E. WEINTRAUB.

VAPOR ELECTRIC DEVICE.

APPLICATION FILED JULY 13, 1909.

1,022,010. Patented Apr. 2, 1912.

Fig. 1.

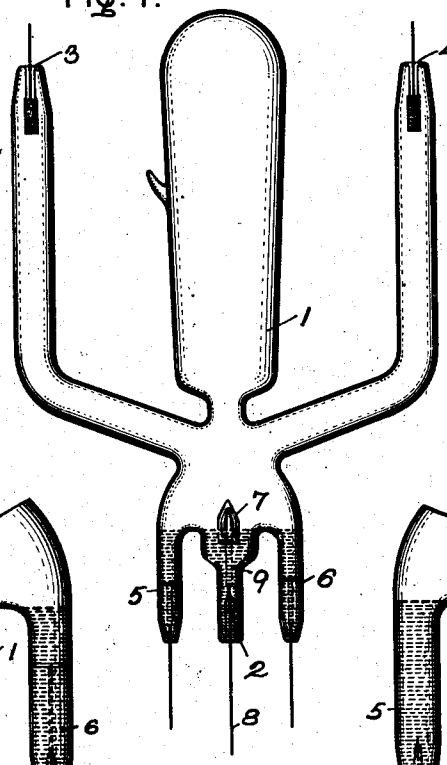


Fig. 5.

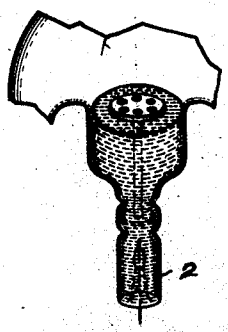


Fig. 7.

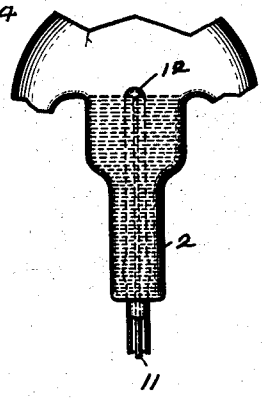


Fig. 6.

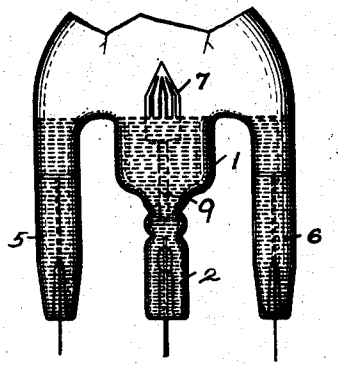


Fig. 8.

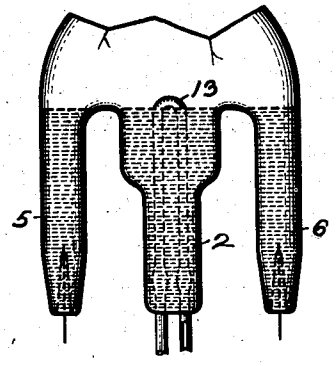


Fig. 2.

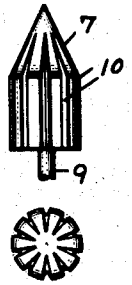
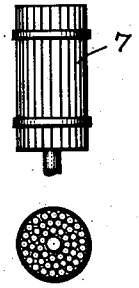


Fig. 3.

Fig. 4.



Witnesses:

W. Ray Taylor.

J. Ellis Glen

Inventor:

Ezechiel Weintraub,

by Albert G. Davis

Atty.

UNITED STATES PATENT OFFICE.

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

VAPOR ELECTRIC DEVICE.

1,022,010. Specification of Letters Patent. Patented Apr. 2, 1912.

Application filed July 13, 1909. Serial No. 507,363.

To all whom it may concern:

Be it known that I, EZECHIEL WEINTRAUB, a citizen of the United States, residing at Lynn, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Vapor Electric Devices, of which the following is a specification.

My invention relates to vapor-electric devices, such as mercury-vapor rectifiers, lamps and the like, and comprises an improved means for obtaining steady and continuous operation of said devices.

My present application is to be considered a continuation of my application Serial Number 438,357, filed June 13, 1908.

It is well known to those skilled in the art that in devices of this character the electric discharge from the negative electrode proceeds from what is known as the "cathode spot," which continuously wanders about in an irregular manner upon the surface of the electrode. It has been found desirable to fix the cathode spot in one position and this has been done by means of a wire projecting just above the surface of the mercury. As platinum does not alloy readily with mercury, platinum wire has been proposed for this purpose. The platinum, however, presents the disadvantage of disintegrating and clouding up the inside of the envelop, thereby creating undesirable short circuits and other ill effects. Thus, when, by the eroding action of the electric discharge, the platinum is disintegrated and deposited in a finely divided state over the inside surface of the envelop, a short circuit may be established between the starting anode and the cathode. It will hence be impossible to start the auxiliary arc. It may likewise happen that the deposit of platinum will cause the cathode spot to wander all over the entire inside surface of the rectifier. I have found that these disadvantages may be overcome by using for the solid projection above the surface of the mercury a material consisting of copper or one of its alloys, such as brass or bronze. Copper dissolves very slowly in mercury and does not muddy up the surface of the mercury and adjacent parts of the envelop so as to cause short circuits. It also has the effect of improving the vacuum of the mercury-vapor device, while the use of platinum deteriorates the vacuum.

According to one modification of my invention the heat generated on the projecting member is carried away by cooling with a suitable fluid, as water or air.

