UNITED STATES PATENT OFFICE.

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METALLIC-FILAMENT LAMP AND PROCESS OF MAKING IT.

1,265,204. Specification of Letters Patent. Patented May 7, 1918.

No Drawing. Application filed July 27, 1917. Serial No. 183,134.

To all whom it may concern:

Be it known that I, HERMAN J. JAEGER, a citizen of the United States of America, and a resident of Weehawken, county of Hudson, State of New Jersey, have invented certain new and useful Improvements in Metallic-Filament Lamps and Processes of Making Them, of which the following is a specification.

My invention has for its object to produce novel metallic filament lamps of the type which are filled with an inert gas such as nitrogen or argon. It pertains particularly to the production of lamps having novel concentrated filaments with a deposit of a refractory metal produced thereon within the lamp after the same has been exhausted and sealed off. By such deposit the concentrated metallic filament, usually the tungsten filament is hardened in the presence of an atmosphere of an inert gas such as nitrogen or argon.

During the manufacture of the novel lamp a chemical compound having a base of a refractory metal different from the tungsten is placed within the lamp. The present invention may be applied to all kinds of metallic filament lamps but is preferably used in connection with metallic filament lamps described and claimed in my co-pending application for Letters Patent of the United States, filed Dec. 15, 1916 under Serial Number 137,071. In the lamp described in the co-pending application, the well known glass rod or support fused to the stem is dispensed with and a glass button suspended in the space within the filament is provided with anchors while the nearly circular filament is directly supported by continuations of the two leads. Accordingly the glass button is located centrally within the filament and therefore uniformly exposed to the heat of the filament when incandescent at a short and even distance therefrom. Likewise the terminals, that is the points of connection between the filament and the continuations of the leads are close to the incandescing filament. For these reasons I prefer to place the chemical compound on the said glass button or on the terminals.

In order to prevent that the chemical compound be decomposed or volatilized during the process of manufacturing the lamp, the filament is not heated on the pump. The lamp receives a socalled dark exhaust and as no heat is produced within the lamp while on the pump, the chemical compound therein retains its normal condition and predetermined quantity. After the lamp has been exhausted and sealed off the filament is heated when any communication with the contents of the interior of the lamp is entirely impossible. By rendering the filament incandescent after the lamp has been sealed off the heat produced by the incandescent filament volatilizes or vaporizes the chemical compound which then is decomposed in the hot space of the concentrated filament section and a deposit of the metallic base of the chemical compound is formed on the filament and hardens the same. It is easily understood that there is no chemical action within the lamp during its exhaustion because the filament remains cold during the socalled dark exhaust. Chemical action on the compound within the lamp is initiated and propagated within the exhausted lamp only by the heat of the incandescent filament when the sealed off lamp is lighted. Thus the lamp is not finished on the pump for practical use. It is actually finished by heating the concentrated tungsten filament in an inert atmosphere after the same has been sealed off from the pump. When the concentrated tungsten filament is heated as herein described and under the prevailing conditions a cloud forms within the lamp around the filament from the chemical compound which cloud becomes lighter and lighter and finally disappears. When the lamp is clear again while heated by the current then it is finished and ready for sale and use. The cloud of vapors gradually disappears because the vapors are decomposed and a deposit is formed on the filament whereby the metallic base of the chemical compound is used up. The other components of the chemical compound remain within the lamp together with the extenuated atmosphere of the inert gas. Should, during the use of the lamp, fine particles of the filament surface be volatilized by accidental strong currents, then no deposit is formed on the inner glass walls of the globe but it appears that the components of the chemical compound still within the lamp in their original molecular proportions relative to the metallic base of the chemical compound react with the said volatilized base and re-form the original compound which

then, under normal conditions of burning the lamp, is again decomposed and the original condition of the lamp restored.

The chemical compounds used for producing a deposit or coating on a concentrated tungsten filament within the lamp after it has been sealed off contain a base of a refractory metal other than tungsten. Among the various refractory metal compounds I prefer to use those, the bases of which are closely related to each other. Chromium, molybdenum, tungsten and uranium form one group of elements in the periodic system and therefore are closely related to each other as is seen for instance by the formation of their acid anhydrids. Of the compounds of these metals tungsten compounds of course are not used because the tungsten is the metal of which the concentrated filament is composed. The three remaining metals being of the same group, adhere, combine and alloy themselves easily with the surface portion of the tungsten filament, and in the presence of an inert atmosphere excellent incandescent bodies are obtained.

