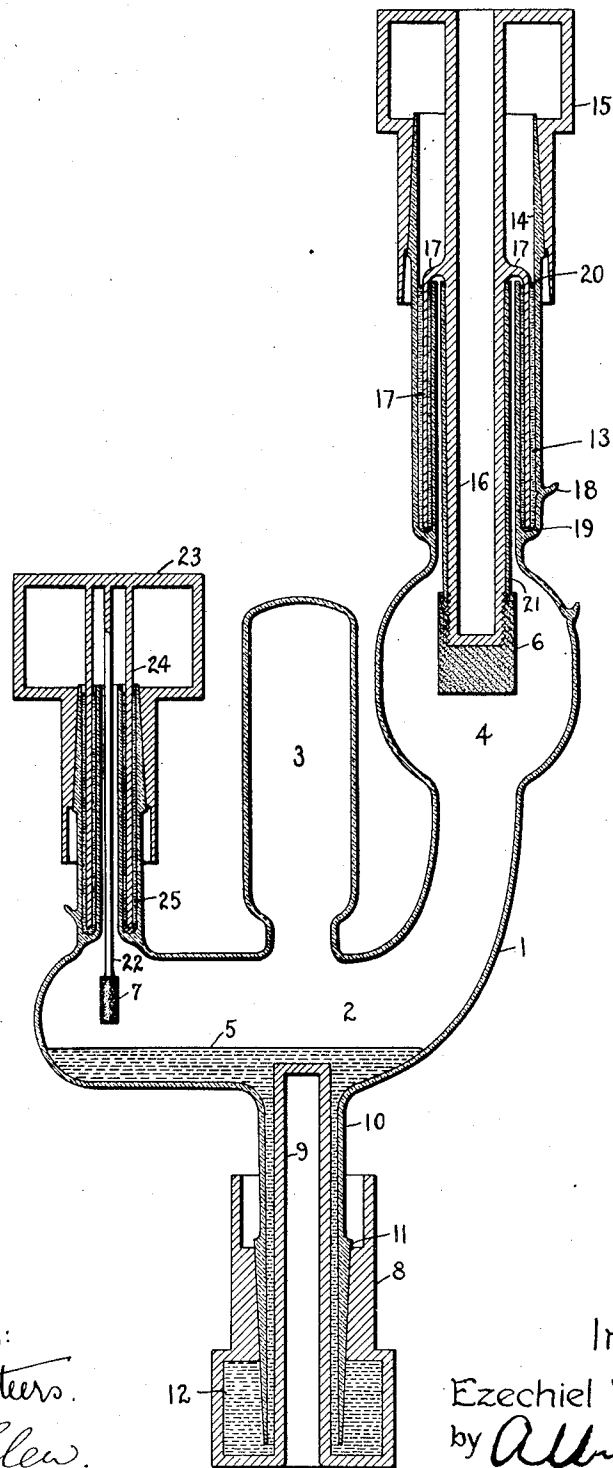


E. WEINTRAUB.
VACUUM APPARATUS.
APPLICATION FILED DEC. 13, 1910.

1,037,379.

Patented Sept. 3, 1912.



Witnesses:
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UNITED STATES PATENT OFFICE.

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

VACUUM APPARATUS.

1,037,379.

Specification of Letters Patent.

Patented Sept. 3, 1912.

Application filed December 13, 1910. Serial No. 597,011.

To all whom it may concern:

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

My invention relates to vacuum-tight seals or closures for vacuum apparatus, particularly electrical devices such as vapor rectifiers and lamps, and it is particularly applicable to devices consisting of a material such as fused silica. The use of fused quartz or silica, as a material for the envelop of vapor electric and similar devices, permits running these devices at a very high current density, thereby increasing the current carrying capacity in the case of rectifiers, or, at a very high temperature, improving the efficiency as well as the color of the light in the case of vapor lamps. The difficulty of sealing leading-in conductors vacuum-tight into this material, however, heretofore have restricted its use.

My invention enables conductors capable of carrying very heavy currents to be sealed into evacuated quartz apparatus, or, in general, into apparatus consisting of a material not suited to have conductors embedded therein by fusion.

In accordance with my invention, hollow metallic caps are tightly fitted by means of a ground joint to the material of the container and a column of mercury is interposed between the interior of the container and the interior of the cap or closure, so that, if any leakage should take place through the ground joint, or through the material of the cap itself, it is prevented from reaching the arc chamber by the column of mercury, and hence it is necessary that the gas pressure in the hollow cap become sufficiently great to overcome the weight of the mercury column before any gas can reach the arc chamber itself.

