H. I. WOOD.

VAPOR ELECTRIC APPARATUS.

APPLICATION FILED DEC. 17, 1903.

942,871. Patented Dec. 7, 1909.

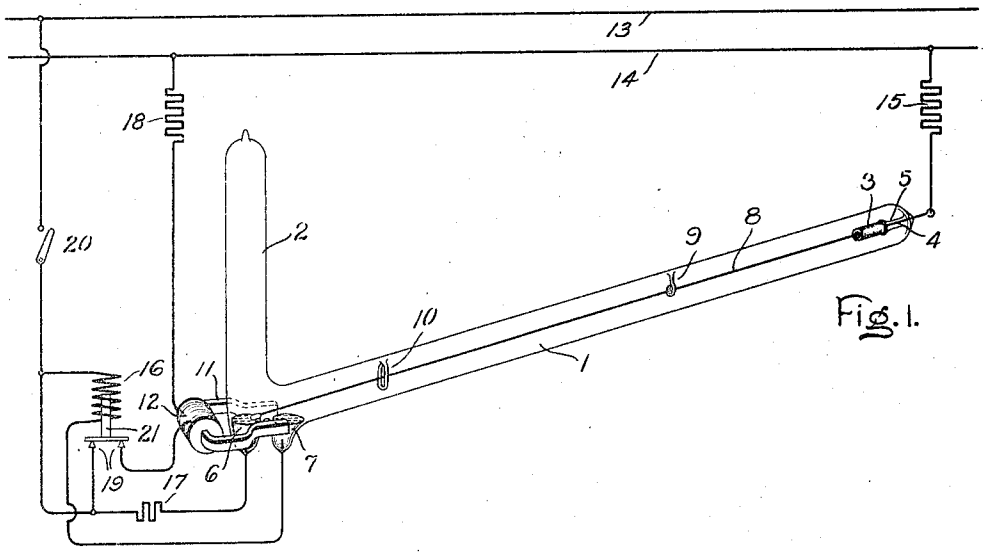

Fig. 1.

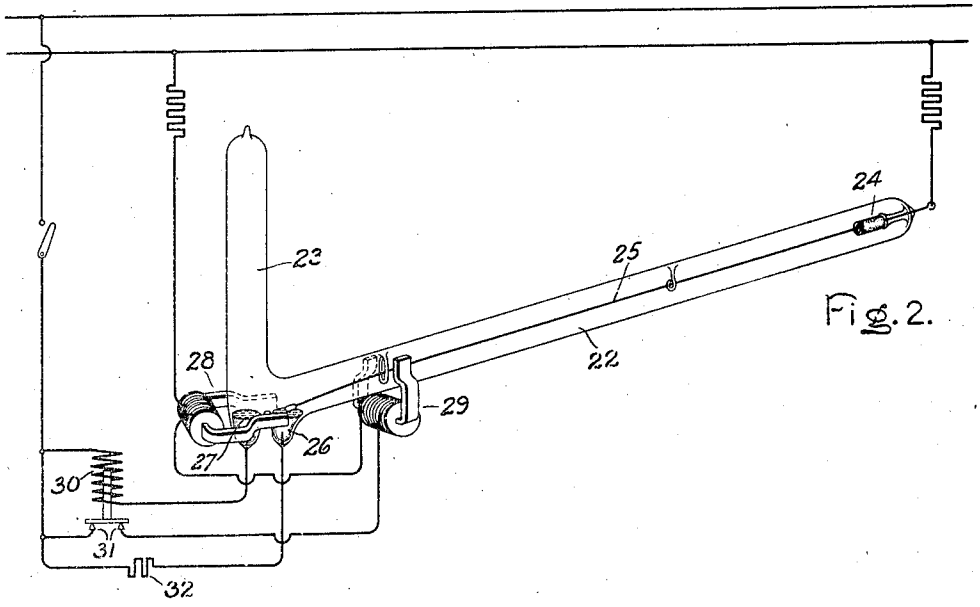

Fig. 2.

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UNITED STATES PATENT OFFICE.

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VAPOR ELECTRIC APPARATUS.

942,871. Specification of Letters Patent. Patented Dec. 7, 1909.

