F. W. LYLE.

VAPOR ELECTRIC DEVICE.

APPLICATION FILED JUNE 18, 1910.

1,079,250. Patented Nov. 18, 1913.

Fig. 1.

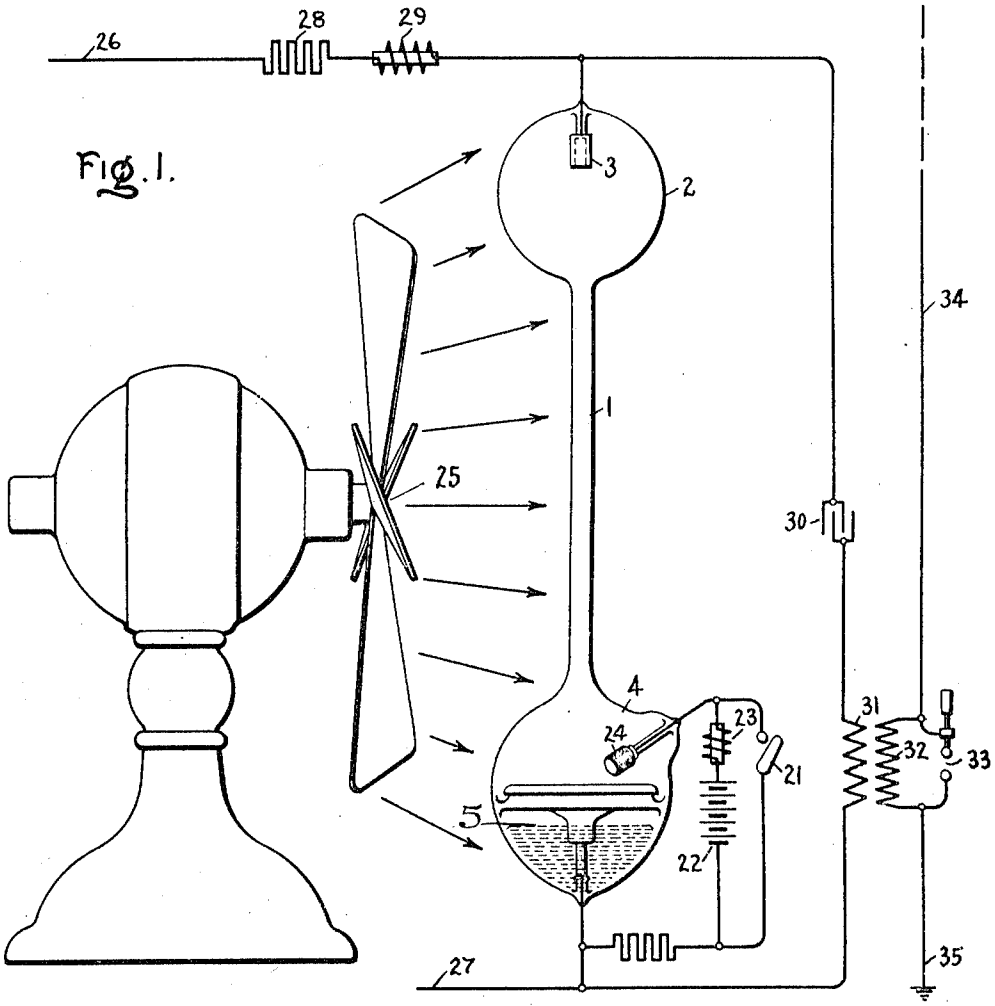


Fig. 2.

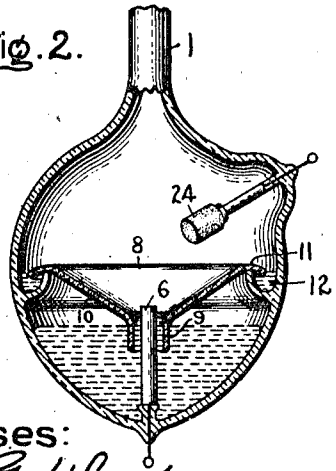
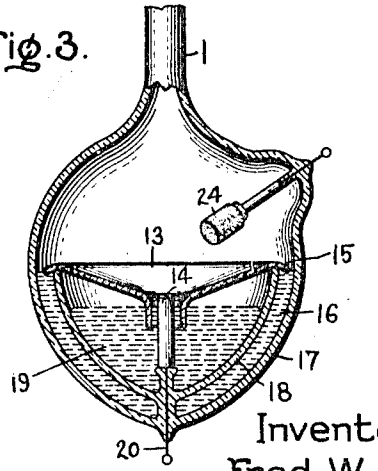


Fig. 3.



Witnesses:

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UNITED STATES PATENT OFFICE.

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VAPOR ELECTRIC DEVICE.

1,079,250. Specification of Letters Patent. Patented Nov. 18, 1913.

