No. 890,679. PATENTED JUNE 16, 1908.

E. B. MERRIAM.

LIGHTNING ARRESTER.

APPLICATION FILED NOV. 8, 1906.

Fig. 1.

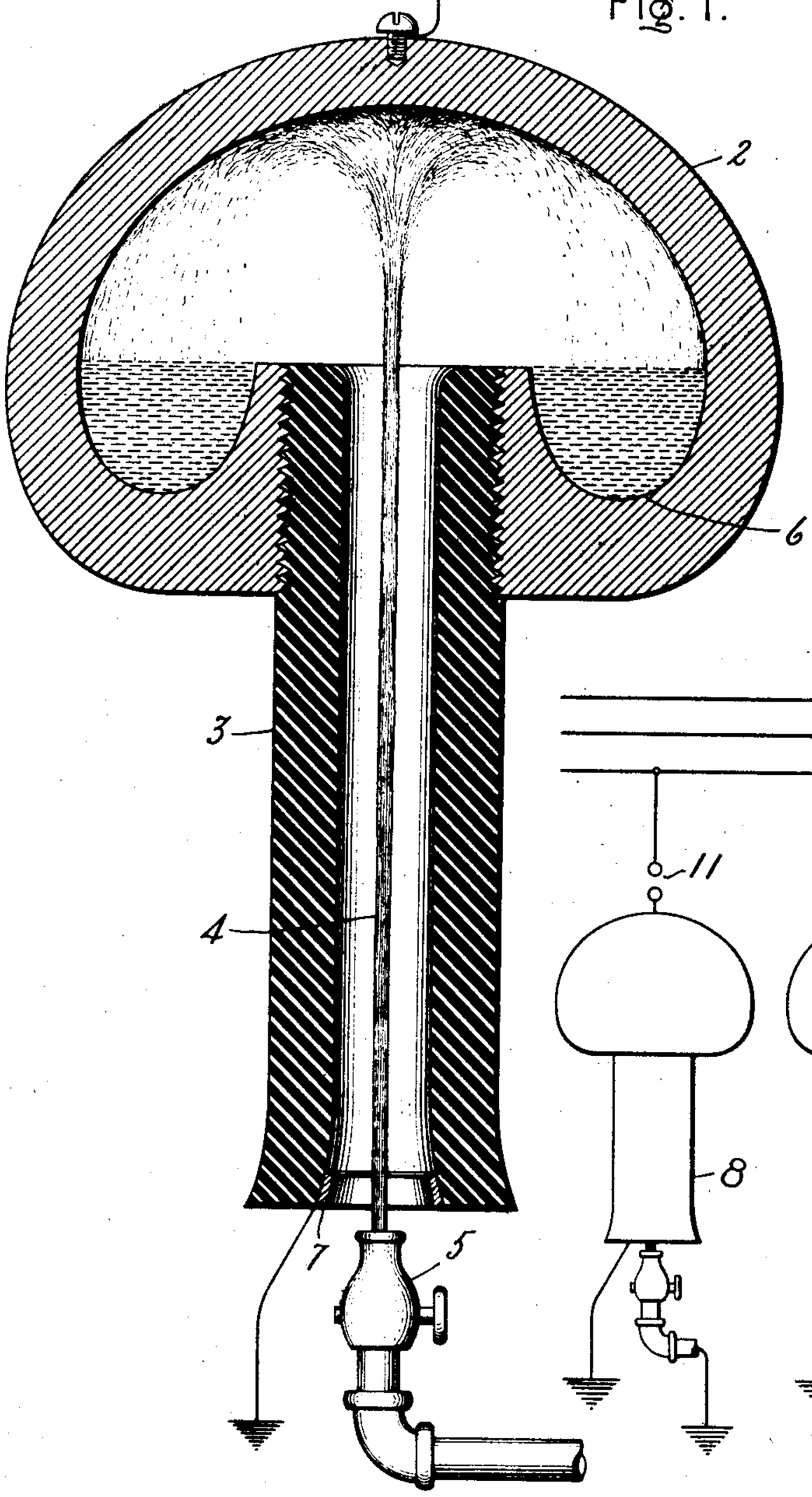
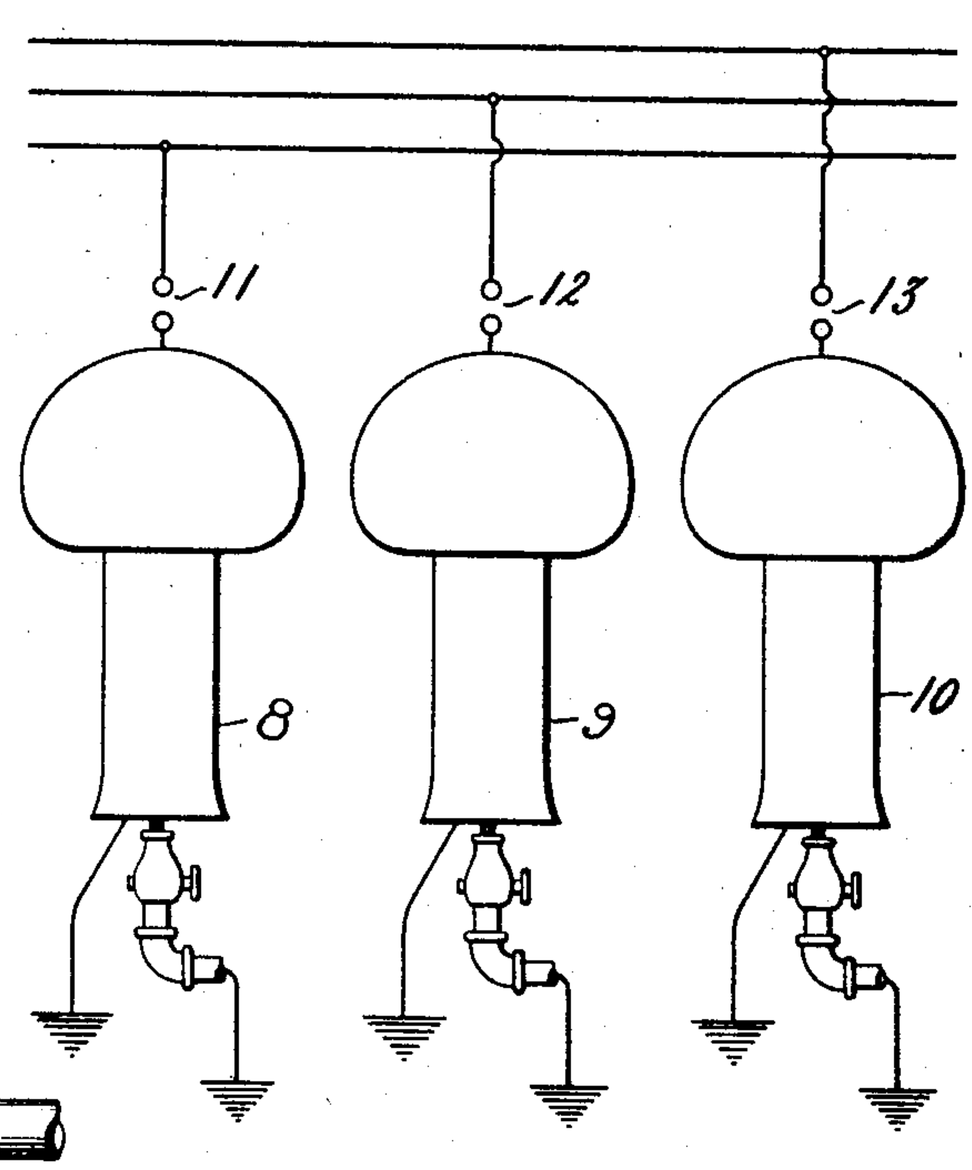


