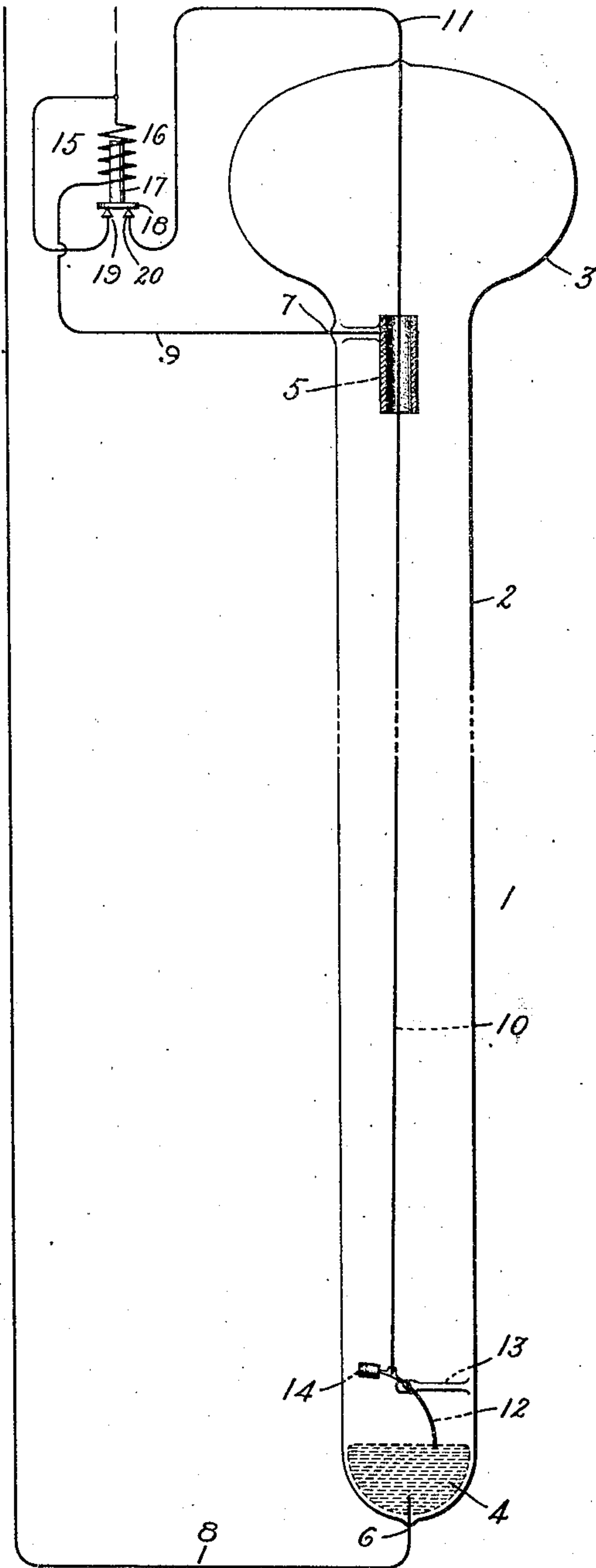


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VAPOR ELECTRIC APPARATUS.
APPLICATION FILED APR. 4, 1904.

925,620.

Patented June 22, 1909.



Witnesses:

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UNITED STATES PATENT OFFICE.

CHATTIN BRADWAY, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

VAPOR ELECTRIC APPARATUS.

No. 925,620

Specification of Letters Patent.

Patented June 22, 1909.

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To all whom it may concern:

Be it known that I, CHATTIN BRADWAY, a citizen of the United States, residing at Schenectady, in the 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 invention relates to improvements concerning apparatus of that type in which an electric discharge is produced between electrodes in the exhausted chamber, which contains a vaporous or gaseous matter derived from at least one of the electrodes, and it consists more particularly of automatic means entirely contained within the exhausted chamber for starting the apparatus into operation.

The features which I regard as characterizing the novelty of my invention are set forth in the appended claims, which are to be construed in view of the following description of the invention, and which, together with the accompanying drawing, illustrates one of its embodiments.

The invention provides means operating automatically whereby the apparatus upon supply of current, will start into operation. I employ in the presence of vapor, a conducting medium for current, in which a gap may be interposed whereby an electrical discharge will be produced. The means for creating such gap constitutes the invention, and it rests for its basis upon the principle that a conductor will, when conveying current, expand under the heating effect of the current, and the change of dimension of the conductor or its expansion is utilized for breaking the circuit and thereby causing an initial electric discharge for starting the apparatus.

In practically embodying my invention I have elected to illustrate it as an electric lamp of the mercury arc type, of which, referring to the drawing, 1 is an exhausted chamber of glass comprising a tube 2, of indefinite length, as indicated by broken lines, and crowned by a bulbous enlargement or vapor-condensing chamber 3. In the lower end of the tube 2 is contained an electrode 4, preferably of mercury, the vapor of which fills the chamber and forms the medium for

converting electrical energy into light, and at the upper end of the tube, below the condensing chamber, is supported in fixed position an electrode 5, said electrodes being electrically connected to lead-in wires 6 and 7, respectively, which extend through the wall of the chamber and convey current from a suitable source by means of the mains 8 and 9. Such is a known type of mercury vapor lamp, and in applying my invention thereto an auxiliary circuit is provided in the exhausted inclosure or chamber, which contains the starting device employed for creating the auxiliary electric discharge for producing the main discharge between the electrodes 4 and 5.