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To all whom it may concern:

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

The main objects of the present invention are to provide a vapor electric apparatus having great stability when in operation; to provide a vapor device adapted to transmit energy at high voltage even when the current is of a pulsating character; to provide means for governing the motion of the cathode spot; to provide a structure allowing slight movements of the cathode spot, but limiting the movement; to provide for the return of condensed mercury to the cathode without disturbing the action of the arc.

A specific embodiment of this invention is disclosed in the accompanying drawings, in which—

Figure 1 illustrates a vapor tube connected to a system which is adapted to produce periodic currents of high frequency; Fig. 2 is a detail showing, in section, the means for limiting the movement of the cathode spot; Fig. 3 illustrates a modified construction.

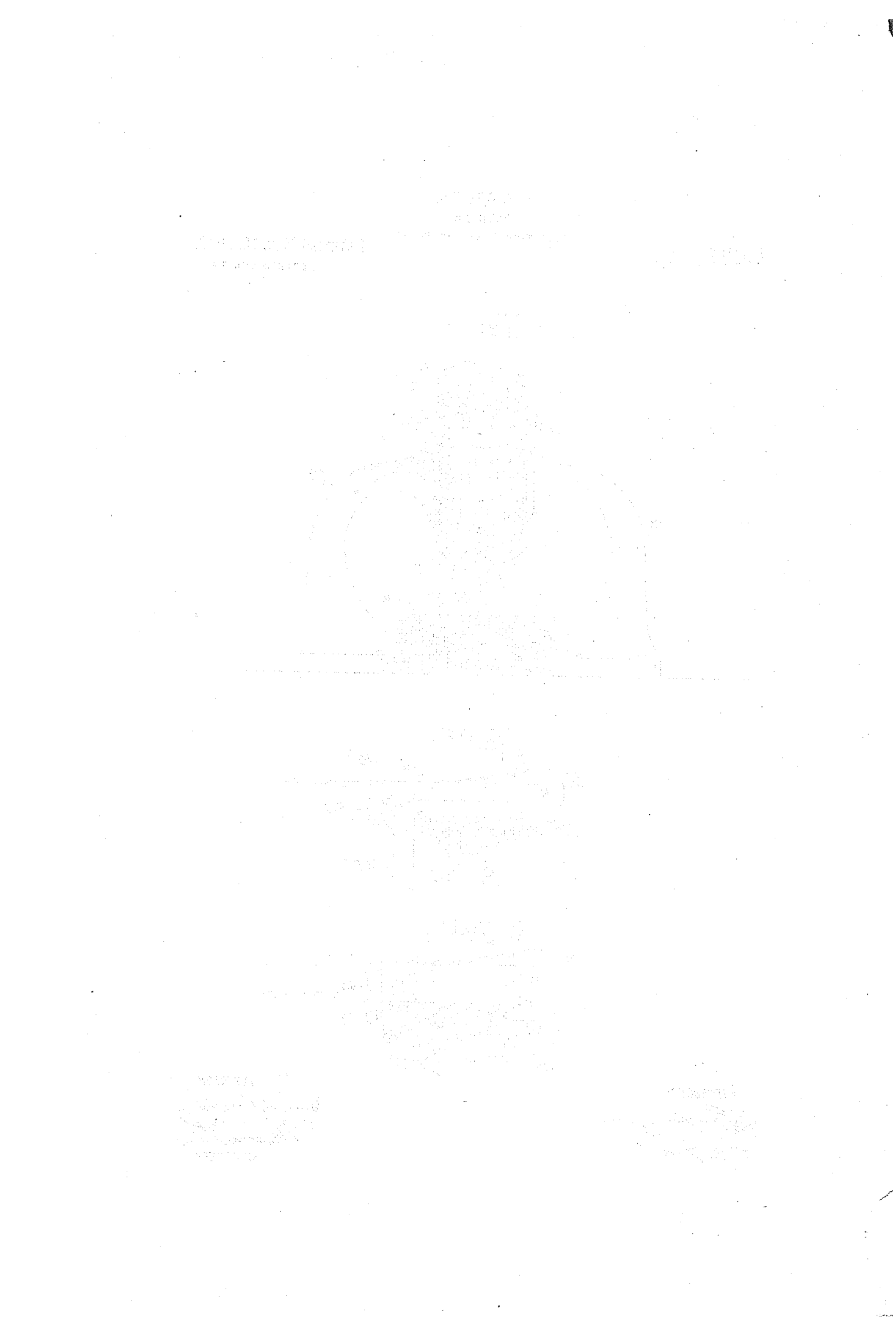
In the construction shown, the vapor device comprises an evacuated glass envelop having a constricted tubular portion 1. This constricted portion, in the embodiment here illustrated, has a length of about eight or ten inches, and an internal diameter of about one-eighth of an inch. At its upper end, it communicates with a large anode chamber 2, in which a hollow graphite anode 3 is mounted. The lower end of tube 1 opens into a large cathode chamber 4, shown in detail in Fig. 2.

