

No. 820,348.

PATENTED MAY 8, 1906.

W. R. BURROWS.  
VAPOR ELECTRIC APPARATUS.  
APPLICATION FILED MAR. 10, 1905.

Fig. 1

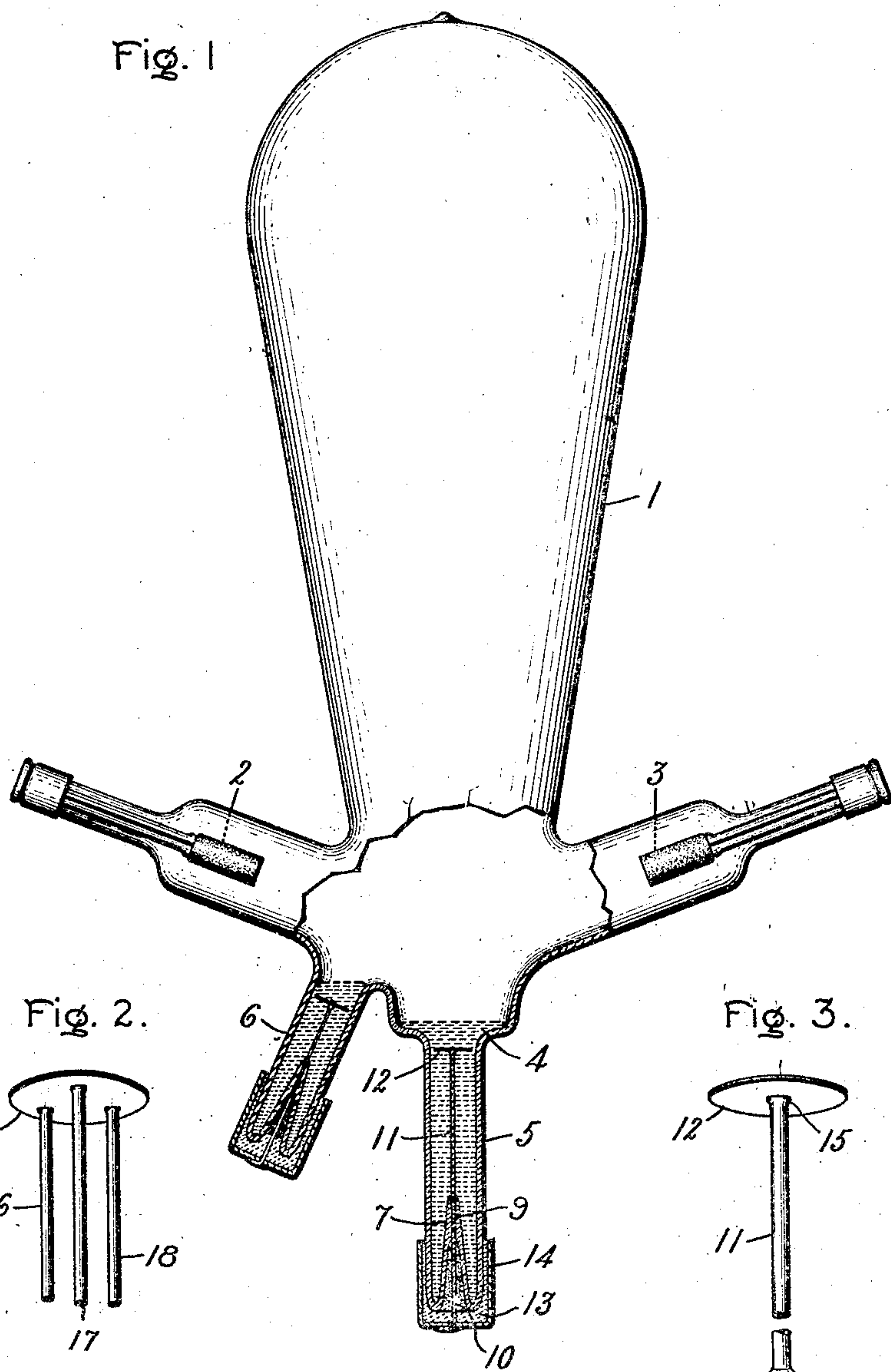


Fig. 2.

