

UNITED STATES PATENT OFFICE.

WILHELM MAJERT, OF BERLIN, GERMANY.

PROCESS OF TREATING METALLIC FILAMENTS FOR ELECTRIC INCANDESCENT LAMPS.

No. 926,069.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WILHELM MAJERT, a subject of the King of Prussia, residing at 17 Belle-Allianceplatz, Berlin, Germany, have invented certain new and useful Improvements in Processes of Treating Metallic Filaments for Electric Incandescent Lamps; and I do hereby declare the following to be a full, clear, and exact description of the invention.

I am aware that by heating metallic filaments to a high temperature by means of the electric current, it is possible to clean the filaments and give them a more compact structure. These operations are performed while the filaments are *in vacuo* or in a neutral gas-atmosphere which does not affect the filaments. Such neutral gases which do not affect the filaments, are nitrogen, carbonic oxid or reducing gases, such as hydrogen, ammonia, water gas.

By the intense heating up to approximately the melting point of the metal used, impurities such as foreign metals of low melting point and boiling point, as for instance lead, silver, arsenic, zinc, as well as sulfur and carbon, are volatilized or converted into dust, while the single particles of the highly fused metal that form the filament are welded more closely together.

Since the working *in vacuo* requires a gradually increasing temperature and consequently a long period for preventing an excessive loss of filaments during the operation, working in practice usually takes place with atmospheric pressure or with a slight pressure above or below the atmospheric pressure in a neutral gas-atmosphere as above stated. The intense heating of the metallic filaments only lasts a few seconds. The filaments thus produced however are not absolutely clean and also not of very compact structure. Lamps made by means of such filaments usually blacken after long use, the filament is not so elastic and the lamp cannot burn under 1 watt current consumption per Hefner candle power without the filament being very soon destroyed.

Now I have found that it is possible to produce a lamp with non-blackening filaments of very compact structure, which has only 0,7—0,8 watt current consumption per Hefner candle power with a life of more than 900 burning hours, by subjecting the filaments to intense heat first, under ordinary

atmospheric pressure or with a slight pressure above or below the atmospheric pressure and then *in vacuo*. It is not immaterial in which order of succession *i. e.* whether first with atmospheric pressure and then *in vacuo*, or first *in vacuo* and then with atmospheric pressure, the heating of the filaments to a high temperature by means of the electric current is effected. If the intense heating were to take place first *in vacuo* and then in an atmosphere of neutralizing gas under atmospheric pressure, the majority of the filaments would be destroyed not only during the first operation but the quality of the ultimately produced filaments would also be inferior.

In practice, I carry out the process in the following manner: I employ an apparatus which is used for preparing (equalizing) the carbon filaments by means of hydrocarbons. When the raw filaments are fastened between the pole-terminals and the glass globe is secured air-tight on the base, the globe is evacuated as completely as possible and then filled with a neutral gas, as for instance nitrogen, hydrogen, carbonic oxid, water gas (the known compound of hydrogen and carbonic oxid) or with ammoniacal gas. Such a powerful electric current is then sent successively through each filament for 1—2 seconds that the filament is heated approximately to its melting point. During each sudden flashing of a filament, it can be seen how it shortens to the extent of 25—50% according to its previous compactness and impurity and that the impurities escape therefrom in the form of a fine dark vapor. When all filaments are thus treated, the globe will be practically evacuated and the single filaments now heated *in vacuo* by the electric current in the same manner as previously in a neutral gas-atmosphere.

The tension and strength of the electric current depend on the thickness and length of the metallic filaments. The duration of the heating action may vary between the fraction of a second and ten seconds. Direct current, or alternating current may be used as electric current. If direct current is employed, it is advisable to send the current twice through the filaments alternately in different directions.

I claim:

The process of cleaning metallic filaments for electric incandescent lamps and giving

them a more compact structure, which consists in very highly heating the filaments twice in succession by the electric current, the first time when they are in a neutral gas-
5 atmosphere and the second time when they are in a practically evacuated space.

In testimony whereof I have signed my

name to this specification, in the presence of two subscribing witnesses.

WILHELM MAJERT.

Witnesses:

JOHANNES HEIN.

HENRY HASPER