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LIGHTNING ARRESTER.

APPLICATION FILED MAY 18, 1907.

928,049. Patented July 13, 1909.

Fig. 1.

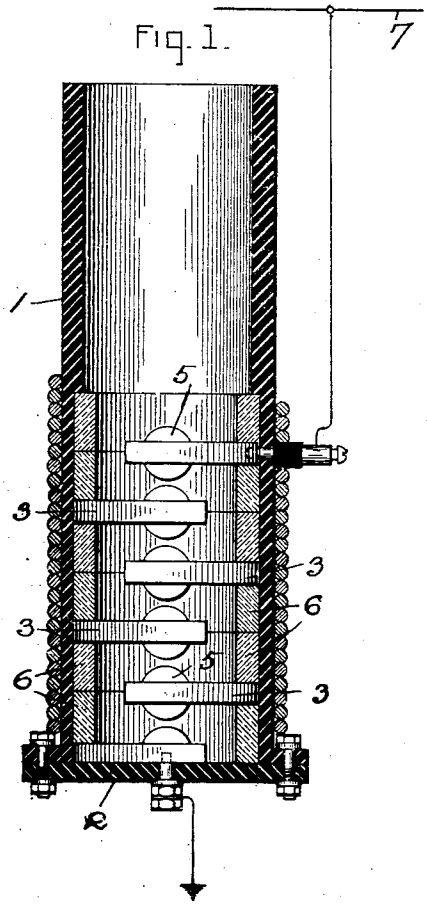


Fig. 2.

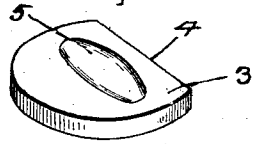
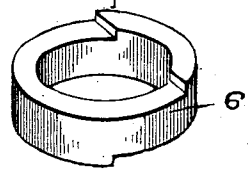


Fig. 3.



WITNESSES

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UNITED STATES PATENT OFFICE.

EDWARD M. HEWLETT AND EZRA B. MERRIAM, OF SCHENECTADY, NEW YORK, ASSIGNORS TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

LIGHTNING-ARRESTER.

No. 928,049. Specification of Letters Patent. Patented July 13, 1909.

Application filed May 18, 1907. Serial No. 374,374.

To all whom it may concern:

Be it known that we, EDWARD M. HEWLETT and EZRA B. MERRIAM, citizens 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.

The present invention relates to the protection of electrical systems and conductors from high potential charges, such as arise from lightning, static, resonance, switchboard manipulations, etc.

The invention comprises a plurality of conductors spaced apart to form air gaps. and inclosed in such a way that the explosive or expulsive action of arcs or current discharges between the several conductors will act cumulatively in extinguishing the arcs, thereby interrupting the flow of current. The spark gaps are so adjusted that normal line potential will not break across and the number of gaps may be varied to suit the voltage of the system and the permissible rise in voltage before relief is desired.

The details of this invention will be better understood by reference to the accompanying drawing in which—

Figure 1 is a sectional elevation of one embodiment, and Figs. 2 and 3 are details.

The drawing is to be considered as partly diagrammatic and as illustrating the principle of this invention rather than details of a specific apparatus embodying it. The embodiment shown comprises a tube or chute 1 of insulating material having an opening therein, as for instance at the top end. The tube may be closed at the bottom by a removable plate 2 and may be reinforced or strengthened by wire bands. Within the tube are disposed a plurality of conductive elements 3 of the general contour shown in Fig. 2. Each conductor may be considered as a thick metal disk cut away on one edge to form a flat edge 4 and carrying convex projections 5 on the top and bottom of the disk, near the center thereof. These conductors are mounted one above another within the insulating tube 1 and are spaced apart and insulated from each other by notched rings 6 of porcelain or other suitable material. Such a ring is shown in perspective in Fig. 3 and is cut away on both edges to form seats for the conductors immediately above and below.

When the various parts are assembled, the conductors form a continuous series of spark gaps of definite and predetermined length. These spark gaps are located between the convex projections of the several conductors. The series of conductors should be proportioned to the voltage of the system to be protected, and the tubular chute may be left unobstructed throughout a part of its length.

