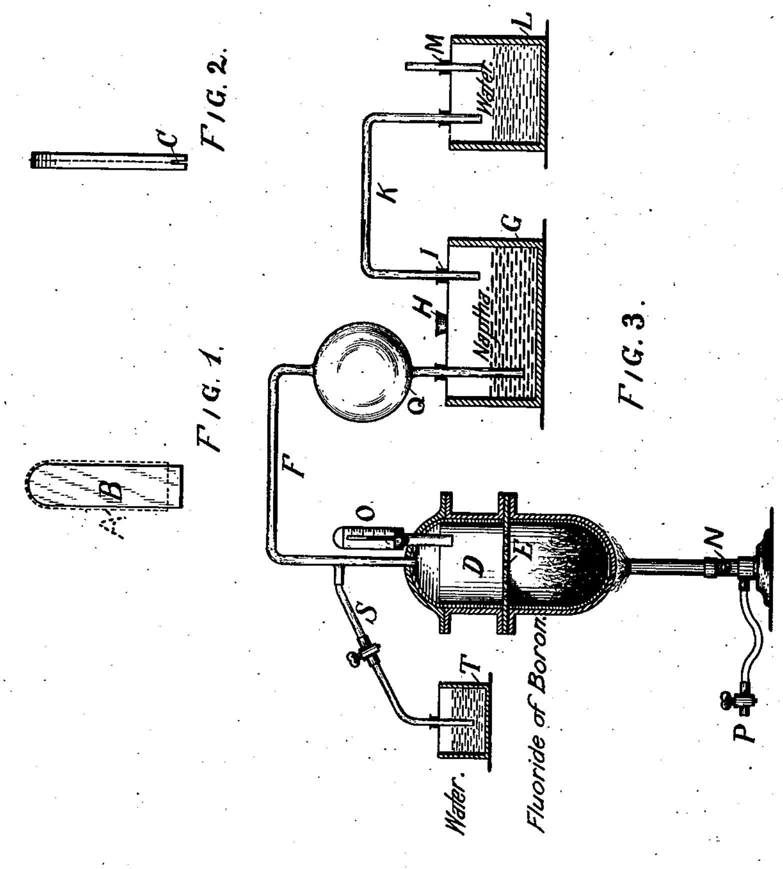
(No Model.)

A. DE LODYGUINE.

PROCESS OF MANUFACTURING FILAMENTS FOR INCANDESCENT LAMPS.

No. 494,149. Patented Mar. 28, 1893.



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PROCESS OF MANUFACTURING FILAMENTS FOR INCANDESCENT LAMPS.

SPECIFICATION forming part of Letters Patent No. 494,149, dated March 28, 1893.

Application filed September 14, 1888. Serial No. 285,432. (No specimens.)

To all whom it may concern:

Be it known that I, ALEXANDRE DE LODYGUINE, a citizen of Russia, residing at Paris, France, have invented a certain new and useful Improvement in the Manufacture of Incandescents for Electric Lamps, (Case No. 220,) of which the following is a specification.

In the accompanying drawings, Figures 1 and 2 are side and edge views of a block of lead upon which the blanks from which the incandescents are manufactured are placed to expose them to the action of the fluoride of boron, as hereinafter described. Fig. 3 is a view of the apparatus in which the blanks are exposed to the action of the fluoride of boron.

My invention relates particularly to the process of manufacturing the incandescents or filaments. I make use of any suitable organic substances, such as bamboo, paper, thread, piassava, or any other organic material capable of the treatment hereinafter mentioned. The organic material used is reduced to the required shape and size in any of the well known ways for making the filaments or blanks from which such incandescents are made. These blanks A, having the required dimensions are bent upon a suitable form or block of lead B, Fig. 1, to give them the required finished shape, and they are fastened upon such block in any desired way, such, for instance, as inserting their free ends into a suitable recess or crease C, in the side or edge of the block, which recess is closed on the ends of the blank to hold it in place. The form B, having the blank secured to it, is placed in a closed vessel in which it is exposed to the action of fluoride of boron (BFl_3). In Fig. 3 I show a form of vessel D, which may be used for this purpose. It is lined internally with lead to resist the action of the fluoride of boron, and it has a grating E, upon which the blocks B, with the incandescents secured thereto, are placed. The chemicals from which the fluoride is produced are placed in the lower part of the vessel. The gas arising therefrom acts upon the blanks secured to the forms B, and carbonizes them, driving off the elements of water chemically combined therewith, preserving the original form and structure of the blanks and imparting to them a homogeneous character, with the exception that the fluoride will combine with any foreign mineral substances which may be contained in the material, forming fluoride salts.