Application filed December 17, 1903. Serial No. 185,482.

To all whom it may concern:

Be it known that I, HOWARD I. WOOD, a citizen of the United States, residing at Schenectady, county of Schenectady, and State of New York, have invented certain new and useful Improvements in Vapor Electric Apparatus, of which the following is a specification.

My present invention relates more especially to starting means for a vapor electric lamp or the like and includes certain novel features not only in the starting mechanism for the lamp but also in the construction and arrangement of the apparatus as a whole.

My invention is intended to be used more especially for starting horizontal or inclined lamps but is, of course, not limited to use in this relation.

The features of novelty which characterize my invention are pointed out with particularity in the appended claims. The invention itself, however, both as to its practical construction and mode of operation will be better understood by reference to the following description taken in connection with the accompanying drawings, in which,

Figure 1 represents one embodiment of my invention and Fig. 2 another form of the same.

In Fig. 1 the exhausted envelop of the lamp consists of an inclined tubular portion 1, in which the arc or current flow takes place, and a relatively short vertical portion 2 constituting a condensing chamber for vapor generated in the lamp during normal operation. At the outer end of the tubular member 1 is located one of the main electrodes 3. This electrode, as shown, consists of a hollow cylindrical body of artificial graphite, carbon or the like supported by a wire or rod 4 extending through the wall of the envelop and constituting a leading-in conductor. This wire is protected by an inclosing tube 5 of glass fused at one end of the wall of the envelop and at the other end flared so as to project slightly, like a hood, over the adjacent end of the electrode 3.

The opposite end of the lamp envelop is provided with two pockets containing bodies of mercury 6 and 7 constituting electrodes. A filament 8 of carbon, electrically connected to the electrode 3, extends therefrom the whole length of the tube, through suitable guides 9 and 10, and rests, at its free end, upon the surface of the mercury electrode 6. The end of the filament, where it comes in contact with the mercury, is slightly enlarged so as to prevent excessive heating and thereby render the effect of disintegration negligible.

An electro-magnet, having a core 11 with projecting arms and a magnetizing coil 12, is arranged so that the magnetic field produced thereby passes through the walls of the tube 1 and across the lower portion or end of the filament 8.

Current is supplied to the lamp from the supply mains 13 and 14. In order to start the lamp connections are made as follows: The anode 3 is connected through a steadying resistance 15 to the positive supply main 14. The main mercury electrode or cathode 7 is connected, through the coil 16 of a cut-out device, with the negative main 13. The companion mercury electrode 6 is connected through a resistance 17 also to the negative main 13. The magnetizing coil 12 of the electro-magnet is connected across the two supply mains 13 and 14, with an interposed resistance 18 if necessary, and includes in circuit therewith the two circuit-breaking contacts 19 controlled by the magnetizing coil 16. When now currents in these circuits are caused to flow by closing the main switch 20, it will be noted that the magnetic field then produced by the electro-magnet acts dynamically upon the current flowing between the positive and negative mains through the filament 8. The direction of magnetization of the electro-magnet is made such that the filament, under the influence of the magnetic field, is lifted off of the electrode 6. An arc is thus started which immediately extends along the filament 8 and to the electrode 3 and, as a secondary effect of the magetic field, is blown across to the main cathode 7. This arc now passes between the electrodes 7 and 3, and by reason of the higher resistance path due to the resistance 17, has no tendency to return to the starting electrode 6. As soon as current flows through the electrode 7 the solenoid 16 is energized thus attracting its core 21 and so breaking the circuit of the magnetizing coil 12 of the electro-magnet. The lamp is now in normal operation.

Instead of using the same electro-magnet for springing the arc by elevating the filament, and also, after it has once been

sprung, for deflecting the arc from the starting electrode to the main electrode, I may, if desired, use separate electro-magnets for this purpose. An organization for effecting this result is shown in Fig. 2. As before, the main tube of the lamp is indicated at 22, the condensing chamber at 23, the graphite anode at 24, and a filamentary conductor at 25. This filamentary conductor extends from the anode 24 and its lower or outer end rests lightly on the top of the mercury starting electrode 26. The main cathode or mercury electrode is located beyond the electrode 26 and is indicated at 27.

