E. E. F. CREIGHTON.

LIQUID ELECTRODE ARRESTER.

APPLICATION FILED JULY 9, 1907. RENEWED JUNE 7, 1911.

1,004,532. Patented Sept. 26, 1911.

Fig. 1.

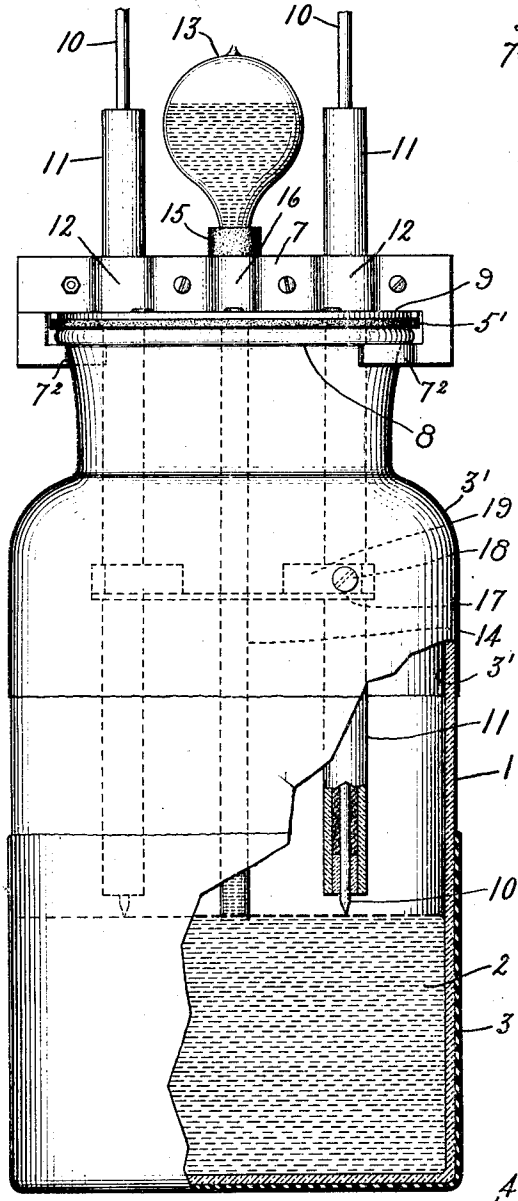
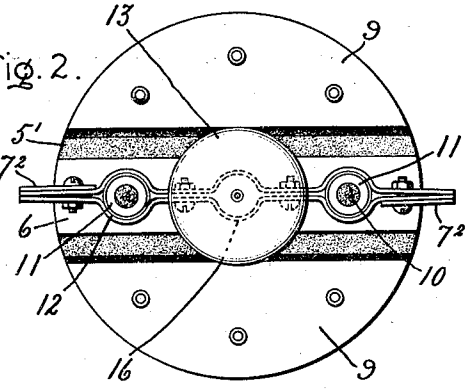


Fig. 2.



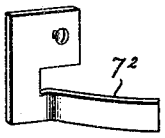


Fig. 5.

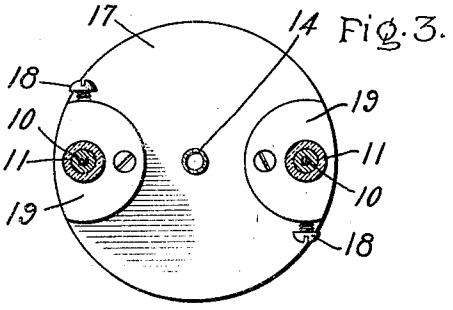
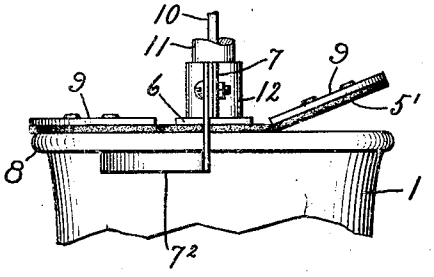


Fig. 3.