Fig. 2.



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UNITED STATES PATENT OFFICE.

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LIGHTNING-ARRESTER.

No. 890,679. Specification of Letters Patent. Patented June 16, 1908.

Application filed November 8, 1906. Serial No. 342,463.

To all whom it may concern:

Be it known that I, EZRA B. MERRIAM, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Lightning-Arresters, of which the following is a specification.

This invention relates to improvements in protective means for electrical systems and apparatus subject to high potential strains arising from resonance, static or other phenomena developed in the system itself, or from lightning or other atmospheric disturbances transmitted thereto.

My invention is embodied in an apparatus in which a water jet discharges into a confined space in such a way that when a heavy electric discharge passes through the apparatus the conducting stream or sheet of water will be converted into steam and generate a high pressure within the confined space and thereby develop a high velocity blast in a direction to extinguish any arc which may form across the space initially bridged by the flowing water.

The apparatus hereinafter described can operate to continuously remove from the line to be protected any static or high potential charge which may be developed therein as by friction of the wind on the wires or by other well known causes, but in addition to this function the apparatus is designed to take care of heavy or disruptive charges which may arise from the direct or inductive action of lightning.

The details in my invention will be better understood by reference to the accompanying drawing forming a part of this specification, in which

Figure 1 is a sectional elevation of my improved protective device; and Fig. 2 is a diagrammatic representation of one arrangement for the protection of a three-phase circuit.

In Fig. 1 the line conductor 1 to be protected is connected directly to a metal shell 2 of copper having a screw threaded opening in its bottom within which fits a non-conducting tube 3 of vulcanized rubber or other strong resistant material. A jet of water or other liquid 4 is directed upward from the nozzle 5 in such a way that it passes centrally through the opening in the tube 3 and impinges against the top of the cavity within the metal shell 2 and is there deflected downward into the annular trough 6 disposed within that shell. From this trough the water overflows through tube 3 and discharges from the end of the tube. The water jet 4 is of relatively high velocity and small cross-section but may be varied in size through a considerable range without departing from the spirit of my invention. The nozzle 5 is connected to ground and the water column 4 presents a high resistance path to ground for any static charge which may accumulate on the line conductor 1. In fact, when the apparatus is disposed as shown in Fig. 1 there may be a continuous leakage of line current to ground by way of water jet 4 and also by the thin film or sheet of water discharged through tube 3, but as these paths are of high resistance the loss of energy therethrough may be very small and unobjectionable.

When a heavy charge is induced on the line conductor 1, as in case of lightning, the discharge will pass to earth through the water traversing the constricted chamber of tube 3 and in so doing will vaporize the water and develop a high vapor pressure within the shell 2, this action being in the nature of an explosion or high velocity blast to drive the arc downward through tube 3 and thereby rupture the arc. I find that the circuit opens at the zero point of the current wave and consequently does not produce oscillations on the line as might be the case with an uninclosed water jet.

To prevent burning of the tip of the nozzle 5 I may introduce an annular metal ring 7 at the lower end of the insulating tube 3 and then connect the ring to earth. This ring then serves to shield the nozzle from the burning action of the arc and thereby insures a water jet of uniform diameter and velocity.

When my device is applied to a three-phase system I may use the arrangement shown in Fig. 2 in which the protective devices 8, 9 and 10, connected respectively to the three conductors of the three-wire circuit, are each provided with a water nozzle connected to ground. In the drawing I have shown the devices 8, 9 and 10 as separated from the line conductors by spark gaps 11, 12 and 13, and I desire it to be understood that these spark gaps are merely diagrammatic and may be set at a break down value approximating that of the normal voltage of the system, or may be so adjusted

as not to break down until the potential has reached a value considerably higher. In the former case, the line will be more easily relieved of static and other abnormal changes of small magnitude, while in the latter case the continuous loss of leakage of line current to ground will be largely prevented.

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

1. A protective device for an electrical conductor subject to abnormal changes comprising means for establishing a moving liquid resistance which is vaporizable by the action of a heavy discharge therethrough, and means for utilizing the expansive action of vapor so produced to interrupt the flow of current from said conductor.

2. A protective device having means for establishing a water jet to carry discharges from the line conductor, and means for confining the expansive action of the water when a heavy discharge is transmitted thereby.

3. A protective device comprising a closed metal shell, means for continuously projecting a liquid into said shell, and a non-conductive tube surrounding said projected liquid and forming a constricted opening from said shell.

4. A protective device comprising means for projecting a stream of liquid against a conductor arranged for connection with the line to be protected, and a non-conducting tube surrounding said stream to form a constricted chamber.

5. In a protective device, the combination of means for establishing a jet of liquid as a discharge path for abnormal current, and means for utilizing the vaporizing action of a heavy discharge through said liquid to develop a high velocity blast assisting in the interruption of said discharge.

6. The combination with an electrical conductor subject to high potential discharges, of a high resistance path to ground including a moving liquid subject to vaporization by a heavy electrical discharge from said conductor, and means for utilizing said vaporization to develop a high velocity blast in a direction opposite to that of said moving liquid.

7. A combined static discharger and lightning arrester comprising a metal shell, means for projecting a jet of water upward into said shell, and a non-conducting tube surrounding said jet and forming a constricted outlet from said shell.

8. The combination with an electrical conductor subject to high potential charges, of a path to ground therefor including a moving liquid subject to vaporization by heavy electric discharges from said conductor, and means for utilizing the vaporization of said liquid to develop a high velocity blast for rupturing the circuit between said conductor and ground.

9. A combined static discharger and lightning arrester comprising a metal shell, means for projecting a jet of water upward into said shell, and a non-conducting tube surrounding said jet and discharging water from said shell.

In witness whereof, I have hereunto set my hand this 6th day of November, 1906.

EZRA B. MERRIAM.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.