

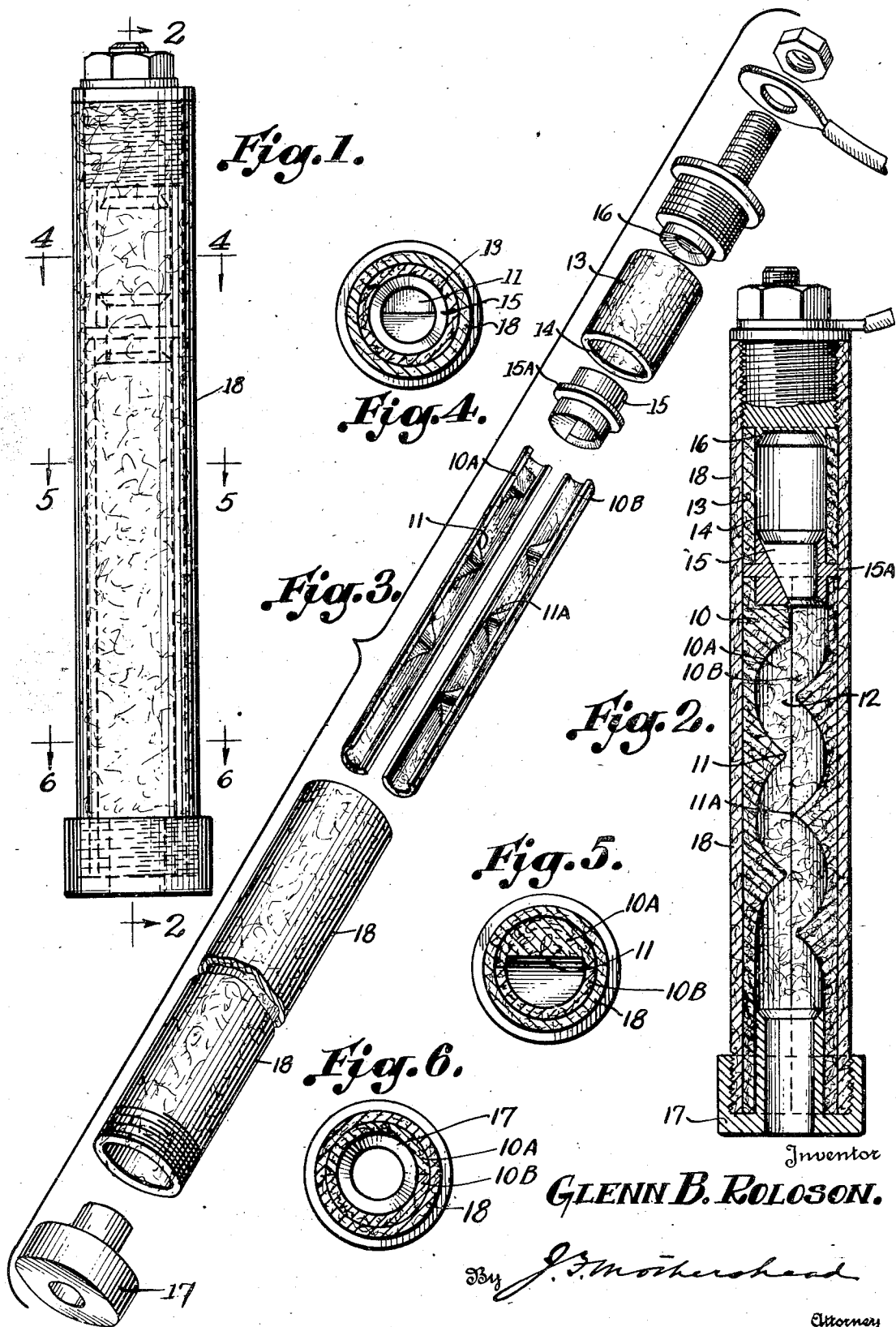
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LIGHTNING ARRESTER, ALTERNATE DEFLECTOR TYPE

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LIGHTNING ARRESTER, ALTERNATE
DEFLECTOR TYPE

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10 Claims. (Cl. 175—30)

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amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government of the United States for governmental purposes without the payment to me of any royalty thereon in accordance with the provisions of the act of April 30, 1928 (Ch. 460, 45 State. L. 467).

My invention pertains to lightning arresters for the prevention of interruptions to service and damage to connected apparatus due to surges produced by lightning or other causes.

The function of lightning arresters connected to electric transmission and distribution lines are, as known in the art, first, to discharge heavy surge currents produced by lightning or other causes and, second, to interrupt the power follow up currents in the shortest possible time, both without destruction of the arresters.