My invention may be best understood by reference to the following description taken in connection with the accompanying drawing which shows a half wave mercury rectifier illustrating the invention. The envelop of this rectifier, consisting of fused silica, incloses a cathode chamber 2, into which opens a condensing chamber 3 and a main anode chamber 4. The cathode chamber contains

a puddle of mercury 5 constituting the cathode of the rectifier. The anode chamber 4 contains an anode 6 consisting of graphite, or other refractory conductive material. The device is also provided with an auxiliary, or starting anode, 7, which is employed for maintaining a continuous side branch, or exciting arc which functionates to maintain the rectifier alive between the successive half waves, or impulses of current, in a manner well understood in the art.

The cathode closure, or seal, consists of a metal cap 8 consisting, for example, of iron, and which is provided with a reëntrant portion 9 projecting into the neck 10 of the envelop. The cap 8 is tightly fitted by means of a beveled ground joint 11 to the material of the container. The chamber 12 of the metallic cap and the annular space between the reëntrant portion 9 and the wall of the container is filled with mercury which is continuous with the pool of mercury forming the cathode of the device.

It will be observed that any leakage of air through the ground joint 11 or through the material of the cap due to any porosity must first force the mercury in the chamber 12 up into the annular space between the portion 9 of the seal and the wall of the container, and, as the wall of the container projects nearly to the bottom of chamber 12, the chamber must first be filled with a considerable amount of gas before the gas can reach the mercury column upon the inside of the container wall. As the differences of pressure are compensated by the resulting differences in mercury level the pressure in the cap becomes greater than the weight of this column of mercury before any gas can reach the interior of the rectifier. The mechanical joint can be made very tight and the leakage will be so small that the life of the joints will be many thousands of hours and will exceed the life of the rest of the device.

The anode seals are very similar in their construction. In this case the lip of the container is provided with annular trough 13, the outer wall 14 of which extends beyond the lip of the container. The cap 15 is fitted to this wall 14 by means of a ground joint, as already described. The cap 15 is hollow and is provided with a reëntrant portion 16 similarly to the cathode cap and is also provided with a downwardly projecting

annular wall 17, which projects into the annular trough 13. When the container 1 has been evacuated and sealed off in the usual manner, the annular trough 13 is filled with mercury by means of a small tube, the sealed portion of which has been indicated at 18. This mercury extends from the level 19 to the level 20, on both sides of the annular wall 17. The reëntrant portion 16 has the anode 6 screw-threaded thereon, and it is provided with a sheath 21 of refractory insulating material, such as silica, to prevent the arc from extending upward beyond the anode 6.

15 The metallic closure for the supplemental anode 7 is similar to that already described in connection with the main anode 4. Because of the smaller current-carrying capacity required of the supplemental anode, a metallic stem 22, extending from the upper wall of the cap 23, takes the place of the reëntrant portion 16 of the cap 15. The downwardly depending tube 24 dips into mercury in the trough 25, thereby interposing a column of mercury between the interior of the container 1 and the interior of the anode cap. It will thus be seen that in the case of each anode seal, balanced columns of mercury separate the space in the rectifier from the space in the hollow cap, and as already explained gas cannot enter the rectifier until the leakage pressure exceeds the weight of the mercury column seal.

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

1. An evacuated container having a portion thereof closed by a seal comprising communicating columns of liquid of low

vapor tension, and a mechanical closure for that portion of the seal which is external to the container, whereby the atmospheric pressure upon the liquid seal is reduced to negligible amount. 40

2. An evacuated container having a closure therefor formed of balanced columns of mercury, and an external vessel closing the mercury column seal from exposure to atmospheric pressure, said external vessel being likewise more or less evacuated. 45

3. A quartz receptacle provided at one part with an annular trough, fluid in the trough, and a closure for the receptacle forming a ground joint with the quartz receptacle and dipping into the fluid in said trough, said closure being evacuated where- 50 by the fluid columns separating the quartz receptacle and the closure are of approximately equal heights. 55

4. The combination of an evacuated container, a hollow, evacuated, mechanically fitted closure therefor, a body of mercury sealing the space in said container from the space in said closure and a partition separating said mercury seal into two columns, communicating respectively with the con- 60 tainer and the closure whereby gas pressure in the closure due to leakage is compensated by a change of mercury level, and is prevented from entering the space in the main container. 65 70

In witness whereof, I have hereunto set my hand this tenth day of December, 1910.

EZECHIEL WEINTRAUB.

Witnesses:

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