E. PODSZUS.

ELECTRIC VAPOR ARC LAMP.

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1,116,480.

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Fig. 1.

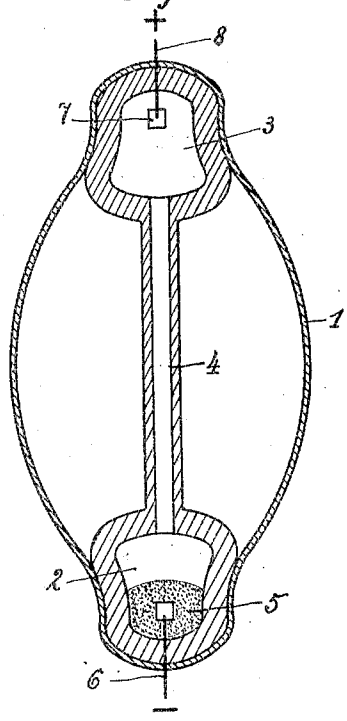
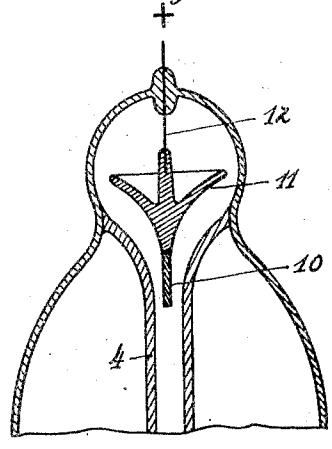


Fig. 2.



Witnesses:

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UNITED STATES PATENT OFFICE.

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ELECTRIC VAPOR ARC-LAMP.

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To all whom it may concern:

Be it known that I, Dr. Emil Podszus, a subject of the Emperor of Germany, residing at Rixdorf, near Berlin, in the Kingdom of Prussia, Germany, have invented certain new and useful Improvements in Electric Vapor Arc-Lamps; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in electric vapor arc lamps, and the object of the improvements is to provide a lamp which as to its lighting effect is more or less independent of the character of the vaporized electrode, and nearly approximates the white light. For this purpose the vaporized electrode is conducted through a solid tube of refractory material which is caused to glow by the heat of the arc, and which forms the luminous body, while the light emanating from the vapor by being inclosed within the said tube is partly or completely absorbed by the tube.

For the purpose of explaining the invention two examples embodying the same have been shown in the accompanying drawing in which:—

Figure 1, is a vertical section of an electric vapor arc lamp embodying the invention, and Fig. 2, is a vertical section of a modification of the lamp.

Referring to the example illustrated in Fig. 1, the lamp is inclosed within an air tight bulb 1 of glass. Within the latter hollow bodies 2 and 3 of refractory material are provided which form chambers for the electrodes. Between the said chambers a solid tubular body 4 of refractory material is located which is adapted to emanate light when heated to glowing temperature. In the example shown in the drawing the tube 4 is rigidly and integrally connected to the hollow bodies 2 and 3. Within the lower chamber 2 the cathode 5 is located which consists of a material of low fusing point, such for example as mercury, and which is connected to the electric circuit by a conductor 6 fused into the wall of the chamber 2 and the glass bulb. Within the upper chamber 3 the anode 7 is located, which is likewise connected to the circuit supplying the electric current by a conductor 8 fused into the wall of the chamber and of the glass bulb. When using the arc lamp the metal forming the cathode 5 is vaporized by the heat of the electric arc, and the vapor thus produced passes over to the anode 7. The vapor forms a conductor for the electric current, and it is thereby heated to glowing temperature. Such heat is imparted to the tubular body 4 which is thereby caused to glow. The light emanating from the vapor is completely or partly absorbed by the tubular body, so that the tubular body forms the exclusive or main source of light. The intensity and the character of the light can be varied by varying the diameter of the tubular body and the thickness of its wall. And I have found, that the temperature of the arc and the tubular body is increased by increasing the inner diameter of the latter and the strength of its wall.

In constructing a lamp of the class described the hollow bodies 2 and 3 and the tubular body 4 are made of refractory material which is not affected by the heated vapor of the cathode, and I have found, that when constructing the tubular body of carbids, pure lime, pure magnesia, pure borium, borids, etc., good results are obtained as to durability and luminous effect. According to the character of the refractory mater. ' of the tubular body 4 and the strength of its wall, the character of the light emitted from the lamp is different. Obviously, when making the tubular body 4 entirely opaque, the character of the light depends exclusively of the character of the tubular body 4. If, however, the latter is made transparent or translucent, the character of the light is affected in a larger or less degree by the light emanating from the glowing vapor. In order to obtain a good economy, I prefer to use bodies of selective emissive power, that is such bodies, the radiation of which differs from that of the black body in certain areas of the spectrum. In such cases the glowing tubular body and the glowing vapor should be in such relation to each other, that the radiation of the vapor corresponds to the area of smaller radiation of the tubular body. Therefore, the intensity of the light is increased, and fur-