My invention may be better understood from the following description taken in connection with the accompanying drawings, in which—

Figure 1 illustrates a mercury vapor rectifier equipped with a solid block projecting above the surface of the cathode; Fig. 2 is a detail view of a preferred form of the cathode block; Figs. 3, 4 and 5 illustrate modifications of members for fixing the cathode spot; Fig. 6 shows a modified arrangement for holding the block in position; and Figs. 7 and 8 illustrate an arrangement for artificially cooling the member projecting above the mercury.

As illustrated in Fig. 1, the mercury vapor device is of the well-known form consisting of an evacuated envelop 1, which contains a main mercury electrode 2 and cooperating electrodes 3 and 4 which ordinarily consist of some solid material as graphite or iron. Electrodes 5 and 6 are auxiliary or starting electrodes, such as commonly employed. As shown in Fig. 1, the cathode block 7 is secured to the leading-in-wire 8 by means of a stem 9 which ordinarily consists of a stiff wire. The cathode block is preferably provided with a series of vertical grooves 10, as shown more fully in Fig. 2, and is pointed at its upper end.

The mercury, as it slowly dissolves copper, "wets" the surface of the block, and creeps up over its surface. The grooves on its surface increase the tendency of the mercury to ascend by their capillary action, but the mercury ascends over the surface of the block even in the absence of grooves. The cathode spot, when it travels at all, moves in a continuous way over the surface of the cathode block. The same action takes place in the modified forms of cathode blocks illustrated in Figs. 3 and 4. In the form illustrated in Fig. 5, consisting of a disk floating on the surface of the mercury and pierced with a number of holes, the cathode spot issues from the mercury in one of these holes. An alternative arrangement for fixing the cathode block in the mercury is illustrated in Fig. 6, and consists in providing the end of the stem 9 with a little projection

or flange which is held in position by the glass walls of the envelop 1, which are pinched in just above and below the flange.

As considerable heating is generated by the electrical current, I consider it preferable in some cases to artificially cool the member projecting above the mercury. This can be conveniently done as illustrated in Fig. 7 by projecting a stream of water or air through a tube 11 into a tubular cathode block 12. The upper part of the cathode block 12 consists of copper or one of its alloys, while the lower part which passes through the glass consists of platinum. In the arrangement illustrated by Fig. 8, the cathode spot is fixed by the tube 13 doubled on itself which projects above the surface of the mercury; in this case, likewise, the upper part of the tube consists of copper and the ends passing through glass walls consist of platinum. It will, of course, be understood that the members 12 and 13, illustrated by Figs. 7 and 8 will serve as leading-in conductor, as well as fixing the cathode spot.

It will be observed that the member projecting above the surface of the mercury, illustrated in each of Figs. 1 to 6 inclusive, is of considerable size, which has the effect of distributing rapidly the heat which is very intense at the limited area covered by the cathode spot. In this manner, the amount of mercury volatilized is very materially diminished. The same action, of course, is also true to a still greater degree of the artificially cooled members 12 and 13, illustrated in Figs. 7 and 8. The spattering of the mercury is likewise reduced as the cathode spot is maintained on the solid member projecting above the surface of the mercury rather than on the surface of the mercury itself. All these effects, by diminishing the amount of vaporized mercury in the space between the anodes, decrease the injurious arcing sometimes taking place across the anodes.

As already pointed out above, the use of copper as the material for the cathode block in any of the forms illustrated serves to improve the vacuum of the mercury-vapor device during its operation.

The amount of copper dissolved in the mercury during the operation of the device is very small, so that even with continuous operation, the block will last for a very long time. Experiments that I have carried out show that even under the most unfavorable conditions one ampere hour of current consumes at the beginning only about .63 milligrams of copper. The rate of consumption rapidly decreases as the mercury becomes alloyed with copper. According to my experience with tubes equipped with a copper cathode block, the body of copper does not loose enough weight after one thousand hours to be noticeable to the eye.

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

1. In a mercury-vapor device, the combination of a negative electrode and a member containing copper projecting above the surface of said negative electrode.

2. In a mercury-vapor device, the combination of a mercury electrode, and a metallic member projecting above the surface thereof during the operation of said device, said member being adapted to rapidly absorb and dissipate heat.

3. In a mercury-vapor device, the combination of a mercury electrode, and a copper-containing member projecting above the surface of the mercury, said member being of sufficient size to rapidly absorb and dissipate heat from its surface.

4. In a vapor electric device, the combination of a mercury electrode, and a metallic block projecting above the surface thereof having vertical grooves to assist the ascension of mercury.

5. In a mercury vapor device, the combination of a mercury electrode and a metallic member projecting above the surface of said electrode during the operation of said device, said member being free to adjust its position above the mercury surface with variations of level of said mercury electrode.

6. In a vapor electric device, the combination of a mercury electrode, and a copper member projecting above the surface thereof, said member having capillary spaces to assist the ascension of the mercury upon its surface.

7. In a vapor electric device, the combination of a mercury containing electrode and a grooved copper block projecting above the surface of said electrode, said block having a pointed tip.

8. In a vapor electric device, the combination of a liquid electrode, and a copper-containing member projecting above its surface, said member having restricted spaces extending throughout its length to assist the ascension of the electrode material.

9. In a mercury vapor device, a combination of a mercury electrode, and a conductive member maintained above the surface thereof, said member being adapted to rapidly absorb and dissipate heat.

In witness whereof, I have hereunto set my hand this 9th day of July, 1909.

EZECHIEL WEINTRAUB.

Witnesses:
JOHN A. MCMANUS, Jr.,
CHARLES A. BARNARD.