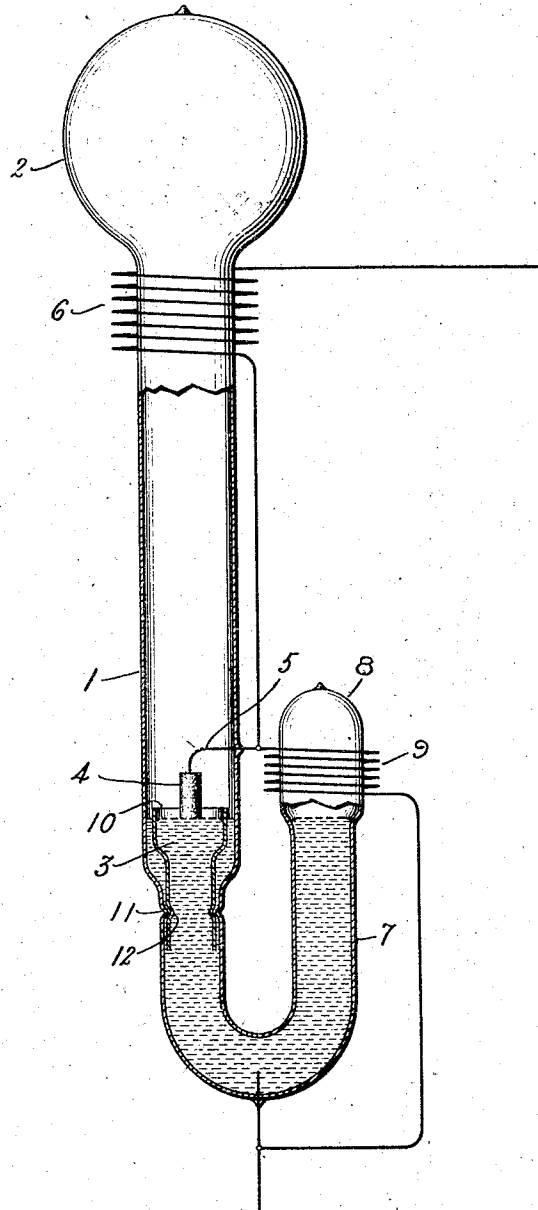


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ELECTRIC ARC LAMP.
APPLICATION FILED NOV. 17, 1904.

1,022,009.

Patented Apr. 2, 1912.



Witnesses:
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UNITED STATES PATENT OFFICE.

EZECHIEL WEINTRAUB, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTRIC-ARC LAMP.

1,022,009.

Specification of Letters Patent.

Patented Apr. 2, 1912.

Application filed November 17, 1904. Serial No. 233,083.

To all whom it may concern:

Be it known that I, EZECHIEL WEINTRAUB, a subject of the Czar of Russia, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a specification.

The invention herein described comprises a novel form of arc lamp in which the arc takes place in a neutral gas such as hydrogen and between electrodes, one at least of which is of vaporizable material. The arc may be of a length commensurate with that of ordinary arcs, as for example from a fraction of an inch to an inch or more in length, and has a potential gradient similar to that of ordinary arc lamps. The arc can be run at small currents below one ampere even, and with small consumption of energy in some cases, as low as 50 to 70 watts. The electrodes do not waste away so that the life of the lamp is practically indefinite.

The features of novelty which characterize my invention I have endeavored to point out with particularity in the appended claims. The invention itself, however, will be better understood by reference to the following description taken in connection with the accompanying drawings, which represent, by way of illustration, one of the numerous embodiments which my invention may assume in practice.

My improved arc lamp comprises in the first place, a gas-tight envelop or container, preferably or conveniently of glass. Such a container is indicated at 1 and is surmounted as indicated by a cooling or expansion chamber 2. This container or envelop is provided with electrodes which are in contact with each other when the lamp is not working and which are slowly separated for starting the arc. One at least of these electrodes is of some suitable vaporizable material, such as mercury, while the other electrode may be of vaporizable material also or of some non-vaporizable material such as iron, graphite, or the like. The mercury electrode in the present instance is represented at 3 and is contained, in the particular form of lamp shown, in the lower U-shaped portion of the envelop or container 1. An electrode 4 of graphite is represented as supported by an insulated wire 5 from the wall of the

envelop 1 and makes contact, when the lamp is out of operation, with the body of mercury 3.

