E. WEINTRAUB.

LIGHTNING ARRESTER.

APPLICATION FILED SEPT. 5, 1911.

1,011,538.

Patented Dec. 12, 1911.

2 SHEETS—SHEET 1.

Fig. 2.

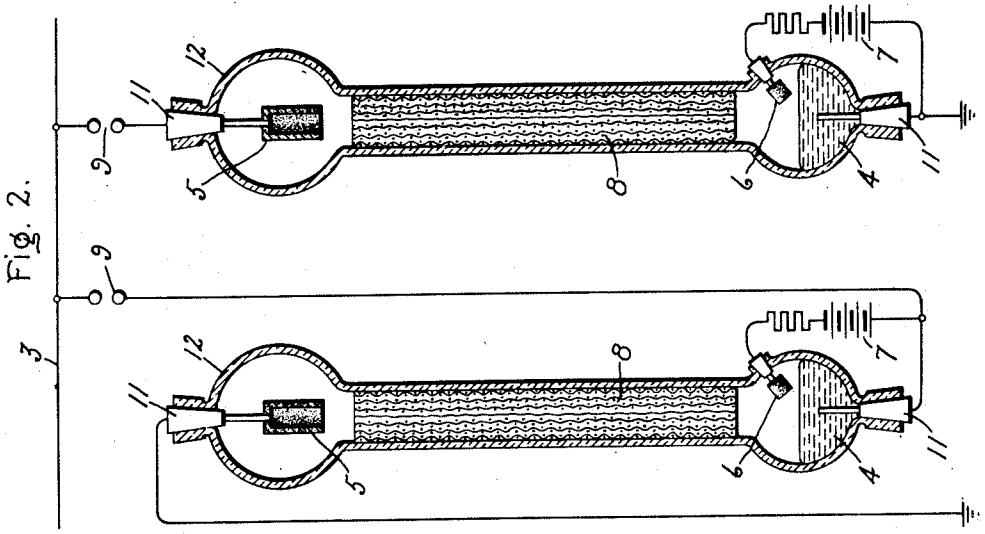
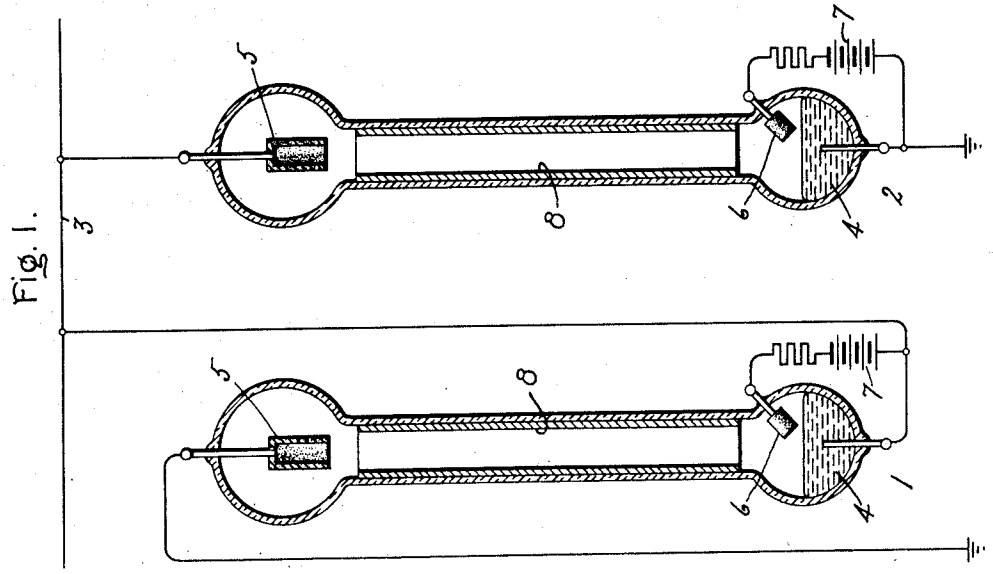


Fig. 1.



Witnesses:
Earl G. Klock.
J. Ellis Glen

Inventor:
Ezechiel Weintraub,
by Albert G. Davis
His Attorney.

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2 SHEETS—SHEET 2.