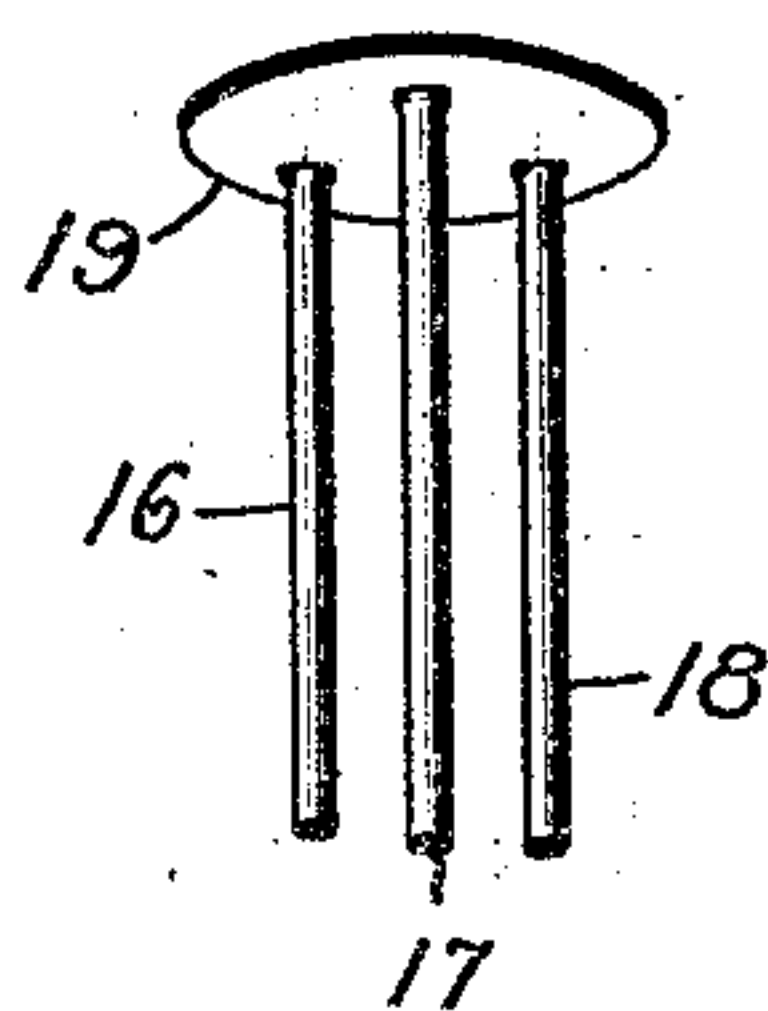
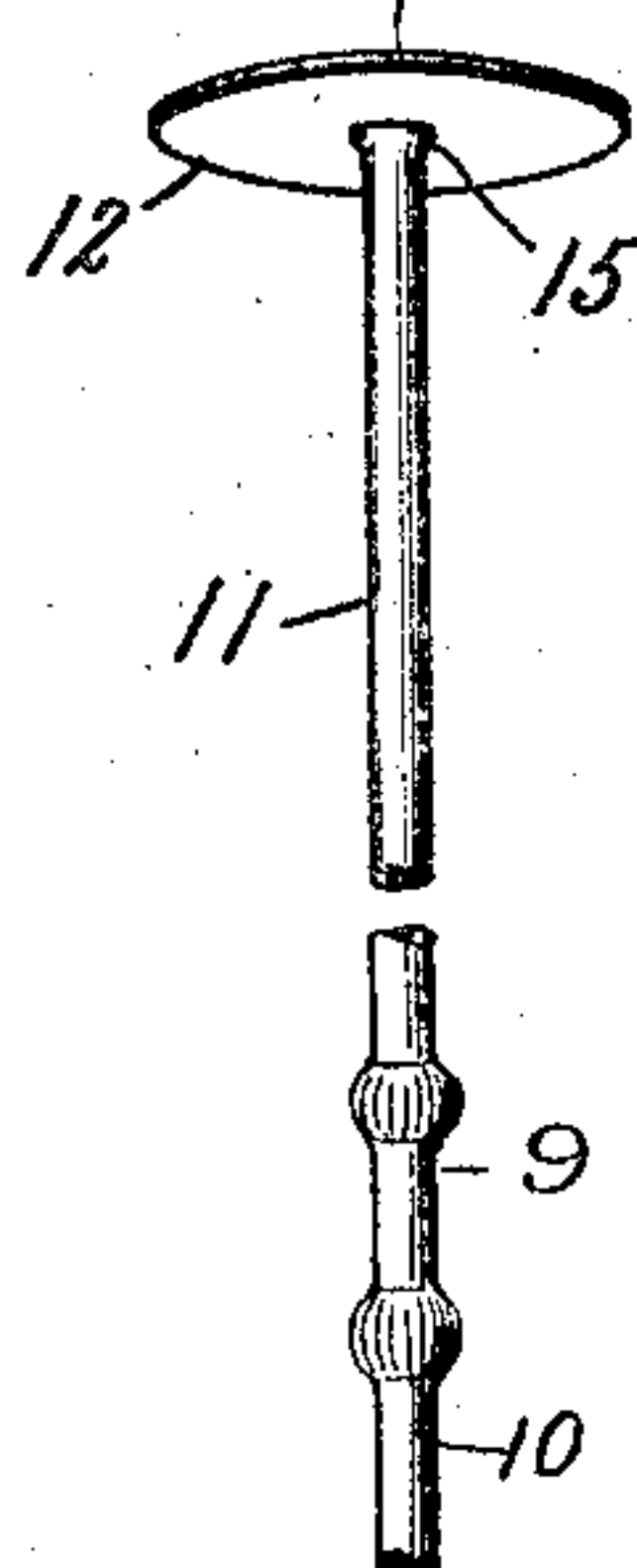