In order to start the lamp some means for slowly separating the electrodes is employed. One such means may consist of a coil or heating conductor 6 about the chamber 1. This heating conductor is represented as in series with the lamp, and when heated causes the neutral gas in the container to expand and thereby force the mercury down the adjacent leg of the container and up the outside leg 7. This operation takes place slowly and thus gives the arc a chance to start. If a rapid separation of the electrodes were made the parts not being allowed to heat up the arc would be unable to maintain itself and would go out. As soon as an initial arc is produced the heat generated thereby assists somewhat in producing an expansion of the gas in the envelop and thereby forces down the mercury column still farther and so lengthens the arc. This lengthening takes place until the counter pressure exerted on the upper portion 8 of the leg 7 increases sufficiently to prevent any further movement. The parts of the lamp are adjusted so that when this condition of equilibrium is established the arc is of the desired length. This adjustment may be made automatic by means of the heating coil 9 connected in shunt to the arc and located about the part 8.

Inasmuch as the voltage consumed in the arc is utilized in a short arc length the temperature of the arc is correspondingly high. Therefore, in order to protect the adjacent walls of the glass envelop, I surround the arc either entirely or at the point whence it emerges from the mercury electrode, in other words, the cathode spot, with a tube or sleeve of a refractory material such as fused quartz or silica. Such a tube is represented at 10 and is arranged, either to float in the mercury, or is fixed in relation to the walls of the main envelop by means of registering indentations 11 and 12.

I have referred to the presence of an inert gas in the main envelop and surrounding the electrodes. Any one of a number of gases may be employed for this purpose. Hydrogen, for example, gives very good results, though other gases can be used such as carbon monoxid, carbon dioxid, hydro-

carbons, air, and so forth. The pressure of the gas, when the lamp is cold, is relatively low and may be in the neighborhood of a tenth of an atmosphere.

5 In the operation of the lamp and particularly during starting, it is very desirable that the gas pressure in the lamp should not rise unduly, for the reason that the arc voltage depends to some extent upon the pressure and rises as the pressure rises. Therefore in starting if the pressure rises too fast the voltage also rises and the arc becomes unstable and goes out. The cooling chamber 2 is therefore of considerable size so as
10 to prevent any sudden change of gas pressure.

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

1. In an electric arc lamp, the combination of a gas-tight envelop, an inert fixed gas therein, arc maintaining electrodes in said envelop initially contacting with each other, and means operating on said gas to separate said electrodes before the arc
20 starts.

2. In an electric arc lamp, the combination of a gas-tight envelop provided with a bent portion, a body of mercury located in said bent portion but not completely filling it, a cooperating solid electrode forming
30 with said body of mercury the terminals of a relatively short arc, and inert gas at moderate pressure in said envelop on both sides of said mercury.

3. In an electric arc lamp, the combination of an arc-inclosing envelop, an atmosphere of gas therein, a fluid electrode, and a refractory sleeve sufficiently large to permit free motion of the cathode spot and inclos-

ing on its surface the active portion of said electrode. 40

4. In an electric device, the combination of a gas-tight envelop, a considerable quantity of inert fixed gas therein, cooperating electrodes normally in contact when the lamp is in inoperating condition, and means
45 for increasing the gas pressure to separate said electrodes.

5. In an electric arc lamp, the combination of a gas-tight envelop, gas at considerable absolute pressure in said envelop, electrodes in said envelop, thermal means in series with said electrode for separating said electrodes and thermal means in shunt with said arc for causing said electrodes to approach one another. 50

6. In a vapor device, the combination of an envelop having a condensing chamber, a substantial quantity of a fixed gas therein, electrodes in said envelop, and means for
60 automatically varying the pressure of said fixed gas in said condensing chamber to start an arc between said electrodes.

7. In a vapor device, the combination of an envelop, a stationary electrode and a body of mercury therein, means for maintaining a moderate gas pressure on opposite sides of said body of mercury and means for varying this pressure to start and maintain
70 a short hot arc between said stationary electrode and said body of mercury.

In witness whereof, I have hereunto set my hand this 15th day of November, 1904.

EZECHIEL WEINTRAUB.

Witnesses:

BENJAMIN B. HULL,
HELEN ORFORD.