

F. CONRAD.  
VAPOR ELECTRIC DEVICE.  
APPLICATION FILED JUNE 21, 1912.

1,159,900.

Patented Nov. 9, 1915.

Fig. 1.

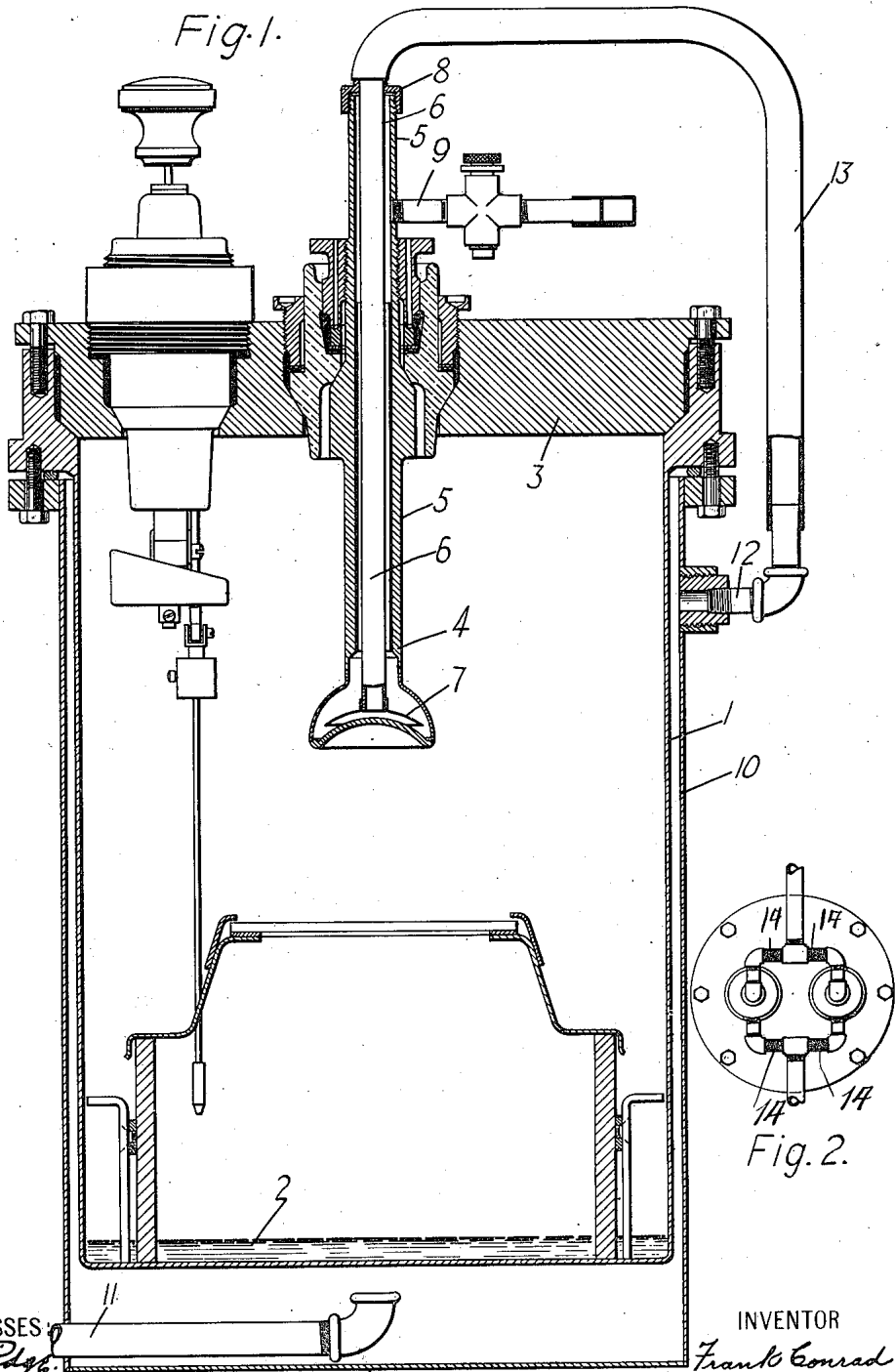


Fig. 2.

WITNESSES  
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# UNITED STATES PATENT OFFICE.

FRANK CONRAD, OF SWISSVALE, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

## VAPOR ELECTRIC DEVICE.

1,159,900.

Specification of Letters Patent.

Patented Nov. 9, 1915.

Application filed June 21, 1912. Serial No. 705,037.

*To all whom it may concern:*

Be it known that I, FRANK CONRAD, a citizen of the United States, and a resident of Swissvale, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Vapor Electric Devices, of which the following is a specification.

My invention relates to vapor electric devices, such as mercury vapor current rectifiers and lamps, and it has for its object to provide means for effectively cooling such devices and of such a character that condensation of vapor upon the anodes is substantially prevented and the presence of abnormal electromotive forces between the anodes prevented.

My invention is illustrated in the accompanying drawings, Figure 1 of which is a side and sectional view through a rectifier embodying my invention, and Fig. 2 is a plan view of a rectifier embodying a modification thereof.