The purpose of gas evolving material in lightning arresters is two-fold, first, to non-ionize the arc paths, and, second, by the expending forces of freed gases, to blow out the arc. Considerable difficulty has been experienced however in controlling the gases sufficiently to perform their full intended function without so restricting the flow of gases as will cause them to burst the arrester. For example, it has been found that the gas flow will sometimes parallel the arc flow and thereby have little destructive effect upon the arc. In some prior art instances efforts have been made to confine the gas flow to the arc path but in structures attempting to accomplish such effects the gas passageways are so restricted or the gas flow so hampered as to cause a bursting of the arrester.

The present invention aims to provide an arrester having ample passageway for the non-destructive flow of the gases and yet provide for controlling the gas flow to insure an interception of all arc paths thereby.

The foregoing and other objects of the invention will become apparent from a reading of the following specification and appended claims. Certain embodiments having the characteristics of my invention and by which the same may be practiced are illustrated in the accompanying drawing, in which:

Figure 1 is an elevational view of the assembled arrester;

Figure 2, a section in elevation of the arrester shown in Figure 1;

Figure 3, an exploded view of the elements of the arrester; and

Figures 4, 5 and 6, cross sectional views taken along lines 4—4, 5—5 and 6—6, respectively, of Figure 1.

Broadly, the invention comprises a di-electric tubular structure 10 of fiber, solid boric acid or other material capable of evolving a considerable amount of substantially non-ionized gas when subjected to the heat of an electric discharge or arc in close proximity therewith, the tubular structure having protuberances 11 and 11A staggered alternately on opposite sides of the inner walls thereof and forming a sinuous gas flow passageway 12 repetitiously and progressively intercepting the axis of the tubular structure, a di-electric tube 13 of similar gas evolving qualities, the inner walls of which form a gas producing chamber 14 communicating with the sinuous passageway, an auxiliary electrode 15 intermediate the gas chamber and sinuous passageway, an end electrode 16 a portion of which extends into communication with the chamber in space discharge relation to the auxiliary electrode, another electrode 17 in space discharge relation to the auxiliary electrode and in communication with the passageway, and a housing 18 of fiber, plastic, glass or other material having suitable insulating characteristics, strength and weather resisting qualities, surrounding the assembled structure heretofore described.

The protuberances 11 and 11A terminate short of the axis of the tubular structure 10, thus providing an unrestricted arc passageway axially of the tubular structure. From another viewpoint, adjacent to-and-fro portions of the sinuous gas passageway merge sufficiently along the axis of the tubular structure 10 as to provide an unrestricted arc passageway axially of the tubular structure.

That portion of the end electrode 16 which communicates with the gas chamber 14 is preferably beveled so as to place its extremity immediately adjacent the wall of the gas chamber. The auxiliary electrode 15 is similarly beveled at its opposite ends and is provided with a centrally disposed passageway, one face of which is inclined to serve as a deflector for gases passing there-through and to direct the same against the foremost surface of the first protuberance 11A of the members forming the sinuous passageway 12. The auxiliary electrode 15 is also provided, for mounting purposes, with an annular flange 15A whereby the electrode may be held in position between the tube 13 and the tubular structure 10. The electrode 17 is vented for the escape of gases from the arrester and is preferably mounted at the exit of the passageway. The innermost end of the electrode 17 may also be beveled for the purposes given hereinbefore with respect to the

electrodes 15 and 16. The electrode 17 may also include a cap portion whereby the lower ends of the tubular structure 10 and housing 18 may be received thereby for retaining purposes.

The arc path between the electrode 15 and the vented electrode 17 is substantially in a plane through the axis of the tubular structure and between the tips or edges of the protuberances 11 and 11A since that is the shortest and also the only unobstructed path between those electrodes.

The tubular structure 10 may be made for manufacturing convenience in two longitudinal sections 10A and 10B and the inner walls provided with a series of concavities, thereby forming the protuberances 11 and 11A. The concavities of the respective members 10A and 10B, however are not symmetrical with respect to each other but are spaced so that the protuberance of one of the members projects toward the concavity of the other member to provide the sinuous passageway 12 when assembled.

It has been found from experience that the outer surfaces of the usual expulsion type tube deteriorates rapidly due to exposure to weather, thus shortening the life of the tube unless protective coatings are applied at frequent intervals. To obviate this constant maintenance, I have discovered that by the use of plastics of suitable strength, insulating and weather resisting qualities, the life of the tube may be increased and the cost of maintenance reduced to a minimum.