A neck or tube F, leads from the retort D, and terminates in a glass vessel G, which is filled with naphtha or other liquid not containing the elements of water, so that the gas will not combine therewith. The end of the tube F, terminates below the surface of the liquid, so that the latter acts as a seal. The trap thus made, while permitting the gas to pass through, effectually seals the retort against the entrance of the atmosphere, and so prevents the strength of the fluoride of boron from being wasted upon the moisture in the atmosphere. The glass vessel G is provided with a filling orifice H, through which the naphtha is poured into it. It is also provided with an outlet I, from which a neck or tube K leads to a second vessel L containing water, said vessel being also provided with an exit opening M, communicating with the atmosphere. The ends of the tube K terminate above the surface of the liquids contained in the vessels G and L, and the gas passing through the liquid contained in the vessel G, escapes therefrom through the pipe K into the vessel L, where it combines with the water. The water is capable of absorbing the gas up to the limit of eight hundred volumes of gas to one of water. The opening M prevents the accumulation of pressure in the vessel L. The gas is destructive of life, and the object of the vessel L is to render it harmless by providing for its absorption. The liquid contained in the vessel L after the absorption of the gas is an acid which can be used for etching glass. Without the provision of the vessel L, the pipe K should lead to a stack or other device by which it can be conducted away to a safe place of discharge.

In Fig. 3 I also show a gas jet N, applied to the lower end of the retort D, for the purpose of heating the chemicals to produce the fluoride of boron. The heat in the retort should not be less than 300° and not more than 570° Fahrenheit. The degree of heat is determined by a thermometer O, and the gas flame is regulated by a cock P. It is not necessary that the incandescents should be treated in the same vessel in which the gas is produced, but, if desired, the gas may be produced in one vessel and then led to another vessel in which the incandescents are placed, as will be readily understood.

In order to prevent the liquid in the vessel G from being forced into the retort D by the atmospheric pressure, when after the completion of the process, the retort D is being cooled, a bulb Q is provided in the pipe F, of sufficient capacity to contain all the liquid in the vessel G, so that when the latter is forced up the pipe by the atmospheric pressure it will fill the bulb and be arrested thereby. In order to prevent danger to the workmen from the gas when the retort D is open, after the completion of the process, a branch pipe S, communicating with the pipe F, is provided. This branch pipe leads to a vessel T containing water, and is provided with a suitable cock. Before opening the retort D, the workman opens the cock so as to permit the gas to communicate with the water in the vessel, which will be of sufficient quantity to absorb the gas remaining in the retort D, so that when the retort is opened it will contain no gas injurious to the workmen.

Lead is used in forming the block B, because it is not affected by the fluoride of boron.