Fig. 4.



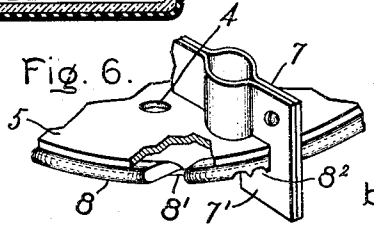


Fig. 6.

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UNITED STATES PATENT OFFICE.

ELMER E. F. CREIGHTON, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

LIQUID-ELECTRODE ARRESTER.

1,004,532. Specification of Letters Patent. Patented Sept. 26, 1911.

Application filed July 9, 1907, Serial No. 382,859. Renewed June 7, 1911. Serial No. 631,853.

To all whom it may concern:

Be it known that I, ELMER E. F. CREIGHTON, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Liquid-Electrode Arresters, of which the following is a specification.

In a previous application, Serial No. 358,777, I have shown and described a lightning arrester consisting of a cell containing a liquid electrode and two solid electrodes.

The present invention relates to details of construction of such a device.

In the accompanying drawing, Figure 1 is a side elevation of a liquid electrode arrester embodying my improvements; Fig. 2 is a top plan view of the same; Fig. 3 is a section through electrodes 11 just above the blocks 19 on the baffle plate, and showing the latter in plan; Fig. 4 is a side elevation of the top of the jar showing one trap door open; Fig. 5 shows one of the hooks for holding the lid on the jar; and Fig. 6 illustrates a modified construction.

The jar 1 is of glass or other insulating material, and contains a volume of electrolyte 2, composed, for example, of an aqueous solution of potassium carbonate, or sodium carbonate, or ammonium chlorid, or copper sulfate, or copper chlorid. A coating 3 of insulating and liquid-proof material is applied to the bottom of the jar, and extends up its sides to a point a little above the level of the electrolyte. This coating is preferably composed of celluloid or an equivalent hydrocarbon compound put on in a melted condition. The upper portion of the jar is coated inside and out with paraffin 3′, or other hydrocarbon compound.

The mouth of the jar is closed by a lid or cover which is provided with a vent, the size and character of which depends upon the size of the jar and the relative volumes of electrolyte and air therein. The object of the vent is to afford an escape for the vapors generated at the instant an arc is formed by a discharge of high potential. If there is a comparatively large volume of air in the jar, the resulting pressure will be moderate, and a simple hole 4 formed in a flat metallic lid 5, as shown in Fig. 6, will be sufficient to relieve the pressure. On the other hand, if the air space is small, it will be necessary to use some such construction as I have shown in Figs. 1, 2 and 4. Here the lid 5′ is made of some flexible material, such as leather. It is stiffened by a plate 6 of rigid material, such as metal, extending across the center of the lid and supporting a clamping bar or yoke 7 composed preferably of two strips of sheet metal bolted together. At each end of the yoke is a hook, which may be integral therewith, as shown at 7′ in Fig. 6, or made separate and attached to the yoke as at 7^2 in Figs. 1, 2, 4 and 5. The latter hooks are sprung over the lip 8 on the mouth of the jar. The hooks 7′ are dropped down through slots 8′ in said lip 8, and the yoke is then given a partial rotation to carry the hooks under the lip. Suitable means are provided to prevent the yoke from being accidentally loosened; such as notches 8^2 formed in the under side of the lip 8 to engage with the edges of the hooks.

Those portions of the flexible lid 5′ which lie on each side of the stiffening plate 6 are reinforced or weighted by segmental plates 9 of rigid material. A space is left between the edges of the plates 6 and 9 so that the leather lid can bend along these lines and form hinges. The reinforced portions thus constitute flaps or trap doors, which will readily open upward to relieve pressure within the jar.