Fig. 3.



Witnesses:

*George H. Tilden*  
*Helen Orford*

Inventor:

William R. Burrows.

by *Alvin H. Dean*  
Att'y



# UNITED STATES PATENT OFFICE.

WILLIAM R. BURROWS, OF NEWARK, NEW JERSEY, ASSIGNOR TO  
GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

## VAPOR ELECTRIC APPARATUS.

No. 820,348.

Specification of Letters Patent.

Patented May 8, 1906.

Application filed March 10, 1905. Serial No. 249,340.

*To all whom it may concern:*

Be it known that I, WILLIAM R. BURROWS, a citizen of the United States, residing at Newark, county of Essex, State of New Jersey, have invented certain new and useful Improvements in Vapor Electric Apparatus, of which the following is a specification.

This invention relates particularly to vapor electric apparatus of that type in which current is conducted through an evacuated chamber rendered conductive by vapor from a mercury electrode.

In such apparatus as heretofore constructed it has been customary to conduct the current to or from the mercury electrode by means of a platinum wire hermetically sealed through the glass wall of the evacuated chamber. Platinum is used for this purpose as its coefficient of expansion is substantially the same as that of glass, so that the apparatus may undergo considerable changes in temperature without destruction of the seal. I have found that such seals are subject to deterioration because of the amalgamation of the platinum wire, and I have also found that unless this platinum wire projects a considerable distance into the mercury there is liability of heating at the surface of contact of platinum and mercury. Another source of danger to such tubes arises from the fact that when the tube is suddenly inverted, as may occur during transportation or manufacture, the rush of mercury from one end of the tube to the other is liable to strike the wall of the fragile vessel with such force as to fracture it. To overcome all these difficulties, I have devised the improved form of leading-in conductor described more particularly in the following description, taken in connection with the accompanying drawings.

Figure 1 is an elevation of a mercury lamp or rectifier provided with my improved form of leading-in conductor. Fig. 2 is a detail view showing one modification of the leading-in conductor adapted for lamps carrying high currents, and Fig. 3 is an enlarged view of the leading-in conductor shown in Fig. 1.