thermore its character approximates that of the absolutely white light. In this respect, good results are obtained if the tubular body is made of certain compounds of a low fusing point, such for example as oxygen and nitrogen compounds of thorium, zirconium, etc. However, when using such compounds the temperature can not be increased beyond a certain limit, because at high temperatures the said compounds are liable to be decomposed by dissociation and electrolysis, whereby the efficiency of the lamp is decreased. To avoid or to decrease the injurious effect of such a decomposition, I prefer not to completely evacuate the lamp, but to fill the same with a gas, preferably the gaseous product of the dissociation under a suitable pressure. For example, if the tubular body consists of oxids, the lamp is preferably filled with oxygen. Thereby the liability of the said substances to decompose under the influence of the heat or by electrolysis is decreased or entirely avoided. When thus admitting a gas to the lamp, the pressure of the latter should not be higher than is necessary, and I have found, that the pressure can be so much the lower, the higher the condensing point of the gaseous product of the dissociation of the tubular body is. By such a gas admitted to the lamp, and also by the glowing tubular body the voltage of the lamp is influenced. Therefore the said voltage and thereby also the temperature of the arc can be varied by varying the pressure of the said gas. The proportion of the rays emitted by the vapor can be varied by varying the diameter of the tubular body and the strength of its wall. Experiments have shown, that the material of the tubular body affects the temperature and the radiation of the vapor, and it has been found, for example, that the intensity of the radiation of mercury is increased near the yellow parts of the spectrum. The character of the light can be further varied, if the tubular body does not consist of a uniform material as described, but of different materials adapted at the same temperature to emit rays of different character. Preferably such materials are applied in a finely powdered form either to the inner or to the outer surface of the tubular body. Examples of suitable materials the radiation of which is different from that of the tubular body are metals of high fusing points, such as tungsten, zirconium, and thorium. By properly choosing the proportion of such materials the character of the light can be influenced within large limits.

In my improved lamp it is of importance that the vapor is conducted exclusively through the tubular body 4. Therefore the passage provided by the tubular body must be the only one which can be traversed by the said vapor. This is the case, if either the chamber 2 inclosing the cathode, or the chamber 3 inclosing the anode are closed in such a way, that the vapor can pass merely through the tubular body. To attain this the tubular body is either fused into one or both of said hollow bodies 2 and 3, or it is otherwise secured thereto in a vapor arc tight manner, for example by grinding or pasting the same into the said hollow body. In case a second connection is made between the said hollow bodies, such connection must be so long and narrow, that the vapor can not pass therethrough by reason of the resistance offered to such passage. In case of very high temperatures the connection of the tubular body 4 with the hollow bodies 2 and 3, and the connection of the latter with the gas bulb is endangered. In such cases means must be provided, whereby the said connections are cooled. This may be done for example by means of condensed and vaporizing metal which is deposited near the said connections. In a similar way, if the temperature in the axis of the current of the vapor is very high, the anode can easily be destroyed, unless it is made of a material of a very high fusing point. To protect the anode, also in this case condensed and vaporizing metal may be used. For the same purpose the anode can be constructed in the form of a tube or of an inverted cone, by which the energy of the jet of the vapor is distributed over a large area. Preferably the enlarged part of the anode is constructed of a different material, such for example as iron. If the anode is made of a material of a very high fusing point, it is itself caused to glow and to emit rays. An example of a construction of the anode referred to is shown in Fig. 2. In said figure, 10 indicates the anode, which is suspended from an inverted cone 11 that is in turn suspended by the conductor 12. The anode is out of contact with the walls of the tube and envelop and is freely accessible to the cathode vapor, which may completely surround the same. At its upper side the said cone provides a receptacle for the vapor condensed within the chamber of the anode, and if the said condensed metal is vaporized by the heat of the anode, the latter is cooled.

In the examples shown in the drawing the hollow bodies 2 and 3, and the tubular body 4 are inclosed within a glass bulb. Such a construction is necessary, if the said bodies are not airtight and not connected with one another in an airtight manner. If, however, the said connections and the rubular and hollow bodies are airtight, so that the vapor can not escape from the said bodies, the glass bulb may be dispensed with.

I claim:

In an electric vapor arc lamp, the combi-

mation with a hollow body, an anode, and a cathode located within said hollow body, of a tubular body communicating with said hollow body and extending therefrom to the anode, said tubular body consisting of refractory material adapted to emit light when heated to glowing temperature, said lamp containing a gas which is the same as that produced by the decomposition of the tubular body.

In testimony whereof I affix my signature, in presence of two witnesses.

DR. EMIL PODSZUS.

Witnesses:

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WOLDEMAR HAUPT.