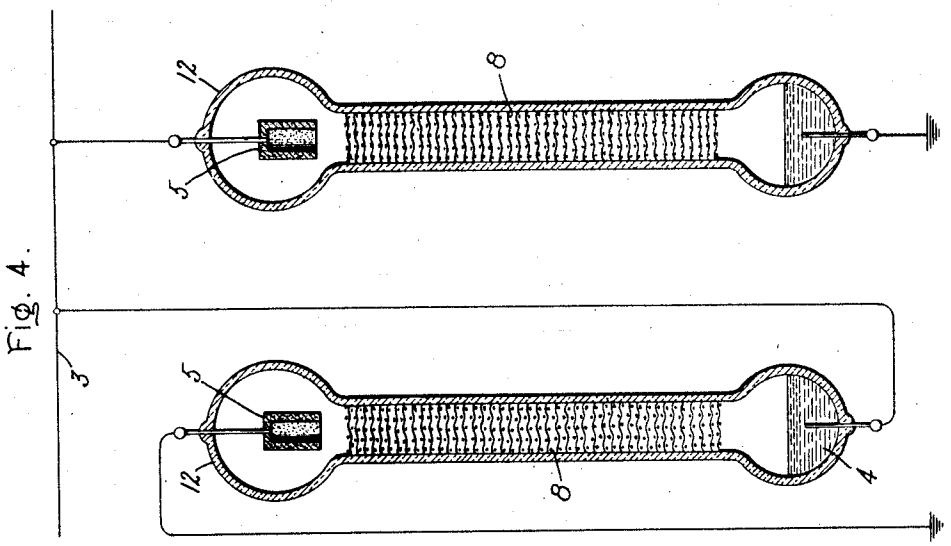

Fig. 4.

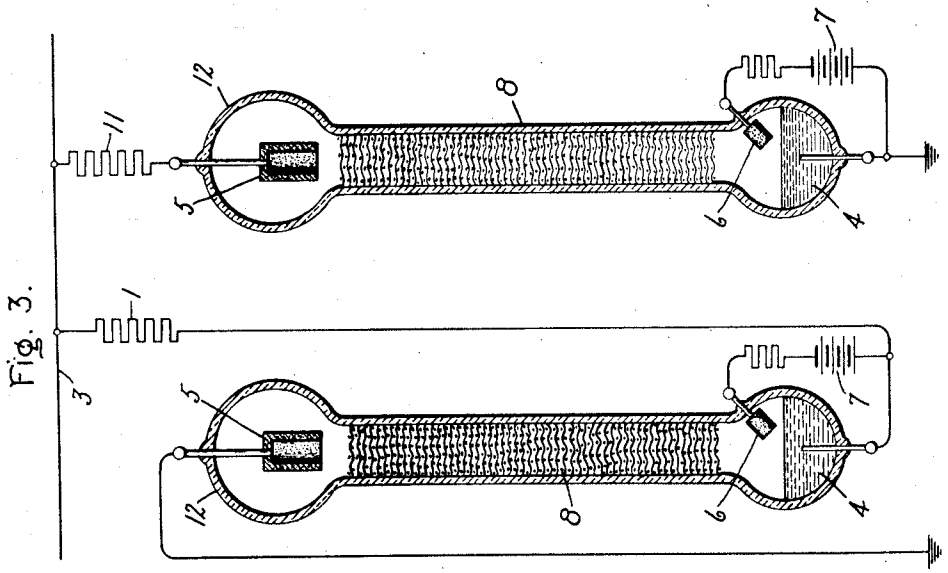

Fig. 3.

Witnesses:
Green Orfond
J. Weichelt

Inventor:
Ezechiel Weintraub
by Albert G. Davis
His Attorney.

UNITED STATES PATENT OFFICE.

EZECHIEL WEINTRAUB, OF LYNN, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

LIGHTNING-ARRESTER.

1,011,538. Specification of Letters Patent. Patented Dec. 12, 1911.

Application filed September 5, 1911. Serial No. 647,575.

To all whom it may concern:

Be it known that I, EZECHIEL WEINTRAUB, a citizen of the United States, residing at Lynn, in the county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Lightning-Arresters, of which the following is a specification.

My invention relates to protective apparatus for electrical circuits and devices. This class of devices is commonly designated as lightning arresters, although their function is not limited to the safe dissipation of lightning strokes but also to the discharge of all over-voltage disturbances. Lightning arresters in this sense of the term act as a sort of electrical safety valve to discharge to ground, or dissipate in any other way, all high potential disturbances without allowing the line current to follow the high potential discharge.

My invention comprises a lightning arrester consisting of a special form of vapor electric device which is sensitive to over-voltage disturbances and furnishes a low resistance discharge path therefor, but imposes a prohibitively high resistance to the passage of current of normal voltage. The vapor device is provided with conductive deionizing bodies in the path of the arc. These bodies have the effect of preventing the formation of and interrupting an arc unless its voltage is very high,—the voltage necessary to overcome the deionizing effect and to maintain the arc varying with the conductivity and size of the deionizing body.

In the accompanying drawings, Figure 1 shows one form of vapor electric device having a glass envelop connected to a transmission line; Fig. 2, shows a modified form of electric device having a quartz envelop and connected to a transmission line through a spark gap; Fig. 3 shows a vapor electric device connected to a transmission line through a resistance; and Fig. 4 illustrates a modification in which the ionizing side branch arc is absent.

