

# UNITED STATES PATENT OFFICE.

FRANK S. SMITH, OF PITTSBURG, PENNSYLVANIA.

## PROCESS OF BUILDING UP CARBON FILAMENTS.

SPECIFICATION forming part of Letters Patent No. 563,329, dated July 7, 1896.

Application filed August 29, 1892. Serial No. 444,470. (No specimens.)

*To all whom it may concern:*

Be it known that I, FRANK S. SMITH, a citizen of the United States, residing in the city of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Processes of Building up Carbon Filaments, (Case No. 504,) of which the following is a specification.

This invention is a method of building up and strengthening incandescent-lamp filaments and may be considered in two main aspects—

First. The method herein set forth is one whereby incandescent-lamp filaments may be built up in process of manufacture and their resistance and cross-section exactly regulated for the conditions under which they are in any given case designed to be used.

Second. This invention has special reference to the specific modification of said method whereby lamps when completed by any process desired may have their incandescent conductors so treated as to greatly prolong their life, modify their initial candle-power to any desired extent, and maintain throughout their life an intensity equal to the initial candle-power. This method is based upon the well-known physical law that the point of vaporization of all substances is lower as the pressure to which they are subjected is decreased.

In a process already well known in the manufacture of incandescent lamps it is customary to subject the filaments to the passage of an electric current in the presence of a tenuous hydrocarbon gas. This method of treatment and its advantages are too well known to require further comment.

This invention contemplates securing these advantages under the very best circumstances and making it possible to pursue them simultaneously with the normal use of the lamp itself.

The present invention is also an improvement on the process as now practiced before the filament is sealed in the bulb.

The most beneficial application of the invention is that wherein it is applied to prolong the life of a lamp in use and to maintain throughout its life a practically uniform candle-power. In this case the lamp is manufactured in any well-known way, but before

finally sealing it there is introduced into the bulb a particle of some material which will vaporize at such a rate, under the conditions of heat and pressure existing in the lamp, as to maintain the latter at a substantially constant candle-power. It is obvious that such a particle of matter will be slowly vaporized by the heat from the filament when the lamp is lighted, and that the gas thereof, being decomposed on contact with the heated filament, will, if the substance be a suitable one, have a part of the results of said decomposition united with the carbon of the filament and serve to increase its resistance and keep up its initial candle-power.

The object of this method in its application to lamps in use is the compensation for the waste which determines the ultimate destruction of the filament and consequent uselessness of the lamp. As the lamp is used the filament is found to slowly disintegrate under the influence of the current, and its cross-section and resistance being thus reduced the current which it takes, and consequently its candle-power, becomes less day by day. By using a substance having a point of vaporization adapted to the heat generated in the lamp to be used, the above-described deposition from the decomposed vapor upon the filament can be made to exactly compensate for the disintegration of the filament, and thus the length of time that the lamp may be economically used may be prolonged to an extent depending upon the quality and amount of material introduced.

One of the most desirable substances that has yet been found for the purposes above described is anthraquinone. It is found that the point of volatilization of this substance is suitable for its use with ordinary lamps, and that the free products of decomposition are of a transparent crystalline character which minimizes the objection to the deposition thereof within the bulb. I do not desire to limit my invention to this particular substance, however, since some other material may be employed, provided its rate of vaporization or sublimation at the temperature of the lamp-bulb, when current is flowing through the filament, is such as to exactly or very nearly exactly compensate for the waste in the filament.



As mentioned above, the method exhibited in this invention is, of course, applicable to the manufacture of lamps and forms a substitute for the present method of filament impregnation in the production of a certain standard candle-power. In this latter case the filament is put under the exhausted receiver together with the requisite amount of the proper vaporizable substance, and current is then turned on and the filament raised to incandescence, when by its own heat it will produce the vapor necessary for its impregnation. Of course, in this latter form of the invention the substance should be sufficiently volatile to impregnate the filament far faster than it is wasted.

What I claim is—

1. The process of increasing the conductivity of an incandescent-electric-lamp filament, which consists in heating the filament in a rare medium together with anthraquinone.

2. The process of increasing the conducti-

bility of an incandescent-electric-lamp filament, which consists in placing the filament in a rare medium with a proper quantity of anthraquinone and heating the said filament by the passage of an electric current through it.

3. The process of building up and prolonging the life of an incandescent-lamp filament which consists in subjecting it to the electric current in the presence of anthraquinone, whereby the temperature of the lamp-bulb maintained during the incandescence of the filament serves to vaporize said substance at such a rate as to substantially compensate for the deterioration of the filament, substantially as described.

In testimony whereof I have hereunto subscribed my name this 27th day of August, A. D. 1892.

FRANK S. SMITH.

Witnesses:

A. DE LODYGUY,  
JAMES WM. SMITH.