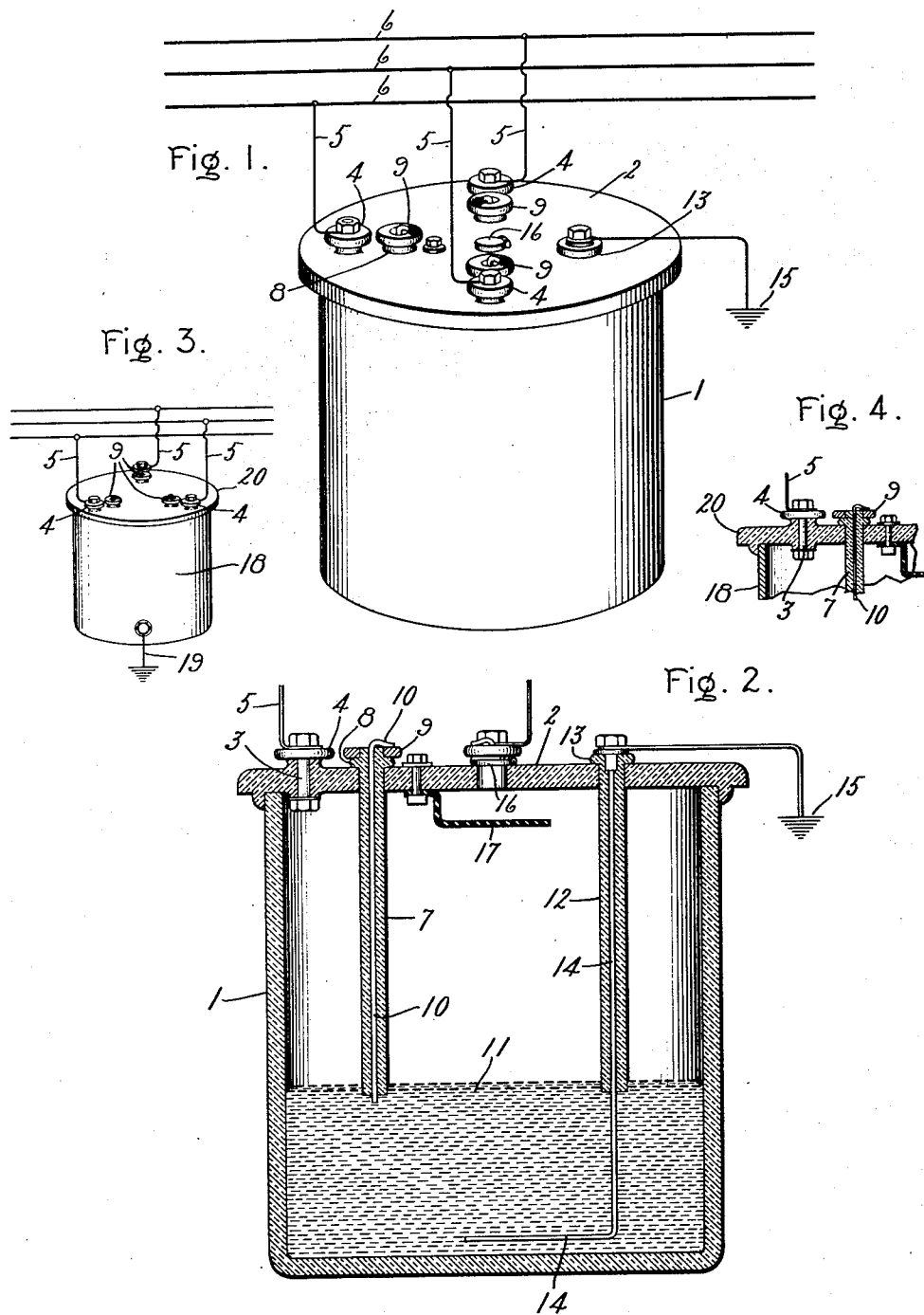


E. E. F. CREIGHTON.
LIQUID ELECTRODE LIGHTNING ARRESTER FOR MULTIPHASE LOW VOLTAGE CIRCUITS.
APPLICATION FILED SEPT. 2, 1908.

1,004,534.

Patented Sept. 26, 1911.



Witnesses:

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UNITED STATES PATENT OFFICE.

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LIQUID-ELECTRODE LIGHTNING-ARRESTER FOR MULTIPHASE LOW-VOLTAGE CIRCUITS.

1,004,534.

Specification of Letters Patent. Patented Sept. 26, 1911.

Application filed September 2, 1908. Serial No. 451,303.

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 Lightning-Arresters for Multiphase Low-Voltage Circuits, of which the following is a specification.

This invention relates to devices for protecting alternating current systems from the destructive effects of lightning, whether transitory or continual.

In a former application, Serial No. 358,777, I have disclosed a lightning arrester in which a copper electrode is placed close to or dipping below the surface of a liquid electrode, composed of a suitable electrolyte, whereby high frequency currents exceeding 1500 volts will be freely discharged, but all below that value will be held back.

