

UNITED STATES PATENT OFFICE.

HERMANN ZERNING, OF HALENSEE, NEAR BERLIN, GERMANY.

METHOD OF DECARBONIZING FILAMENTS FOR INCANDESCENT LAMPS.

No. 908,930.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, HERMANN ZERNING, a subject of the King of Prussia, and resident of Halensee, near Berlin, in the Kingdom of Prussia, German Empire, have invented new and useful Improvements in Methods of Decarbonizing Filaments for Incandescent Lamps, of which the following is a full, clear, and exact description.

10 In the manufacture of the filaments consisting of metallic compounds for incandescent lamps, it is necessary to obtain the finished filaments as clear from carbon as possible, because a small quantity of carbon influences the resistance or strength and usefulness of the filaments considerably. Most methods hitherto contrived for this purpose cannot be carried out on a large scale without great difficulty and scarcely permit the perfect removal of the carbon unless means are used which simultaneously attack the metal of which the filament consists.

My present invention is intended to enable the filaments to be completely decarbonized on a large scale without the metal of the filament suffering.

The invention consists in decarbonizing the filament by means of nitrogen gas or nitrogenous gases, produced by heating phospham (PN_2H) with or without an addition of phosphorus in a vacuum.

The nitrogen contained in phospham passes off at a relatively low temperature, and forms, in a free state, with the carbon, cyanogen or the like, or oxidized compounds of the same. The phosphorus, which becomes free simultaneously, is able to combine with the oxygen still present, or to exert its reducing action on the metal oxid impurities, which may perhaps still be present in the filament. The phosphorus added is of special importance when it may be assumed that the filament contains a considerable quantity of oxygenous impurities.

In carrying out the invention a small percentage of phospham to which some phosphorus may be added is mixed with the metal powder from which the paste used for squirting the filaments of incandescent lamps is made and then a paste is very carefully prepared. The amount of phospham depends on the nature of the binding agent used and is larger according as the binding agent contains more carbon. The

proportion of phospham in the finished paste amounts to 4 per cent., for instance, when tar is employed as the binding agent. The action of the phospham takes place immediately, when the filament is made incandescent in a vacuum, as it then becomes absolutely free from carbon without its strength being impaired in any manner.

Another method for carrying out the process is designed to liberate the nitrogen contained in the phospham and to allow it to act exteriorly on the filament. In this case the filaments are placed in a suitable furnace, in which a vacuum is produced. The furnace is then heated up to about 130° , in order to remove the water and the products of decomposition evolved at that temperature, whereupon the taps of the pump are closed and the furnace is now heated slowly up to 800° to 1000° C. The phospham is decomposed and the nascent gaseous materials will have a pressure of some millimeters of mercury according to the quantity of phospham employed. The amount of phospham depends on the binding agent used in manufacturing the paste for the filaments. If the binding agent is very carbonaceous, then a correspondingly larger quantity of phospham must be employed and the heating correspondingly prolonged. Filaments treated according to this process are perfectly free from carbon and are firm. This heating process may also be carried out with the assistance of the electric current in any vessel in which a vacuum can be produced, or in the bulb of an incandescent lamp. When the filaments are thus treated, said filaments can be dusted over or otherwise coated with phospham. For example, finely powdered phospham can be mixed with a paste which is applied to the filament with a brush. When the filament so coated is rendered incandescent by the electric current nitrogen is also separated.

If the filament is to be decarbonized after it has been inserted in the bulb of an incandescent lamp, the following method is preferably employed:—Powdered phospham is mixed with alcohol and then applied to the filaments before it is melted down. Instead of this, the phospham paste can be placed on the electric wires, supports etc. After exhausting the air out of the bulb by means of a pump, the tap between the lamp and the air-pump is closed and the lamp is made

to glow for some time by a supply of electric current. The phospham is thus vaporized no matter where it may be situated in the lamp. Finally, it may be mentioned, that
5 the phospham may in this case also be heated outside the lamp in a space, which may be connected with the lamp. Of course the arrangement must be such that the vacuum in the lamp is not lessened.

10 Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

15 1. The method of producing a decarbonized filament for incandescent lamps, consisting in placing a filament in a compartment, producing a vacuum in said compartment, and heating said filament in said com-

partment in the presence of phospham and while maintaining the vacuum.

2. The method of producing a decarbon- 20 ized filament for incandescent lamps, consisting in placing in a suitable compartment a filament bearing phospham, producing a vacuum in said compartment, and heating said filament in the compartment while 25 maintaining the vacuum and until decarbonized.

In witness whereof I have hereunto signed my name this 30th day of August 1906, in the presence of two subscribing witnesses. 30

HERMANN ZERNING.

Witnesses:

HENRY HASPER,
WOLDEMAR HAUPT.