The evacuated chamber 1, of glass or other suitable material, is provided with two anodes 2 and 3 of carbon and a mercury cathode 4 contained in the tubular extension 5 of the evacuated chamber. An auxiliary electrode 6 is provided for the purpose of starting or exciting the tube in the manner well known

to persons skilled in the art and in its mechanical details is essentially the same as the large electrode 4.

To seal up the lower end of tube 5, I turn the glass walls back to form a conical projection 7, through the center of which passes the leading-in conductor. This conductor is made up of three parts welded together end to end. The center part 9 is of platinum and is completely embedded in the glass wall of the tube, and thereby protected from amalgamation. The upper part 11 of the leading-in conductor is of iron and is of considerable length and cross-section to increase the area of contact between the solid conductor and the liquid conductor. The lower part 10 may be of copper or other suitable material. A cylindrical disk 12, of iron, is riveted or otherwise secured to the top of the iron conductor 11 and is of such diameter that a small annular space is left between the outer edge of the disk and the inner surface of the glass tube 5. This disk is located a considerable distance below the surface of the mercury electrode and serves not only to increase the area of contact between the leading-in conductor and the mercury cathode, but also serves as a baffle-plate to constrict the passage-way into the tubular extension 5, and thus prevent the sudden rush of mercury into or out of this extension in case the apparatus is suddenly inverted.

By the construction above described amalgamation and overheating of the leading-in conductor are prevented, and at the same time the apparatus is protected from the shock of moving mercury. The lower end of the tubular projection 5 may be embedded in a mold of plaster-of-paris 13, contained in a copper cup 14, to which the copper wire 10 is soldered or otherwise secured.

Fig. 3 shows in detail the baffle-plate 12, connected to the top of the conductor 11. Although this disk may be attached to the conductor in any convenient manner, I prefer to make a slight projection or enlargement near the end of conductor 11 and to slip the disk on over the end of the conductor and rivet down the end, so that the disk is held firmly in place.

The modification shown in Fig. 2 is especially adapted for use in a lamp or rectifier carrying heavy current, as the plurality of leading-in conductors 16, 17, and 18 gives a



large contact area between the solid and the liquid conductors and at the same time insures a suitable support for the iron disk 19.

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

1. A frangible vessel having a leading-in conductor, said conductor consisting in part of platinum embedded in the wall of said vessel, said conductor having another part consisting of non-amalgamating metal, and a body of mercury surrounding said last-named part and contacting therewith.

2. A frangible vessel containing mercury, and a leading-in conductor comprising two parts, one of said parts being of non-amalgamating metal and contacting with said mercury, the second part being of material subject to amalgamation and completely embedded in the wall of the frangible vessel.

3. A fragile vessel having a leading-in conductor, said conductor consisting in part of platinum embedded in the wall of said vessel, and having another part consisting of iron surmounted by an iron disk, and a body of mercury surrounding said disk and contacting therewith.

4. A fragile vessel having a leading-in conductor, said conductor consisting in part of a metal whose coefficient of heat expansion is substantially equal to that of the wall of said vessel in which it is embedded, said conductor having another part consisting of a non-

amalgamating metal surmounted by a metal disk, and a body of mercury surrounding said disk and in contact therewith and also in contact with said non-amalgamating metal.

5. A vapor electric apparatus having an evacuated chamber of fragile material, a mercury electrode therein, a plurality of leading-in conductors making electrical contact with said mercury, and a metal disk mounted on said conductors and rigidly supported thereby, said disk and the inner wall of said chamber forming a restricted passage-way to retard the flow of said mercury from its normal position.

6. A vapor electric apparatus having an evacuated chamber, a mercury electrode therein, a plurality of leading-in conductors having extensions of non-amalgamating metal immersed in said mercury electrode and making electrical contact therewith, and an iron disk rigidly secured to said leading-in conductors, said disk and the inner wall of said chamber forming a restricted passage-way to retard the flow of said mercury from its normal position.

In witness whereof I have hereunto set my hand this 8th day of March, 1905.

WILLIAM R. BURROWS.

Witnesses:

CHAS. H. HEELEY,  
S. N. WHITEHEAD.