The starting means consists of an expansible member that is connected in circuit with the mains and is arranged in such cooperative relation to the other portion of the circuit that when current causes the member to expand, due to the heat resulting from the partial conversion of the energy passing through the member into heat, the circuit will be broken and an arc sprung across the gap thus formed. I have found that the coefficient of expansion of carbon or similar refractory material, in the form of a filament or rod, renders such material available for use as the expansible member, when provided in suitable length, whereby the cumulative expansion is adequate to give the necessary range of movement to enable a gap to be formed, as already pointed out. One end of the filament or rod is fixed while the free end is provided with a suitable contrivance which normally dips into the mercury electrode and is adapted to be withdrawn by the expansion of the filament or rod under the influence of current. As shown in the drawing, the carbon filament or rod is substantially co-extensive with the length of the tube, terminating at its lower end a short distance above the lower electrode or body of mercury 4, but the exact length of the filament is not arbitrary. Its upper end is anchored at the wall of the chamber and is connected with the conductor 11, and at its lower end the filament is suspended to expand freely in the direction of its length. Intermediate the filament and the mercurial

electrode, and movably attached to the depending end of the filament, is a carbon-tipped tilting lever 12, of iron or other non-vaporizable substance, which is slightly immersed at its tip in the body of mercury. This is the normal position of the lever in which the auxiliary circuit, composed of the conductor 11, the filament 10 with the lever 12 and the main electrode 4, is completed. The lever is pivoted, as a first-class lever, on a supporting lug 13 extending from the wall of the chamber and is suitably counterbalanced by the weight 14 so as to render the tilting of the lever as sensitive as is possible. With this arrangement, the effect of current in flowing through the auxiliary circuit causes expansion of the filament, whereby the lever is raised out of the body of mercury and creates thereby a gap in the circuit, resulting in an arc bridging the gap. This arc serves to inaugurate the main discharge or arc, by causing an ionization of mercury, and the ions operate to convey current through the chamber between the main electrode, starting the lamp into full operation.

In order to render the filament idle, as a conductor of current, during the main operation of the lamp, a cut-out apparatus 15 may be provided which is located in circuit with the main 9. This apparatus consists of a solenoid 16 which, when energized, acts upon a core 17 carrying a bridging contact 18 which connects the contact points 19 and 20 in the auxiliary circuit. Upon a flow of current incident to the main discharge and resulting from the current passing through the ionized vapor of the lamp to the anode 5, the solenoid will be energized and will operate the cut-out apparatus. The main current thus passing through the solenoid retains the cut-out apparatus open during the continued operation of the lamp, and as soon as the current in the main circuit is interrupted for any reason, the solenoid is immediately deenergized and the cut-out apparatus restored, thereby placing the auxiliary circuit again in condition of initial operation.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof; but I desire to have it understood that the apparatus shown is only illustrative, and that the invention can be carried out by other means.

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 vapor containing chamber, an electrode therein, and means for opening the circuit within said chamber, said means comprising an expansible element changeable in

length due to the heat effect of current passed therethrough, said expansible element being initially in circuit with said electrode.

2. In a vapor electric apparatus, the combination of an exhausted chamber, electrodes therein one at least of which is vaporizable, and an auxiliary starting circuit including an arc-producing device which is located within the chamber and operates by expansion when heated with current.

3. In a vapor electric apparatus, the combination of an inclosure, electrodes therein one of which is vaporizable, and a conducting medium in the inclosure normally in contact with the vaporizable electrode which contact is broken by the expansion of the medium under the influence of heat due to the passage of current.

4. In a vapor electric apparatus, the combination of an inclosure, electrodes therefor, and a filament electrically connected at one end with one electrode, which connection is adapted to be broken by the expansion of the filament under the influence of heat arising from the passage of current therethrough.

5. In a vapor electric apparatus, the combination of an inclosure, a vaporizable electrode at one end thereof, a non-vaporizable electrode at the other end of the inclosure, and a conductor extending through the inclosure and composed of two members, one of which is partially immersed in the vaporizable electrode and adapted to be withdrawn from the said electrode by the expansion of the other member.

6. In a vapor electric apparatus, the combination of an inclosure, a vaporizable electrode at one end, an electrode cooperating therewith at the other end, a filament suspended in the inclosure, which is adapted to expand when conveying current, a lever connected at the lower end of the filament and supported in contact with the vaporizable electrode, and means supplying current to the filament and electrodes.

7. In a vapor electric apparatus, the combination of an exhausted chamber, a vaporizable electrode at the lower end thereof, a non-vaporizable electrode at the upper end, supply mains connected with the electrodes, means initially connected with the lower electrode, an electric discharge producing device included in said means which is controlled by the thermal effect of current therein, and a cut-out apparatus for controlling the supply of current to the means.

8. In a vapor electric apparatus, the combination of an exhausted chamber, main electrodes, an auxiliary electrode adapted to convey current initially to a main electrode, said auxiliary electrode comprising a filament of refractory material and a movable member connected therewith which is with-

drawn from the main electrode to produce an electric discharge when the filament is caused to expand by the effect of current passing through the same, and means for supplying
5 current to the electrodes.

9. The combination of an evacuated chamber, electrodes therein, and arc producing means within said chamber comprising a movable contact member cooperating with

a conductor initially supplied with current 10 and expansible to produce movement of said contact member.

In witness whereof, I have hereunto set my hand this 2nd day of April, 1904.

CHATTIN BRADWAY.

Witnesses:

BENJAMIN B. HULL,
HELEN ORFORD.