In Fig. 2, a vaporizable cathode 5 is in contact with the outer glass walls of the cathode chamber. The cathode may be of mercury or other suitable vaporizable material. Projecting above the surface of the vaporizable cathode is a conductor 6, preferably of copper or other metal wet by the mercury. This conductor may be in the form of a rod, and may be anchored below the surface of the cathode by connection to the lead wire, as shown in Fig. 2. A cap 8, of silica, or magnesia, or the like, envelops the copper rod 6 and flares outward therefrom. This cap has at its lower end a tubular portion 9, which dips below the surface of the cathode and forms a small annular channel about the copper rod 6. The cap has a flaring or conical portion 10, which is provided at its outer edge with a downwardly projecting lip 11. The lip dips into an annular trough 12, and the trough holds a small quantity of mercury adapted to serve as a seal around the outer edge of the cap. Although the cap 8 rests on the edge of the annular trough 12, its contact is so imperfect or loose that when the mercury which condenses on the walls of the envelop and collects in the annular trough, fills that trough to overflowing, it can seep through between the upper edge of the trough and the under surface of the cap, and so can replenish the cathode without disturbing the cathode spot or interfering in any way with the normal action of the arc.

In Fig. 2, the annular trough 12 consists of glass, and is made integral with the glass wall of the bulb and high enough above the cathode to insulate the mercury or other liquid in the trough from the vaporizable material of the cathode.

In Fig. 3, a refractory cap 13 forms an annular channel about the central copper rod 14, and has at its outer edge a depending lip 15, dipping in an annular trough to form a seal, but in this modification, the annular trough extends down almost to the base of the tube, and the mercury body 16 contained therein is in contact with the outer wall 17 of the bulb and with an inner glass cone 18. This cone serves to hold the cathode 19, and to insulate the cathode from the surrounding mercury 16. The cathode lead wire 20 is insulated from the mercury 16, but is electrically connected with the cathode 19.

When a vapor electric device of either of the types just described is connected to a circuit such as is shown in Fig. 1, its operation is as follows: By closing and then opening a switch 21, which is connected across a battery 22, and a reactance coil 23, an inductive kick may be produced between the auxiliary anode 24 and the mercury cathode 5 of the tube. This will serve to initiate a small side branch arc between the auxiliary anode 24 and the cathode, and this arc may be continuously maintained by current from



dipping in said cathode and forming an annular channel about said rod, said cap having a flaring portion with a depending lip, an annular trough, and a body of vaporizable material in said trough forming a seal for said depending lip, said material being insulated from said vaporizable cathode.

7. In a vapor electric device having an envelop and an anode, the combination of a mercury cathode, a copper rod projecting above the surface of said cathode, a cap covering said cathode except in the neighborhood of said copper rod, and means for holding mercury in contact with the outer edge of said cap to form a seal.

8. In a vapor electric device having an envelop and an anode, the combination of a mercury cathode, a rod projecting above the surface of said cathode, a refractory cap loosely inclosing said rod, said cap having a depending lip, and an annular trough containing mercury in which said lip dips.

9. In a mercury vapor device having an envelop and an anode, the combination of a mercury cathode, a refractory cap covering the greater part of the cathode surface but leaving free a portion exposed to said anode and means for returning condensed mercury to said cathode at a region not exposed to said anode.

10. In a vapor electric device having an evacuated envelop, the combination of an anode, a vaporizable cathode, a funnel shaped refractory cap having its inner edge in contact with the cathode, the outer edge of said cap having a depending portion, an annular trough in which the depending portion loosely fits and a body of liquid in said trough forming a seal for the upper edge of said cap, said liquid being insulated from the cathode.

11. In a vapor electric device, the combination of an anode, a mercury cathode, an annular trough surrounding said cathode, a body of mercury in said trough insulated from the cathode, a funnel shaped cap consisting of refractory insulating material covering the greater part of said cathode surface, the lower edge of said cap dipping into said cathode and having its depending upper edge dipping into the mercury in the annular trough.

12. In a vapor electric device having an anode and a vaporizable cathode, an annular trough adapted to contain fluid material insulated from said cathode, and a refractory shield covering the greater part of the cathode surface and having its edge projecting into said trough so that a seal is formed upon the introduction of fluid material into the trough.

13. In a vapor electric device, comprising an envelop, a mercury cathode and anode, the combination of a refractory cap for said cathode exposing only a small part of the cathode surface and having a depending lip and a supporting member for said cap constituting with said envelop a trough for containing mercury which will seal the edge of said cap.

In witness whereof, I have hereunto set my hand this fifteenth day of June, 1910.

FRED W. LYLE.

Witnesses:

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FRANK G. HATTIE.