The present invention has reference to this form of lightning arrester, and consists in a single cell adapted to take care of lightning discharges from a polyphase line. To this end the cell contains a plurality of anodes connected respectively to the several line conductors, the liquid cathode being grounded.

This arrester is designed for use on systems whose potential is below 1500 volts. There will be no leakage from line to line, or from line to ground through the ground connection under normal conditions due to the series gap. But if the potential on any one or more of the line conductors becomes dangerously high, owing to lightning of any kind, and exceeds the gap spark potential, the excess of potential will be at once relieved, establishing an arc from the anode connected with said conductor to the liquid electrode and thence to ground. By combining the three anodes in one cell, a compact and inexpensive device is produced.

In the accompanying drawing, Figure 1 is a perspective view of an arrester embodying my invention; Fig. 2 is a diametrical section thereof; Fig. 3 shows a modification; and Fig. 4 is a section of a portion of Fig. 3.

Referring first to Figs. 1 and 2. The cell comprises a jar 1 of glass or other insulating material, having a cover 2 of like material. Binding posts are mounted on the cover, such as the screw-bolts 3 extending through

holes in said cover. Under the head of the bolt is an annular disk or washer 4 of metal, and the lead 5 from the line conductor 6 is clamped upon said washer by the head of the bolt. Adjacent to each binding post is a hole in the cover through which passes a tube 7 of glass, porcelain or other refractory insulating material. A flange 8 on said tube supports it in said hole, and above said flange is placed a washer 9 of metal arranged with its edge at a suitable distance from the washer 4 to form a spark-gap. A copper wire 10 is run through the tube 7 and its upper end is soldered to the washer 9. The lower end of said wire is close to or dips below the surface of a volume of electrolyte 11 which partially fills the jar. The tube extends preferably nearly to the end of the wire. A tube 12 is suspended in the jar by its flange 13, and serves to protect a wire 14 which extends down into the electrolyte and has a considerable surface exposed thereto. The upper end of the wire 14 is grounded at 15. The cover has a vent hole provided with a guard 17 on the under side of the cover a little below the vent, to prevent the electrolyte from being thrown out of the vent during the active periods of the arrester.

In Fig. 3 the grounded wire 14 is omitted, and the jar 18 itself constitutes the ground connection, being in this instance made of metal, such as cast iron, and having, if desired, a grounded wire 19 attached to it. The cover 20 is made of glass or porcelain to facilitate the insulation of the spark-gap washers 4 9 and the anodes 10. When this cell is connected to a system having a potential of less than 1500 volts abnormally high potentials are discharged freely on account of the limiting potentials of the spark-gap and of the arc at the liquid surface, but the following low voltage dynamic current is quickly shut off by the failure of the arc to persist at the surface of the electrolyte.

This arrester is simple and compact and takes the place of three or more single-anode cells when a multiphase system is to be protected.

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

1. A liquid electrode lightning arrester for low voltage multiphase systems comprising a jar containing a volume of electrolyte, a plurality of anodes in operative relation

- to said electrolyte and proportioned to cause the current density at voltages below the critical limiting voltage of a true liquid electrode arrester to develop an arc which materially increases resistance to current flow, electrodes spaced apart to form a spark gap connected respectively with each anode and each line conductor of said system, and a ground connection for said electrolyte.
2. The combination with a jar having a cover of insulating material and containing a volume of electrolyte, of a plurality of tubes of insulating material depending from said cover, metallic anodes extending through said tubes and dipping into the electrolyte, said anodes being proportioned to cause the current density at voltages below the critical limiting voltage of a true liquid electrode arrester to develop an arc which materially increases resistance to current flow, electrodes spaced apart to form in series with each anode a spark gap which breaks down at potentials which will cause sufficient current to develop the arc to the electrolyte, and means for grounding said electrolyte.
3. The combination with a jar having a cover of insulating material and containing an electrolyte, of binding posts on said

cover, metallic washers connected with said posts, tubes of insulating material depending through said cover, metallic washers on the upper end of said tubes in spark-gap relation to said other washers, and metallic anodes in said tubes connected with the washers thereon and coöperating with said electrolyte to develop from the anode to the electrolyte upon breakdown of the spark gap an arc which increases the resistance to current flow.

4. The combination with a grounded metallic jar, of a cover of insulating material, a plurality of metallic anodes suspended from said cover, spark-gap electrodes for each anode, and a liquid cathode in said jar in operative relation to said anodes the immersed surface of said anodes being such that upon breakdown of said spark gap the current density develops between the anode and the liquid cathode an arc which materially increases the resistance to current flow.

In witness whereof, I have hereunto set my hand this 31st day of August, 1908.

ELMER E. F. CREIGHTON.

Witnesses:

BENJAMIN B. HULL,
MARGARET E. WOOLLEY.