Gases developed in gas chamber 14 are forced therefrom, by their own accumulation, and in their flow from the chamber are deflected, by the deflecting intermediate electrode 15, outwardly and into the first concavity of the tubular structure 10 from which it is directed by the first of the series of protuberances across the axis of the tubular structure or shortest arc path between the rim extremities of electrodes 15 and 17. This process of causing the gases to flow in a zig-zag or sinuous course repetitiously and successively across the arc path is repeated by the successive staggered and alternate protuberances until the gases eventually discharge into the open air through the open electrode 17. It will thus be seen that since the gases are caused to cross the arc path a number of times, non-ionized gas is positively introduced into an arc, flowing between the electrodes, each time the gases cross the axis of the passageway. A lengthening of the arc, tending to break the same, undoubtedly results from the intersecting gas flow.

Having described my invention in connection with an illustrated embodiment thereof, what I claim is:

1. An electric discharge and arc interrupting device comprising the combination of a tubular construction of di-electric material capable of evolving non-ionized gases when subjected to the heat of an arc in close proximity therewith, inner wall portions of said tubular construction forming a gas chamber and other inner wall portions thereof forming an unobstructed sinuous gas-flow passageway extending from communication with said chamber and repetitiously and progressively intersecting the axis of said tubular construction, adjacent to-and-fro portions of said sinuous passageway merging along the axis of the tubular construction sufficiently to provide an unobstructed arc passageway axially of the tubular construction, an end electrode having an extremity immediately adjacent a wall of said gas chamber and another portion closing one end of

said chamber, an auxiliary electrode intermediate said gas chamber and one end of said sinuous passageway in space discharge relation to said end electrode and having extremities immediately adjacent the walls, respectively, of said chamber and sinuous passageway, and another electrode in space discharge relation to said auxiliary electrode and in communication with said passageways.

2. An electric discharge and arc interrupting device comprising the combination of a tubular construction of di-electric material capable of evolving non-ionized gases when subjected to the heat of an arc in close proximity therewith, inner wall portions of said tubular construction forming a gas chamber and other inner wall portions thereof forming an unobstructed sinuous gas-flow passageway extending from communication with said chamber and repetitiously and progressively intersecting the axis of said tubular construction, adjacent to-and-fro portions of said sinuous passageway merging along the axis of the tubular construction sufficiently to provide an unobstructed arc passageway axially of the tubular construction, an end electrode having an extremity immediately adjacent a wall of said gas chamber and another portion closing one end of said chamber, an auxiliary electrode intermediate said gas chamber and one end of said sinuous passageway in space discharge relation to said end electrode and having extremities immediately adjacent the walls, respectively, of said chamber and sinuous passageway, another electrode in space discharge relation to said auxiliary electrode and in communication with said passageways, and a housing of insulating material surrounding said tubular construction.

3. An electric discharge and arc interrupting device comprising the combination of a tubular construction of di-electric material capable of evolving non-ionized gases when subjected to the heat of an arc in close proximity therewith, inner wall portions of said tubular construction forming a gas chamber and other inner wall portions thereof forming an unobstructed sinuous gas-flow passageway extending from communication with said chamber and repetitiously intersecting the axis of said tubular construction, an end electrode closing one end of said chamber, an auxiliary electrode in space discharge relation to said end electrode and having extremities exposed to said chamber and sinuous passageway, and another electrode in space discharge relation to said auxiliary electrode and in communication with said passageways.

4. An electric discharge and arc interrupting device comprising the combination of a tubular construction of di-electric material capable of evolving non-ionized gases when subjected to the heat of an arc in close proximity therewith, inner wall portions of said tubular construction forming a gas chamber and other inner wall portions thereof forming an unobstructed sinuous gas-flow passageway extending from communication with said chamber, an end electrode exposed to said gas chamber and closing one end thereof, another end electrode in communication with said sinuous passageway and in space discharge relation to said first mentioned end electrode, and an auxiliary electrode intermediately of and in space discharge relation to said end electrodes and having extremities exposed to said chamber and sinuous passageway.

5. An electric discharge and arc interrupting device comprising the combination of a tubular

construction of di-electric material capable of evolving non-ionized gases when subjected to the heat of an arc in close proximity therewith, inner wall portions of said tubular construction forming a gas chamber and other inner wall portions thereof forming an unobstructed sinuous gas-flow passageway extending from communication with said chamber, an end electrode exposed to said gas chamber and closing one end thereof, another end electrode in communication with said sinuous passageway and in space discharge relation to said first mentioned end electrode, an auxiliary electrode intermediately of and in space discharge relation to said end electrodes and having extremities exposed to said chamber and sinuous passageway, and a housing formed of insulating plastic material surrounding said tubular construction.