As shown in Fig. 1, the mercury vapor devices 1 and 2 are connected between the transmission line 3 and ground, as indicated, by the cathode 4 and the anode 5 respectively. The electrodes are connected to the conductors by means of stout platinum wire sealed in the glass wall, as usual. The anodes consist of some suitable refractory material, such as graphite; the cathodes consist of mercury, or similar vaporizable material. In each of the devices a supplemental anode 6 is provided which maintains a side branch arc supplied with current from a storage battery 7, or any other convenient source. This side branch arc, as usual, ionizes, or maintains conductive, the space between the cathode and anode, so that, when potential is impressed on the main anode, an arc can be formed.

I have found that a conductive body in the arc path exerts a deionizing, or so to speak, arc-rupturing influence. In other words, it counteracts the tendency of the side branch to start an arc, and tends to disrupt an arc which has been started by a high voltage when the voltage has been reduced. Therefore, to prevent the line current from either starting or maintaining an arc under ordinary conditions in the vapor device and to prevent it from maintaining an arc which a surge or lightning discharge has started, a conductive body 8 is provided in both of the arcs between the anode and cathode. The voltage value necessary to overcome the deionizing effect of this member depends upon the conditions,—chiefly, of course, upon the proportions of the deionizing body. This deionizing body may consist of the metallic tube as indicated in Fig. 1, or a roll of metallic gauze as shown in Fig. 2, or of disks of metallic gauze as shown in Fig. 3. Various other modifications will readily suggest themselves.

It will be seen that, when the lightning stroke, high voltage surge, or other abnormal phenomena, produces a dangerously high voltage in the transmission line 3, an arc will form either through the device 1 or 2 to ground, depending upon the polarity of the high voltage disturbance which thus will be discharged. When the arc is once started, the line can readily discharge to earth as the resistance of the mercury arc is very low. An oscillatory discharge takes place through the two mercury arc tubes gradually diminishing in amount. As soon as the voltage falls to a safe value, the arc will be extinguished by the presence of the deionizing body 8.

In the modification of my device illustrated by Fig. 4, the exciting side branch arc is absent. In this case, a small amount of gas, such as hydrogen, is left in the tube,

its pressure being in the neighborhood of, and preferably less than 0.1 mm. This gas will lower the resistance of the tube so as to allow an over-voltage disturbance to start an arc and thus be discharged. In other respects the construction of the arrester is similar to those already described.

If desired, the arc extinguishing effect of the arrester may be still further increased by placing a spark gap between the line and ground in series with the vapor electric device, as is indicated at 9 in Fig. 2, or, by placing a resistance in circuit with the device, as indicated at 10 in Fig. 3. In any event, the length and shape of the deionizing body, the length of the spark gap, or the value of the resistance, are so adjusted that an arc may be formed and maintained at a predetermined over-voltage and not at normal voltage.

In order to increase the current carrying capacity of the vapor electric device, the envelop may to advantage be made of material more refractory than glass, such as quartz. In this event, the leading-in conductors should consist of a material having substantially zero coefficient of expansion. Fig. 2 shows a device in which plugs 11 of nickel steel make a ground tapered joint in the quartz envelop 12. The construction and the arrangement of parts shown in this figure are otherwise similar to that already described in Fig. 1.

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

1. The combination of a device to be protected, a discharge apparatus comprising an evacuated envelop, electrodes therein one of which consists of vaporizable material, means for maintaining said apparatus in a condition conductive to current of a voltage greater than a predetermined value, and means for rupturing an arc when the voltage falls below this value.

2. The combination of a line, or other device to be protected, a lightning arrester comprising an evacuated envelop, electrodes therein one of which consists of mercury, and conductive material in the arc path between said electrodes.

3. The combination of a device to be protected, a lightning arrester comprising an evacuated envelop having a constricted portion, main electrodes disposed near opposite ends of said constricted portion one of said electrodes consisting of vaporizable material, and a metallic body in the arc path between the main electrodes.

4. In combination with a line or device to be protected from high potential disturbances, vapor electric devices in discharging relation thereto, a discharge connection for said devices, and a conductive deionizing body in the path of the arc in said devices.

5. In combination with a line or other device to be protected from high potential disturbances, vapor electric devices one of which has its anode connected to said line and another a cathode connected thereto, an earth connection for the coacting electrodes, and metallic material in the path between said electrodes.

6. In combination with a line or other device to be protected from high potential disturbances, a vapor electric device, an earth connection for said device, means for generating conductive vapor in said device, and a conductive deionizing body in said device.

7. The combination of a device to be protected from high potential disturbances, a vapor electric device in current-discharging relation thereto, and a conductive, deionizing body in the arc path of said device.

In witness whereof, I have hereunto set my hand this first day of September, 1911.

EZECHIEL WEINTRAUB.

Witnesses:
JOHN A. McMANUS, Jr.,
FRANK G. HATTIE.