The conductors are arranged alternately in the tube so that a sinuous air or gas passage is formed through the series of air gaps. This feature is of particular importance as it insures a cumulative extinguishing action of the arcs. The arrester may be connected in circuit in any of the ways now well understood in the art, as for instance, directly between line conductor 7 and ground.

When a high potential charge occurs on line conductor 7, the high potential current will jump across the series of gaps and escape to ground. The line current will also tend to follow across the gaps and produce arcs between the convex surfaces of the several conductors.

When an arc forms between the two conductors, as for instance between the grounded conductor of the series and the one immediately above, the gases developed by the arc and the air heated by the arc expand and develop a relatively high pressure in the chamber surrounded by the lowermost porcelain ring. These gases can escape upward around the cut-away edge of the conductor into the chamber surrounded by the second porcelain ring. Simultaneously with this expansion of the lowermost chamber, the expansion goes on in the chamber above because of its own arc and also in all the other chambers of the series. The result is the development of pressure in each of the chambers and the production of a powerful blast outward toward the opening of the tube or chute. This blast passes over substantially all of the gaps and extinguishes the arcs.

So quick is the explosive effect and so rapid the extinction of the arcs, that very little line energy passes to ground and very little disturbance is introduced on the protected system.

The device may be used with the open end of the chute at the top or with the open end at the bottom, and the invention is not limited to any special shape or conformation of tube, so long as the expansion of the gases in

the several closed chambers acts cumulatively in extinguishing the arcs.

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

1. In a lightning arrester, the combination of a plurality of metal conductors insulated from each other and spaced apart to form a succession of air gaps, and a wall surrounding each air gap to form a chamber limiting the expansion of gas when an arc forms between said conductors and directing the expansion products of one chamber into the arc path of the next.

2. In a lightning arrester, the combination of a chute, a plurality of conductors arranged therein to form a series of air gaps and a sinuous gas passage, means for connecting one of said conductors to a line conductor to be protected from abnormal charges, and means for connecting another of said conductors to ground.

3. In a lightning arrester, a chute, a plurality of plates forming a plurality of chambers in said chute communicating with each other, and projections on said plates in the direct path of gases passing from one chamber to the next.

4. In a lightning arrester, the combination with a plurality of conductors spaced apart to form a series of air gaps, of means whereby fluid is put under pressure by arcs in said gaps and is directed through each gap in a direction opposite the direction of flow of fluid in the adjacent gaps.

5. The combination of a plurality of conductors insulated from one another and spaced apart to form air gaps, and means for confining the gases expanded when arcs form across said gaps and for directing said gases through each gap in a direction opposite the direction of flow of gases through the adjacent gaps.

6. In a lightning arrester, the combination of a plurality of conductors spaced apart to form a series of air gaps, and means for confining the gases expanded by arcs produced across said gaps and for directing the gases through each gap in a direction opposite the direction of flow of gases through the adjacent gaps, whereby a cumulative action of the gases from the several arcs in the extinguishment of other arcs of the series is effected.

7. In a lightning arrester, the combination of walls forming a passage open at one end and closed at the other, and plates insulated from one another and projecting into said passage to form a succession of spark gaps all in series.

8. In a lightning arrester, the combination of a plurality of conductors insulated from each other and spaced apart to form air gaps, a wall surrounding each air gap to form a chamber limiting the expansion of gas when an arc forms between said conductors, said walls coöperating with an end wall to form a passage open at one end and closed at the other and leading successively through the arc paths of adjacent chambers.

9. In a lightning arrester, the combination of a tube of insulating material, insulating rings within said tube, and conductive plates clamped between adjacent rings to project into said tube and overlap, said plates being separated to form a series of spark gaps.

10. In a lightning arrester, the combination of a tube of insulating material, conductive plates projecting into said tube to form spark gaps, said plates being alternately arranged to form a sinuous passage, and a closure for one end of said tube.

In witness whereof, we have hereunto set our hands this 17th day of May, 1907.

EDWARD M. HEWLETT.
EZRA B. MERRIAM.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.