The metallic electrodes consist of copper wires 10, which are insulated preferably by glass or porcelain tubes 11. Between the wire and the tube there is preferably left a space which may be packed with insulating material like sulfur. The tubes pass through the lid or the lid and its central plate, and extend some distance above it. The strips which compose the yoke 7 are bowed outwardly at 12 to permit the tubes to pass between them and serve as clips to clamp and support the electrodes at the proper height above the electrolyte.

In order to maintain a constant level of the electrolytes, a reservoir 13 is provided, consisting of a closed bulb, preferably of glass, having a tubular stem or feeding tube 14 running down through a rubber bushing 15 clamped in a bowed-out portion 16 of the yoke 7. The feeding tube terminates at the normal level of the electrolyte. When the latter is lowered by evaporation air can enter the feeding tube and bulb until a sufficient quantity of water has fed down from

the reservoir to restore the normal level in the jar and seal the end of the feeding tube.

A baffle plate 17 is supported by the tubes 11, being adjustable at any height above the electrolyte by means of the set-screws 18, tapped into blocks 19 which are secured to the baffle plate and are bored for the passage of the tubes 11.

In case a high potential charge occurs on the line, it will jump the gap between one electrode and the electrolyte and second gap between the electrolyte and the other electrode. I find from experiment that the line current does not follow the high potential discharge unless the line voltage is higher than the critical limiting voltage of the cell, which varies somewhat with the electrolyte and is usually above 1500 volts. I attribute the current rupturing feature of the cell to the difficulty in producing or maintaining an arc from a metallic anode to a liquid cathode at a potential less than 1500 volts. At higher voltages an arc can be produced readily. But if the normal line voltage is above 1500 volts, two or more cells can be coupled up in series to obtain a breakdown voltage of any desired value. When a discharge takes place through a cell of this kind, some of the electrolyte is vaporized by the heat of the arc, and the resulting pressure in the jar is relieved by the vent-hole or by the automatic opening of the trap doors. The baffle plate intercepts any liquid which may be thrown up by the agitation of the electrolyte when the discharge occurs. Any loss of electrolyte by vaporization is made good by the supply of water which automatically feeds down from the reservoir. The external insulating coating on the jar is a safe-guard, both in reinforcing the insulation at this point, and in preventing the escape of the electrolyte in case the jar cracks. The paraffin coating prevents the leakage of arcs over crystals deposited on surfaces where they are liable to form by the drying of drops of electrolyte spattered upon the upper portions of the jar by a violent discharge.

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

1. A liquid electrode lightning arrester, comprising a liquid containing jar having a lid of flexible material, electrodes passing through said lid and a stiffening plate crossing the middle of said lid.

2. A liquid electrode lightning arrester, comprising a jar having a lid of flexible material, a stiffening plate crossing the middle of said lid, aluminium electrodes passing through said plate, and a yoke resting on said plate and clamping said electrodes.

3. The combination with a jar, of a lid of flexible material, a plate crossing said lid, electrodes passing through said plate, a reservoir having a feeding tube passing down through said plate, and a yoke composed of two strips of sheet metal lying on opposite sides of said electrodes and feeding-tube and serving as clips to clamp and support the same.

4. The combination with a jar, of a lid therefor, insulated electrodes passing through said lid, and a yoke clamping said electrodes and having hooks engaging with said jar.

5. A liquid electrode lightning arrester comprising a jar containing a volume of electrolyte and a volume of air, a lid for said jar, insulated electrodes supported thereby, and a coating of liquid-proof material covering the lower portion of said jar up to a point above the level of the electrolyte.

6. The combination with a jar, of a lid therefor, insulated electrodes passing through said lid, and a baffle plate supported by said electrodes and adjustable with respect to each of said electrodes.

7. In a liquid electrode cell, the combination of a jar filled in part with an electrolyte, a lid for said jar, electrodes passing through said lid, and a yoke extending across the lid and resting on the edges of the jar to be supported thereby, said yoke clamping the electrodes in position but permitting longitudinal adjustment thereof.

In witness whereof, I have hereunto set my hand this 3rd day of July, 1907.

ELMER E. F. CREIGHTON.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.