

Feb. 14, 1933.

M. PIRANI

1,897,497

GASEOUS ELECTRIC DISCHARGE DEVICE

Filed Aug. 5, 1931

Fig. 1

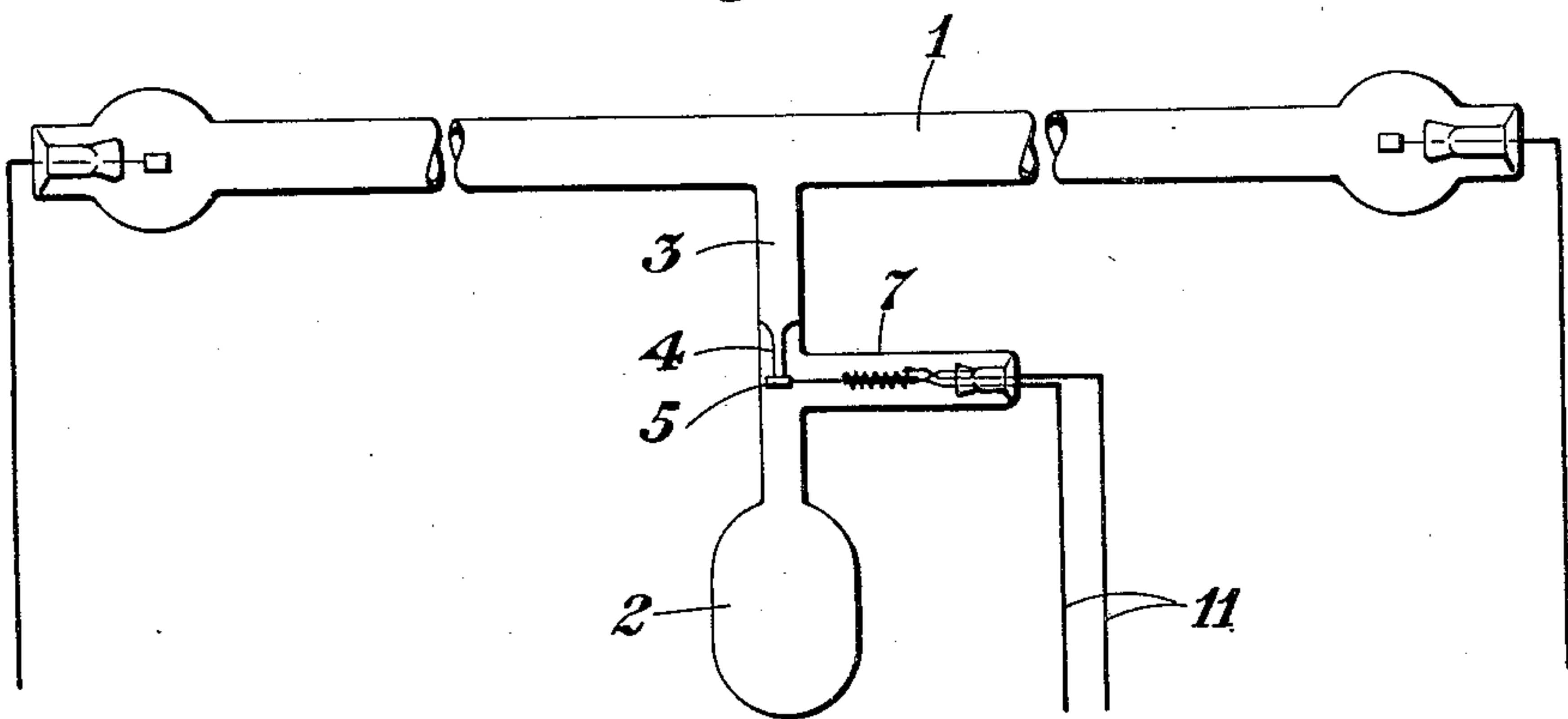


Fig. 2

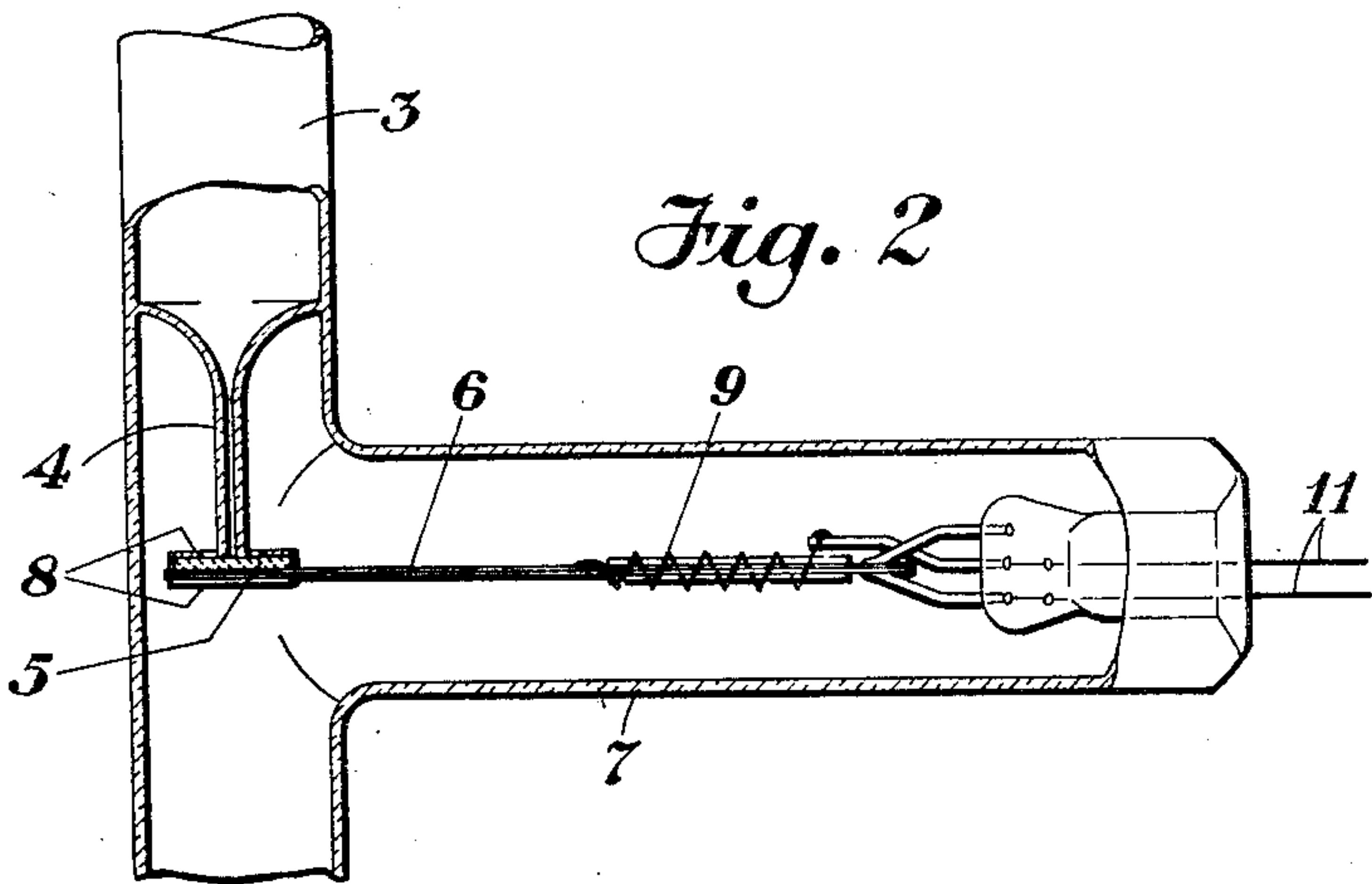
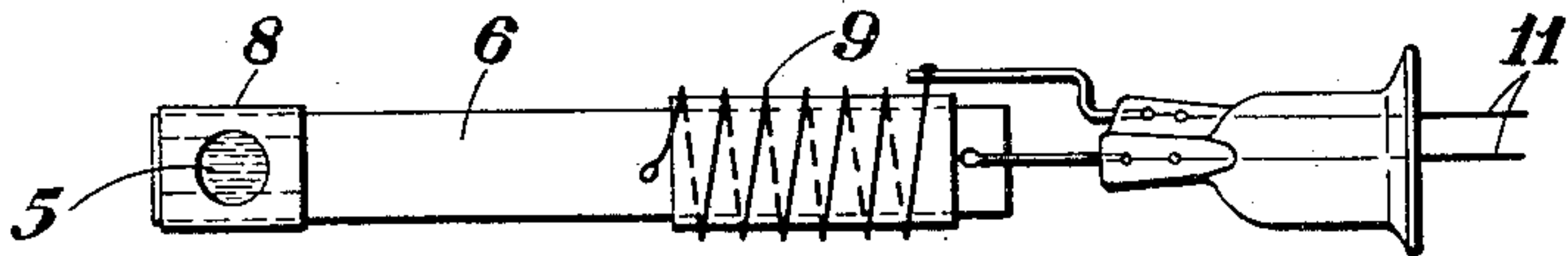


Fig. 3



INVENTOR
Marcello Pirani
BY Charles E. Tullar.
ATTORNEY

UNITED STATES PATENT OFFICE

MARCELLO PIRANI, OF BERLIN-WILMERSDORF, GERMANY, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK

GASEOUS ELECTRIC DISCHARGE DEVICE

Application filed August 5, 1931, Serial No. 555,288, and in Germany September 12, 1930.

The present invention relates to gaseous electric discharge devices generally and more particularly the invention relates to means for feeding gas replenishments to such devices and is an improvement on my copending application Serial Number 381,036, filed July 25, 1929, being the invention of Marcello Pirani and Kurt Nitschke.