6. An electric discharge and gas interrupting device comprising a combination of an elongated hollow member of insulating material closed at one end and open at the other, an end electrode carried by said member at the closed end of, yet exposed to, the hollow thereof, a vented electrode carried by said member in communication with the hollow thereof and in space discharge relation to said end electrode, an auxiliary electrode carried by said member intermediately of and in space discharge relation to said end and vented electrodes, a gas chamber formed by the inner walls of said member between said end and auxiliary electrodes, at least a portion of the inner walls of the gas chamber being capable of evolving non-ionized gases when subjected to the heat of an arc flowing between the end and auxiliary electrodes, the inner walls of said hollow member between said auxiliary and vented electrodes being provided with unsymmetrically opposed concavities cooperatively forming a sinuous gas-flow passageway between said gas chamber and the open end of said member, whereby an arc flowing substantially a straight path between the auxiliary and vented electrodes will be repetitiously intercepted by gases created within and forced from the gas chamber as they flow through the sinuous passageway to the exit of the device.

7. An electric discharge and gas interrupting device comprising a combination of an elongated hollow member of insulating material closed at one end and open at the other, an end electrode carried by said member at the closed end of, yet exposed to, the hollow thereof, a vented electrode carried by said member in communication with the hollow thereof and in space discharge relation to said end electrode, an auxiliary electrode carried by said member intermediately of and in space discharge relation to said end and vented electrodes, a gas chamber formed by the inner walls of said member between said end and auxiliary electrodes, at least a portion of the inner walls of the gas chamber being capable of evolving non-ionized gases when subjected to the heat of an arc flowing between the end and auxiliary electrodes, the inner walls of said hollow member between said auxiliary and vented electrodes being provided with unsymmetrically opposed protuberances forming a gas-flow passageway repetitiously and progressively intercepting the axis of said member.

8. An electric discharge and gas interrupting device comprising a combination of an elongated hollow member of insulating material closed at

one end and open at the other, an end electrode carried by said member at the closed end of, yet exposed to, the hollow thereof, a vented electrode carried by said member in communication with the hollow thereof and in space discharge relation to said end electrode, an auxiliary electrode carried by said member intermediately of and in spaced discharge relation to said end and vented electrodes, a gas chamber formed by the inner walls of said member between said end and auxiliary electrodes, at least a portion of the inner walls of the gas chamber being capable of evolving non-ionized gases when subjected to the heat of an arc flowing between the end and auxiliary electrodes, the inner walls of said hollow member between said auxiliary and vented electrode being provided with unsymmetrically opposed concavities cooperatively forming a sinuous gas-flow passageway between said gas chamber and the open end of said member, to-and-fro portions of said sinuous passageway merging sufficiently along the axis of said member to form an axially disposed arc passageway.

9. An electric discharge and gas interrupting device comprising a combination of an elongated hollow member of insulating material closed at one end and open at the other, an end electrode carried by said member at the closed end of, yet exposed to, the hollow thereof, a vented electrode carried by said member in communication with the hollow thereof and in spaced discharge relation to said end electrode, an auxiliary electrode carried by said member intermediately of and in space discharge relation to said end and vented electrodes, a gas chamber formed by the inner walls of said member between said end and auxiliary electrodes, at least a portion of the inner walls of the gas chamber being capable of evolving non-ionized gases when subjected to the heat of an arc flowing between the end and auxiliary electrodes, the inner walls of said hollow member between said auxiliary and vented electrodes being provided with unsymmetrically opposed protuberances forming a gas-flow passageway repetitiously and progressively intercepting the axis of said member, and a housing formed of insulating plastic material surrounding said tubular construction whereby the device is rendered extremely capable of withstanding the deteriorating effects of exposure to weather.

10. An arc interrupter comprising a tubular insulating casing member, electrodes extending within said tubular insulating casing member to provide a spark gap space between said electrodes within said casing member, a separate interior tubular gas evolving member between said electrodes disposed within said tubular insulating casing member adjacent the walls thereof and between said electrodes, at least the ends of said electrodes which extend toward each other being beveled decliningly inward toward the axis of the electrode, whereby the shortest spark gaps between said electrodes are immediately adjacent the inner surface of said gas evolving material, means for venting the arcing space of said spark gap, the construction and arrangement being such that an arc forms internally of said tubular insulating casing member rather than exteriorly thereof, and means for directing gases evolved from said material across said spark gap.

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