After this step in the operation, the incandescents are removed from the blocks B, and they are then placed in an air-tight crucible and covered with graphite or powdered carbon, and the crucible is placed in a furnace and exposed to a high temperature for the purpose of eliminating from the incandescents any fluoride which may remain uncombined, as well as the chemical combinations which may have formed upon them, and also any other gases or substances contained therein, which can be removed by the heat of the furnace. Heat can be conveniently obtained by the use of a gas furnace, and a gradually increasing temperature should be applied, say, during a period of about thirty minutes, until the highest temperature is reached, which may be continued about two hours and then gradually reduced until the furnace is cold. When the crucible is sufficiently cold the incandescents are removed therefrom and attached to temporary clamps or electrodes and placed in a suitable chamber, from which the air has been removed, and there heated to a very high heat *in vacuo* by passing a current of electricity through them. The incandescent in this operation should be exposed to as high a heat as it is capable of withstanding without fracture. The purpose of this step of the operation is to drive off all occluded gases from the incandescent and to complete the carbonizing operation. The perfect treatment by the fluoride has the effect of increasing the ability of the incandescent to withstand heat, and the effect of subsequent super-heating by means of the electric current is to change the rather friable carbon of the incandescent thus obtained into a highly refractory homogeneous coke in which the form and structure of the original blank are preserved. During this step of the operation the atmosphere of the chamber is being continually drawn off, so that the gases which are expelled from the incandescent by the high heat shall be carried away from and out of the chamber. It is better to admit a small quantity of illuminating gas or other suitable gas into the chamber before the beginning of this step of the process, for the purpose of reducing the amount of oxygen contained in the chamber, as the effect of the admission of the gas is to reduce the quantity of atmospheric air which may be present. This operation of heating by means of an electric current occupies but a short time, being in the case of ordinary sized incandescents from thirty seconds to two minutes. The incandescents are then removed from the temporary clamps or holders and so much of the ends as were not fully exposed to the high heat of the electric current, may be broken off. After this the incandescents are secured to the platinum clamps or holders which constitute their permanent electrodes in the finished lamp, and placed in a receiver from which the atmosphere is exhausted and to which an atmosphere of carbonaceous gas not containing oxygen, say for instance, gasoline or rhigoline, is admitted. An electric current is then passed through the incandescent for the purpose of building it up by the deposition of the carbon, and thereby imparting to it a uniform resistance. This step of the process does not differ from that usually practiced in the manufacture of fibrous filaments for incandescent lamps, except that it follows instead of preceding the operation of driving off the occluded gases. The advantage of driving off the occluded gases before the process of building up the carbon by deposition is that if the latter operation is first performed, the hard deposit or shell thereby made upon the incandescent, has a tendency to prevent the escape of the gases, so that a greater or less quantity remains in the incandescent, and the effect of their presence is to endanger the incandescent, and to increase the blackening of the bulb of the lamp when in use and shorten its life. The incandescent is then taken and sealed into the lamp bulb in the usual way, and the latter is either exhausted or filled with an artificial atmosphere in the way practiced in the manufacture of incandescent lamps. The incandescent may be heated by an electric current while the bulb is being evacuated, in the usual way.

I have referred somewhat to the construction of apparatus used in this process and also to periods of time which may be occupied by some of the steps, but I do not limit myself to any particular form of apparatus.

or to any particular periods of time in the various operations. These things, together with the form and construction of the apparatus which is used in the process, will be readily understood by persons familiar with the art, and it is not necessary to encumber this specification with any further description of or reference to them.

The action of the fluoride of boron is to decompose the organic substance composing the incandescent by dehydrating it, leaving practically nothing, in the case of a vegetable material, but the carbon with which it has no chemical affinity, and in the case of an animal substance, leaving only the carbon and nitrogen.

There are other chemical agents, known to chemists which have such an affinity to water that they will decompose and carbonize organic substances, among which agents are sulphuric acid, fluohydric acid, chlorine gas, caustic soda, and caustic potash. Such chemical agents are more or less adapted to use in my improved method, and I include them in my claim as the chemical equivalents of the fluoride of boron, although not so powerful for the purpose. The manner of using them to dehydrate and decompose organic substances is familiar to the skillful chemist and need not be here described.

The advantages of my improved process consist in the fact that the incandescents are very free from a tendency to blacken the lamp when in use, and require with the same life and candle-power a smaller expenditure of energy than incandescents made by any other process heretofore known to me.

Now, what I claim as my invention, and desire to secure by Letters Patent, is—

The process of making carbon filaments or incandescents for electric lamps from organic material, which consists in the following steps, viz: dehydrating and decomposing the incandescents by the action of a chemical agent; then subjecting them to a high temperature with the exclusion of oxygen; then expelling the occluded gases from the incandescents and coking them by subjecting them to a high temperature by the passage of an electric current; and finally giving them the required resistance by the deposition of carbon; substantially as described.

In testimony whereof I have hereunto subscribed my name this 9th day of August, A. D. 1888.

ALEXANDRE DE LODYGUINE.

Witnesses:
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