It is well known in the art that common gas present in the gaseous filling of gaseous electric discharge devices has a tendency to "clean up" during the operation of the device with disastrous effects to the operating characteristics thereof. It is as equally well known in the art that the means used for feeding gas replenishments to the gaseous filling of the electric discharge device must be accurate so that the gas replenishments fed thereto closely approximate the amount needed to maintain the gas pressure substantially constant. The object of the present invention is to provide a simple, positive acting, accurate and sensitive gas feeding means for feeding gas replenishments to the gaseous atmosphere of a gaseous electric discharge device. A further object of the invention is to provide such a gas feeding means which is especially useful in connection with gaseous electric discharge devices having a high vacuum in the discharge container thereof. Still further objects and advantages attaching to the device and to its use and operation will be apparent to those skilled in the art from an inspection of the accompanying drawing and from the following detailed description.

In accordance with this object the invention comprises a narrow throat provided between the container of the gaseous electric discharge device and a gas reservoir chamber fused to said container. A valve is provided to close the mouth of said throat, said valve consists of a stopper element to hermetically close the mouth of said throat, a bimetallic strip which bends when heated, and a means to heat said strip. The heating means and the stopper element are attached to opposite ends of said bimetallic strip. Said heating means is cut into and out of the current supply circuit of the electric discharge device auto-

matically, or manually, as desired, to feed gas replenishments to the gaseous electric discharge device when needed.

In the drawing accompanying and forming part of this specification an embodiment of the invention is shown in which,

Fig. 1 is a side elevational view of a complete electric discharge device, made in accordance with the present invention.

Fig. 2 is an enlarged view of the valve partly in section, and

Fig. 3 is an enlarged top view of the valve showing the construction thereof in detail.

Like numbers denote like parts in all the figures.

Referring to the drawing the gaseous electric discharge device consists of a discharge container 1 having suitable electrodes sealed therein. A gas reservoir chamber 2 is fused to said container 1 by tube 3. A capillary tube 4 is fused into said tube 3, the mouth of said capillary tube 4 being closed by stopper element 8—5 attached to bimetallic strip 6 as shown in Fig. 2. Said strip 6 is arranged in side tube 7 of said tube 3 and is provided with heater element 9 at the end thereof opposite that to which stopper element 8—5 is attached. Element 8—5 consists of two parts, part 5, which hermetically closes the mouth of tube 4 and which is of elastic material such as gum, parafined leather, cork, or like material impervious to the gas used, and a metal container 8 which holds part 5 on bimetallic strip 6.

Said heater 9, if desired, is cut into and out of the current circuit of the tube 1 by connecting leads 11 thereof to a means, such as a magnetic switch, controlled by current flowing in said tube 1 similar to that disclosed in my co-pending application referred to hereinbefore, so that the movements of bimetallic strip 6 and therewith the stopper element 8—5 are controlled by variations in current flowing in said tube circuit caused by changes in gas pressure in said tube 1. When heater 9 is cut into the circuit, due to a loss of gas pressure, bimetallic strip 6 is caused to bend slightly to move part 5 from the mouth of capillary tube 4 and gas seeps over into container 1 from reserve chamber 2 to

restore normal conditions of gas pressure to the gaseous electric discharge device. As soon as normal conditions of gas pressure have been restored in tube 1 heater 9 is again cut out of the current circuit of tube 1 so that strip 6 resumes its normal position in which position element 5 covers and hermetically closes the mouth of tube 4.

I have found that a very simple method of making the capillary tube 4 to provide a gas passage of predetermined diameter is by thrusting a metal wire of the desired diameter into a glass tube, said wire having a greater coefficient of expansion than that of the glass, heating said wire and said glass tube to the softening temperature of the glass so that the inner walls of the glass tube come into contact with the walls of the metal wire, and allowing said wire and said glass to cool slowly. As the metal wire has a greater coefficient of expansion than the glass tube said wire frees itself from the walls of said glass tube during the cooling process and may be removed therefrom at a suitable time leaving a gas passage of predetermined diameter.

While I have shown a particular embodiment of my invention it will be understood of course that such illustration is primarily for purposes of disclosure and that numerous substitutions, modifications and changes in the form and details of the device and in its use and operation may be made by those skilled in the art without departure from the broad spirit and scope of the invention, for example, a plate of a material pervious to the gas may be used in place of capillary gas tube 4.

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

1. A valve for feeding gas replenishments to the gaseous atmosphere of a gaseous electric discharge device comprising an element pervious to said gas, an element impervious to said gas and adapted to close said pervious element, a metal element carrying said gas impervious element and adapted to move when heated, and means to heat said metal element.

2. A valve for feeding gas replenishments to the gaseous atmosphere of a gaseous electric discharge device comprising a gas passage, means to hermetically close said gas passage, a bimetallic strip carrying said means and adapted to bend when heated, and means to heat said bimetallic strip.

3. In combination an electric discharge device comprising a container, electrodes sealed therein, a gaseous atmosphere therein, a gas reservoir therefor and means comprising a gas passage, an hermetic stopper for said passage, a bimetallic strip carrying said stopper and adapted to bend when heated, and means controlled by current flowing in said device to heat said strip to control the flow of gas

replenishment to said container from said reservoir.

In witness whereof, I have hereunto set my hand this 22nd day of July, 1931.

MARCELLO PIRANI. 70

75

80

85

90

95

100

105

110

115

120

125

130