Two electro-magnets 28 and 29, the magnetizing coils of which are in the same circuit, are arranged so that one, the magnet 29, when energized raises the filament 25 so that its lower end is carried out of engagement with the starting electrode 26, while the other magnet 28 draws the arc thus formed away from the starting electrode 26 to the running electrode 27. The circuit of these magnets, as soon as the lamp starts, is interrupted by a cut-out device the energizing coil 30 of which is in circuit with the electrode 27 and the circuit breaking contacts 31 in the circuit of the magnets as indicated. As before, a resistance 32 prevents the return of the arc after its transfer from the starting electrode 26 to the running electrode 27.

In some instances it may be sufficient to employ only one mercury electrode and to allow the filament, after it has started the lamp by being disengaged from the electrode, to return to and rest upon the electrode. This, of course, does away with complication but is open to the objection that the end of the filament resting in the electrode is subject to disintegration. I find it preferable, therefore, after the lamp has been started, to cut the filament out of circuit. This I have done, in the organizations above described, by using a plurality of mercury electrodes, one of which is a starting electrode with which the filament engages and which, after the lamp is started, is cut out of circuit, and the other a running electrode or main cathode.

It is evident that numerous modifications and adaptations of my invention may be made without departing from the spirit thereof, for which reason I do not wish to be limited to the exact details shown and described.

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

1. In a vapor electric apparatus, the combination of a vaporizable electrode, a conductor having one end resting thereon, and means for subjecting said conductor to the influence of an intersecting magnetic field.

2. In a vapor electric apparatus, the combination of a vaporizable electrode, a filament having one end resting on the surface of said electrode, means for passing current through the filament, and means for subjecting the filament to the influence of an intersecting magnetic field whereby it is caused to move out of engagement with the electrode.

3. The combination of an exhausted envelop, electrodes therein adjacent to each other, a filament having one end resting on one of the electrodes, and a magnet or other device producing a magnetic field for lifting the filament out of engagement with its coacting electrode and for blowing the arc then resulting toward the coöperating electrode.

4. In a starting device for vapor electric apparatus, the combination of means affording a conducting path through the apparatus for current from the supply source, and means acting electro-dynamically upon the current thus flowing for producing a break in the conducting path thus generating an initial starting arc.

5. The combination of an exhausted envelop, a plurality of electrodes, and an electro-magnet for causing an arc started from one electrode to shift to another electrode.

6. The combination of an exhausted envelop, a plurality of electrodes, and a device producing an electro-magnetic field for causing an arc started from one electrode to shift to another electrode.

7. The combination of an exhausted envelop, electrodes therein, a filament secured at one end in fixed relation to the envelop and having its opposite end resting on one of said electrodes, and electric means for producing a disengagement between the end of the filament and the electrode on which it rests.

8. The combination of an envelop containing electrodes, a filament extending longitudinally of said envelop and engaging one of said electrodes, and means for laterally moving the filament.

9. The combination of an envelop containing electrodes, a filament in said envelop adapted to engage one of said electrodes, and means for laterally moving an end of the filament.

10. The combination of an exhausted envelop, electrodes therein in fixed relation to each other, and a relatively movable filament extending between said electrodes.

11. The combination of an exhausted envelop, electrodes therein in fixed relation to each other, a filament extending between said electrodes, and magnetic means for moving said filament.

12. The combination of an exhausted envelop, a fixed electrode therein, a movable filament, connections between the filament and the electrode adapted to receive current from the same supply main, and a so-

lenoid or magnetizing coil in circuit with said connections and acting to move said filament.

13. The combination of an exhausted envelop, a fluid electrode, and a filament provided with an enlarged end dipping in said electrode.

14. The combination of an exhausted envelop, a fluid electrode, and a filament provided with an enlarged end.

15. In an apparatus of the character described, the combination of a filament and a tip therefor capable of acting as a positive electrode without excessive heating.

In witness whereof, I have hereunto set my hand this 15th day of December, 1903.

HOWARD I. WOOD.

Witnesses:

BENJAMIN B. HULL,

HELEN ORFORD.