The rectifier or other vapor electric devices in connection with which the present invention is employed may be of any suitable form, but is here shown as comprising a metallic casing 1 containing a pool of mercury 2, which constitutes a vaporizable negative electrode or cathode, and having a cover 3 that is clamped thereon to render the casing vacuum-tight. The rectifier of Fig. 1 is provided with but one main anode 4 that projects through, but is insulated from, the cover and extends a suitable distance into the casing. The anode comprises a water tight outer shell 5 of any suitable form, but preferably having an enlarged lower end with a concave extremity, and an inner tube 6 of somewhat less diameter than the outer shell and opening at its lower end into the enlargement thereof, the lower end of the inner tube being provided with a vane 7 that directs the cooling medium into the extreme portions of the said enlargement. The inner tube extends somewhat beyond the upper end of the outer shell, which is provided with an apertured cap 8 that closely fits the inner tube and provides a water tight connection between the outer and inner tubes. The inner tube constitutes an inlet pipe or conduit for a cooling me-

dium, and the outer tube or shell is provided near its upper end with a lateral outlet tap 9.

The casing 1 is loosely surrounded by an outer tank or jacket 10, a water-tight joint being provided between the casing and the tank at their upper ends. The tank or jacket is provided at or near its bottom with an inlet tap 11, and at or near its top with an outlet tap 12 that is connected by means of an insulating pipe or tube 13 to the inner tube of the anode.

In the operation of the rectifier, water, oil, or other suitable cooling medium, is forced at a suitable pressure through the inlet tap 11 into the tank or jacket 10, where it absorbs heat given off at the cathode and other parts of the rectifier, and then it flows out of the jacket 10 through the outlet 12 at the top, through the pipe 13, and finally through and out of the anode 4. Thus, the water supplied to the anode for cooling the same is of a higher temperature than the water that enters the tank or jacket, because it is warmed somewhat by the heat given off by the body of the rectifier before being delivered to the anode. Consequently, the anode will always have a somewhat higher temperature than the cathode and other parts of the rectifier, with the result that mercury vapor does not condense thereon but condenses upon the cooler parts. No difficulty, therefore, is experienced in the operation of the rectifier by reason of the collection of mercury upon the anode and of its dropping therefrom upon other parts, and short circuits are consequently much less liable to occur than would otherwise be the case. Furthermore, the cooling of the anode prevents the material thereof from attaining such a temperature that the negative electrode resistance thereof may be overcome. Superior results are also obtained in operation by reason of the concave form of the lower end of the anode which has the effect of causing the arc to travel around and prevents it from becoming local.

In the rectifier of Fig. 2, two main anodes are employed, and, in order that they may have substantially the same temperature, the water or other cooling medium is directed through them in parallel streams. To this

end, the pipe that connects the upper end of the tank or jacket with the anodes is divided into two branches respectively leading to the two anodes. Insulating joints 14 are inserted in the branches of the cooling pipes in proximity to the anodes so that a short circuit between the anodes is prevented. I find that, by employing ordinary tap water as the cooling medium, a sufficiently high resistance path is provided between the two anodes to prevent harmful short circuiting therebetween. The resistance of said path is, however, so low as to cause the dissipation of high-voltage charges occurring on the anodes or on the lead wires thereto. In this manner, the short circuiting of the anodes within the container is largely prevented, as is set forth in United States Patent to Hayden, No. 1,032,900, July 16, 1912.

I claim as my invention:

1. The combination with a current rectifier having an anode provided with passages for a cooling medium, of a casing surrounding the rectifier, and means for directing the flow of a cooling medium between the casing and the rectifier and then through the passages in the anode.
2. The combination with a current rectifier having a terminal member provided with passages for a cooling medium, of means for directing a cooling medium first upon the rectifier and then through the passages in the terminal member.
3. The combination with a current rectifier having a terminal member provided with passages for the reception of a cooling medium, of a casing surrounding the rectifier, and a connection between the upper

portion of the casing and the passages in the terminal member.

4. The combination with a rectifier having a terminal member provided with passages for the reception of a cooling medium, of a casing surrounding the rectifier and having an inlet at its bottom and an outlet at its top, and means for providing communication between the outlet and the passages in the terminal member.

5. The combination with a current rectifier having a plurality of terminal members each provided with passages for a cooling medium, of means for directing a cooling medium first upon the rectifier and then through the passages in the terminal members.

6. The combination with a current rectifier having a plurality of terminal members provided with passages for a cooling medium, of means for directing a cooling medium first upon the rectifier and then in parallel streams through the passages in the terminal members.

7. The combination with a vapor rectifier provided with two anodes and a cathode, of cooling means including a stream of cooling liquid of low conductivity passing to both anodes, whereby a protective conducting path of high resistance is provided between the anodes.

In testimony whereof, I have hereunto subscribed my name this 17th day of June, 1912.

FRANK CONRAD.

Witnesses:

WM. M. BRADSHAW,  
B. B. HINES.

Correction in Letters Patent No. 1,159,900.

It is hereby certified that in Letters Patent No. 1,159,900, granted November 9, 1915, upon the application of Frank Conrad, of Swissvale, Pennsylvania, for an improvement in "Vapor Electric Devices," an error appears in the printed specification requiring correction as follows: Page 2, line 67, claim 4, for the word "liquid" read *fluid*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 8th day of February, A. D., 1916.

[SEAL.]

R. F. WHITEHEAD,  
Acting Commissioner of Patents.

Cl. 175—354.