The refractory compounds chiefly employed are the chlorids such as chromium chlorids, molybdenum chlorids and uranium chlorids. The chromium dichlorid $CrCl_2$ and the chromium trichlorid $CrCl_3$ or as some call it the hexachlorid Cr_2Cl_6 may be used. The dichlorid is a white crystalline powder and the chlorid a violet crystalline substance. Also the molybdenum dichlorid $MoCl_2$, as well as the trichlorid $MoCl_3$, or as some call it molybdenum hexachlorid Mo_2Cl_6 may be used. The uranium tetrachlorid also is a solid substance which is rather hygroscopic and must be carefully handled. Likewise the pentachlorid is hygroscopic and as it dissociates when heated into chlorin and tetrachlorid the latter preferably is used in the present process. All the chlorids mentioned are solid substances, therefore they are preferably mixed, in a finely powered state, with some binding medium to form a thick paste. For this purpose hydrocarbons of various consistency are employed to form the paste which is applied within the lamp as herein stated. As little as possible of the hydrocarbon is used to make the paste. Should the hydrocarbon give rise to the formation of a trace of carbid the same appears to have no effect on the efficiency of the lamp as carbids usually are of very high fusion point.

Elementary chromium and molybdenum possess very high fusion points. Likewise the metallic uranium obtained by the action of the electric current, as in this instance too, has a very high fusion point and a high specific gravity. Therefore the uranium compounds are very useful in the present process. Instead of depositing the chemical compounds within the lamp in form of a paste formed with vaseline for instance, in close proximity to the concentrated tungsten filament, the said compounds may be suspended in liquid hydrocarbon of rather high density and the concentrated filament may be dipped therein when on the stem before being fused into the lamp. The first described method, however, is preferred.

I claim as my invention:

1. The process of producing metallic filament lamps with an inert gas therein, consisting in placing a chemical compound having a base of a refractory metal in close proximity to the metallic filament, giving the lamp a cold exhaust, sealing it, heating the filament, thereby decomposing the compound in the presence of the inert gas, and forming a deposit of its base on the filament.

2. The process of producing metallic filament lamps with an inert gas therein, consisting in placing a chlorid having a base of a refractory metal in close proximity to the metallic filament, giving the lamp a cold exhaust, sealing it, heating the filament, thereby decomposing the compound, and forming a deposit of its base on the filament.

3. The process of producing incandescent lamps with concentrated metallic filaments and an inert gas therein, consisting in placing a chemical compound of the chromium group in close proximity to the concentrated filament, giving the lamp a cold exhaust, sealing it, heating the filament, thereby decomposing the compound, and forming a deposit of its base on the filament.

4. The process of producing incandescent lamps with concentrated metallic filaments and an inert gas therein, consisting in placing a chlorid of the chromium group in close proximity to the concentrated filament, giving the lamp a cold exhaust, sealing it, heating the filament, thereby decomposing the compound, and forming a deposit of its base on the filament.

5. The process of producing incandescent lamps with concentrated metallic filaments and an inert gas therein, consisting in placing uranium chlorid in close proximity to the concentrated filament, giving the lamp a cold exhaust, sealing it, heating the filament, thereby decomposing the compound, and forming a deposit of its base on the filament.

6. The process of depositing on concentrated metallic filaments for incandescent lamps a metal forming the base of the refractory compound in the presence of an extenuated atmosphere of an inert gas, consisting in placing the chemical compound in close proximity to the filament, giving the lamp a cold exhaust, sealing it, and then heating the filament, thereby decomposing the compound and forming a deposit of its base on the filament.

7. The process of depositing on concen-

trated metallic filaments for incandescent lamps a refractory metal from a chlorid in the presence of an extenuated atmosphere of an inert gas, consisting in placing the chlorid in close proximity to the filament, giving the lamp a cold exhaust, sealing it, and then heating the filament, thereby decomposing the compound and forming a deposit of its base on the filament.

8. The process of depositing on concentrated metallic filaments for incandescent lamps a metal of the chromium group in the presence of an extenuated atmosphere of an inert gas, consisting in placing a compound of the chromium group in close proximity to the filament, giving the lamp a cold exhaust, sealing it, and then heating the filament, thereby decomposing the compound and forming a deposit of its base on the filament.

9. The process of depositing on cencentrated metallic filaments for incandescent lamps a metal from a chlorid of the chromium group in the presence of an extenuated atmosphere of an inert gas, consisting in placing the chlorid of the chromium group in close proximity to the filament, giving the lamp a cold exhaust, sealing it, and then heating the filament, thereby decomposing the compound and forming a deposit of its base on the filament.

10. The process of depositing on concentrated metallic filaments for incandescent lamps uranium from uranium chlorid in the presence of an extenuated atmosphere of an inert gas, consisting in placing uranium chlorid in close proximity to the filament, giving the lamp a cold exhaust, sealing it, and then heating the filament, thereby decomposing the compound and forming a deposit of its base on the filament.

Signed at New York, N. Y., this 24th day of July, 1917.

HERMAN J. JAEGER.

Witnesses:
MORRIS WEISS,
ELSIE SCHMID.