Sept. 21 , 1926. 1,600,843

M. PIRANI

TUNGSTEN ARC LAMP

Filed Feb. 8, 1923

Fig. 1.

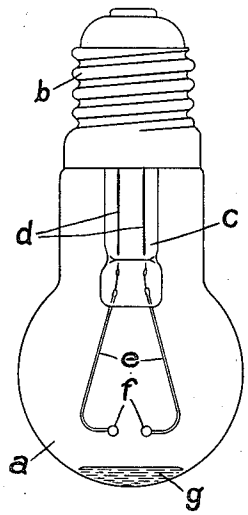
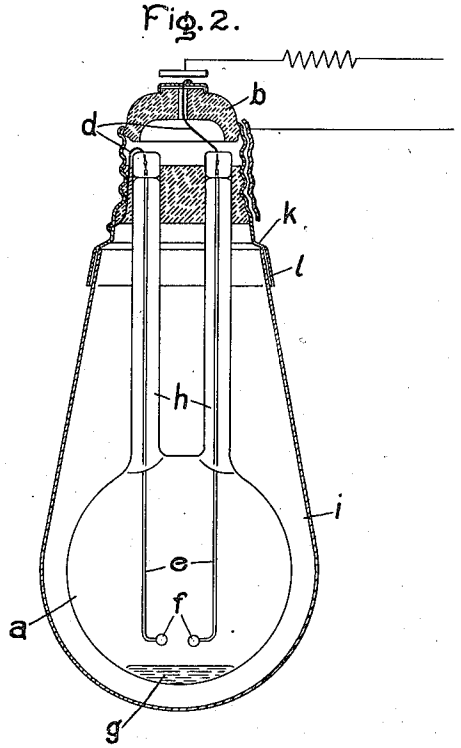


Fig. 2.



Inventor:
Marcello Pirani,
by Alexander S. Lamt.
His Attorney.

Patented Sept. 21, 1926. 1,600,843

UNITED STATES PATENT OFFICE.

MARCELLO PIRANI, OF WILMERSDORF, NEAR BERLIN, GERMANY, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

TUNGSTEN ARC LAMP.

Application filed February 8, 1923, Serial No. 617,858, and in Germany April 1, 1922.

My invention relates to improvements in arc lamps.

Heretofore arc lamps of the above character have required special starting apparatus when used in connection with the usual commercial lighting circuits.

Among the objects of my invention are the following: to provide a tungsten arc lamp which automatically starts with the line voltage of the ordinary commercial lighting circuit without the provision of special starting apparatus; and to provide details in improvement for increasing the efficiency and serviceability of such lamps.

The means for accomplishing this are hereinafter more fully set forth and claimed. Referring to the accompanying drawing, Fig. 1 shows the lamp in elevation; Fig. 2 shows the lamp in modified form, the drawing being made partially in sections. Referring to these figures more in detail, it will be seen that the lamp constructed as shown in Fig. 1 has a glass globe or bulb *a* and a socket engaging terminal *b*. The lead in wires *d* pass through the usual stand *c* into the bulb and are connected with the electrodes *e* which are provided at their ends with suitable terminals such as the tungsten ball terminals *f* between which the arc plays. The space between the two balls may be in the neighborhood of one eighth of an inch. This distance of course may be varied with the gas pressure used. This lamp is filled with a gas such as argon and contains also a quantity of mercury *g* in a metallic form as indicated. The argon is supplied in the bulb at a pressure of about 1 to 10 mm. The vapor pressure of the mercury is very small while the lamp is cold and the effect of the argon or other rare gas predominates. Therefore, the arc can be formed at the ordinary line pressure without any special starting or voltage raising apparatus. If the arc is set up in an atmosphere of low pressure a very energetic atomization action of the electrodes takes place, and I propose to control this by the use of mercury vapor. The mercury in the lamp is heated when the arc is established, and therefore the mercury vaporizes and acts as a check on the atomizing action on the electrode. It will be understood that the temperature of the lamp may be controlled by any suitable means during the operation so as to maintain the mercury vapor at the required pressure. This may be done for example by restricting the dimensions of the bulb in which the mercury in contained. The mercury pressure may be in the neighborhood of one atmosphere.

When the lamp is constructed as above indicated a corona discharge first appears when the lamp is connected across the usual lighting circuit and this is followed by the formation of the arc which is set up between the tungsten terminals *f* through the argon or other rare gas. Now as the temperature rises, the mercury vapor pressure increases and serves as a check as described. It is found that satisfactory results are obtained when the temperature of the mercury is held at about 200 degrees C. during the operation of the lamp. In the lamp circuit a resistance is introduced in series with the lamp.

Referring to the modified form of the lamp shown in Fig. 2, it will be seen that this form also has the electrodes *e* and the ball terminals *f*. However, the electrodes in this form of lamp are led through narrow tubes *h* to the lower ends to which the bulb *a* is connected. The lead in wires *d* of course pass through the upper ends of the glass tubes. These wires *d* are, as shown, connected in the usual manner to the socket engaging terminals of the bulb.

During the operation of the lamp of course the mercury is heated and the mercury vapor pressure rises and in the form of lamp shown in Fig. 2, this mercury vapor forces the argon or other gas into the narrow tubes *h*. Obviously, therefore, the rare gas and the mercury come into contact only in the narrow tubes. As a result of the foregoing construction, the current inlet points are protected from any harmful heating effect, since only the mercury containing bulb *a* is kept hot. For the protection of the bulb *a*, I also provide in the construction of Fig. 2 an outer bulb *i* which may be connected with the outer air by a suitable opening at *k*.

It is obvious that in a lamp of this character I may use a number of electrodes and I may arrange the same in different ways. Also, some other metal may be substituted for mercury to supply the heavy vapor. It will be understood that in place of having two tubes *h*, as shown in Fig. 2, I may have a single small tube in which both of the leads *e* are contained. In any event, the

lower opening of the tube *h* should be made as small as possible, but large enough to permit any mercury vapor which condenses therein to fall back into the bulb *a*.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. An arc lamp having an enclosing sealed bulb, electrodes and terminals therein, an atmosphere in the bulb of one of the rare gases at a sufficiently small pressure to permit the formation of an arc between the terminals at a comparatively low voltage and mercury in the bulb for providing a higher vapor pressure during the operation of the lamp, said lamp having a second enclosing bulb container.

2. An arc lamp having a sealed containing bulb enclosing a light gas and also enclosing means for generating a heavy gas and a compartment into which the lighter gas may be retired by the heavy gas when the heavy gas is generated and the pressure of the heavy gas is sufficiently increased, said light gas adapted to enable the arc to be formed under low voltage, the arc constituting the only means for initiating the generation of the heavy gas to increase the gas pressure within the bulb and whereby the light intensity of the arc may be increased.

In witness whereof, I have hereunto set my hand this 17th day of January, 1923.

MARCELLO PIRANI.