce them, and also any other fibers varying in size, to uniformity by  
90 passing them through a cutting die, which shaves off the extraneous matter, or a revolving cutter may be passed along the fibers or they may be reduced in any other practicable  
way.

Upon the ends of the fiber A are fixed prior to carbonization, the clamps B. These clamps are made of any suitable carbonizable material, lignum-vitæ, box-wood, &c., being well  
95 adapted therefor. They may be made flat-

tened or square but preferably are cylinders. A small hole is bored through the center and the fiber inserted therein as shown in Fig. 2. It is advantageous to moisten these inserted ends of the fiber with a solution of sugar, or with other carbonizable liquid. Pieces of platinum wire C, C, are inserted into the clamps as shown in Fig. 1.

Upon carbonization the material of clamps B, B, shrinks around and upon the wires and fiber, binding them tightly together, which result is aided by the carbonization of the liquid applied as before suggested, to the inserted ends of the fiber.

D is a flask or box of metal capable of withstanding a high degree of heat, having a groove E of the desired shape cut in its bottom as shown in Fig. 3. As fibrous material contracts or shrinks in the process of carbonization, it is necessary to provide for the movement attendant thereon, care being taken at the same time to prevent any movement which would allow of warping or distortion. This is effected by the groove E, which allows a longitudinal movement but prevents any other. In this groove, the fiber with its attached ends is placed, a cover F being then laid over it. A corresponding groove may be cut in the upper surface of the cover F, and another fiber laid therein, and a number of such covers, limited by the capacity of the flask or box D, may be used so that many may be carbonized at one operation. When the flask or box E is full the lid F' is fastened tightly thereon, and the whole placed in any suitable furnace for carbonization. The result is what is now known as the horse-shoe carbon made as a single fiber, with carbon clamps and proper conductors securely attached thereto by the process of carbonization. As these carbon clamps, from their much larger size relatively, contain a large quantity of deleterious gases which come out very slowly when under the action of the vacuum pumps, it is preferable that clamps be used, which have first been carbonized, and subjected in vacuo, to heat sufficient to produce a high degree of incandescence. When such are used, a very small amount of sugar applied to the ends of the fibers, serves, by its carbonization, to bind them securely together.

I do not make any claims herein relating specifically to the matter of making a filament of a number of fine filaments welded together by a carbonizable cementing material, since this matter forms the subject of a divisional application filed by me July 2, 1888, Serial No. 278,852.

What I claim is—

1. An incandescing conductor for an electric lamp formed of a carbonized natural fiber of endogenous growth and made up of parallel elementary fibers, substantially as set forth.

2. The method of making incandescing conductors for electric lamps consisting in taking a natural fiber, of endogenous growth and composed of parallel elementary fibers passing the same through a cutting die to remove the extraneous matter and then carbonizing the same, substantially as set forth.

3. The method of making incandescing conductors for electric lamps in a bent or horse-shoe form consisting in taking a straight filament of fibrous material then introducing it into a flask or box provided with means for holding it in a bent or horse-shoe form, while allowing of longitudinal movement necessary for contraction during carbonization and then subjecting said flask or box to a carbonizing heat, substantially as set forth.

4. The method of uniting a carbon filament with the metallic leading conductors, which consists in securing the ends of the carbon filament to clamps of carbon by a cementing carbonizable material and then carbonizing such cementing material, substantially as set forth.

5. A carbon clamp for uniting the incandescing and metallic conductors formed of a carbonized material united to the incandescing conductor by a carbonized cementing material, substantially as set forth.

6. The carbonizing flask or box provided with grooves for the reception of fibers, substantially as set forth.

This specification signed and witnessed this 10th day of March, 1880.

THOS. A. EDISON.

Witnesses:

WM. CARMAN,  
C. P. MOTT.