L. S. BRACH.

LIGHTNING ARRESTER.

APPLICATION FILED APR. 9, 1913.

1,173,165. Patented Feb. 29, 1916.

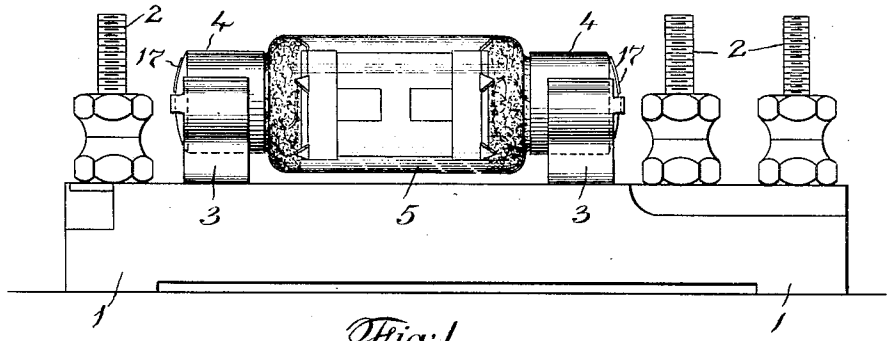


Fig: 1.

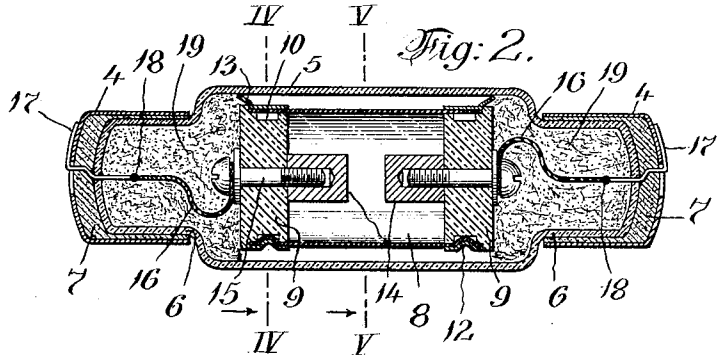


Fig: 2.

Fig: 3.

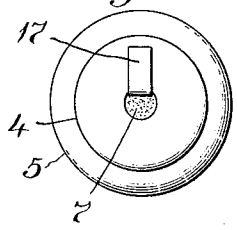


Fig: 4.

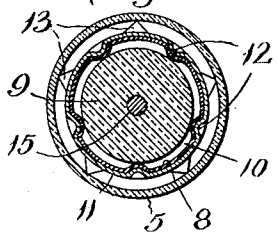
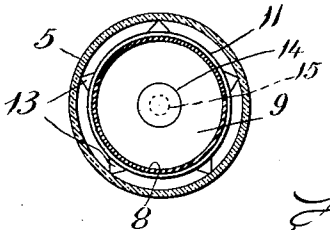


Fig: 5.



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LIGHTNING-ARRESTER.

1,173,165. Specification of Letters Patent. Patented Feb. 29, 1916.

Application filed April 9, 1913. Serial No. 759,966.

To all whom it may concern:

Be it known that I, LEON S. BRACH, residing at New York, in the county of New York and 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 a lightning arrester and particularly to that type known as vacuum lightning arresters.

An object of the invention is to provide a thoroughly practical and commercial article which may be dispensed as an article of manufacture for use in connection with appropriately formed insulator blocks to which the arrester may be conveniently attached to form the proper electrical connections after the manner of the attachment of ordinary fuse plugs, and to construct the interior parts of the arrester so as to be substantially proof against breakage due to the shocks of handling.

A further object is to provide an arrester comprsing a container, to provide electrodes within the container movable in all directions toward the walls of the container, and to provide means for cushioning all relative movements of the electrodes and container.

A further object is to provide an arrester comprising a vacuum container, to provide an independently formed container movable within the vacuum container, to provide oppositely disposed electrodes within the inner container, to provide flexible electrical connections extending from the inner container through the wall of the outer container, and to provide means for yieldingly limiting the relative movement of the inner and outer container.

A further object is to provide spring members extending from the inner container to the inner surface of the walls of the outer container for cushioning lateral relative movement between the containers.

A further object is to provide a lightning arrester comprising a vacuum container, spaced electrodes therein, a leading in-wire, and a shield of refractory insulating material intervening between the electrodes and the leading in-wire, to provide a fireproof protection inclosing said leading in-wire beyond the shield, to provide means for retaining the fireproof material in position, and to adapt the fireproof material to serve as a cushion between the shield and one wall of the container.

Other objects and aims of the invention, more or less specific than those referred to above, will be in part obvious and in part pointed out in the course of the following description of the elements, combinations, arrangements of parts and applications of principles, constituting the invention; and the scope of protection contemplated will be indicated in the appended claims.

In the accompanying drawings which are to be taken as a part of this specification, and in which I have shown a merely preferred form of embodiment of the invention, Figure 1 is a side elevational view of a lightning arrester constructed in accordance with the provisions of this invention, the arrester being shown in supported relation upon an appropriately formed insulating block; Fig. 2 is an enlarged, longitudinal, vertical, sectional view of the arrester proper. Fig. 3 is an end elevational view of the structure shown in Fig. 2; Fig. 4 is a transverse, sectional view taken on the plane of line IV—IV of Fig. 2; and Fig. 5 is a similar section taken on the plane of line V—V of Fig. 2.

The present invention is an improvement upon the structure shown in my co-pending application, Serial No. 676,851, filed February 10, 1912.

In my co-pending application I have disclosed a vacuum container substantially the same as in the present invention and I have shown spaced electrodes contained within a separately formed container carried within the outer container. In the co-pending application, however, the separately formed container is substantially rigidly mounted upon one or more leading in-wires, these wires being adapted to hold the inner container spaced from the walls of the outer container. The leading in-wires must be of relatively large size and must be rigidly secured in the glass wall of the outer container in order to accomplish their purpose. Slight shocks, as in handling, easily fracture the glass and destroy the usefulness of the structure. In the present invention the separately formed container within the vacuum or outer container is independently movable in all directions. The electrodes are carried within the inner container and flexible connections made therefrom through the walls of the outer container. The inner container is cushioned in all its movements by suitable means interposed between its

outer surface and the inner surface of the outer container.

Between the outer side walls of the inner container and the inner side walls of the outer container are arranged a plurality of spring fingers whereby relative lateral movement is cushioned. The space between the outer end walls of the inner container and the inner end walls of the outer container is filled with asbestos fiber, mineral wool or other resilient fireproofing material. The spring fingers at the sides prevent migration of the fireproofing resilient material along the sides of the inner container. The soft nature of the fireproofing material permits unobstructed flexing of the leading in-wires, and serves to cushion relative endwise movement. In this manner all localized strains are taken from the outer container so that the structure may be handled with immunity without danger of fracture. Limited cushioned movement is afforded in all directions between the containers. The heat of discharges is effectively kept away from the leading in-wires.

Referring to the drawings for a detailed description of the structure illustrated, the numeral 1 indicates an insulating block having suitable binding posts 2, and appropriately spaced spring pockets 3 into which the opposite metallic end caps 4 of the arrester are adapted to engage in a well understood manner.

The outer container 5 of the structure is preferably of glass, and comprises a cylinder having its opposite ends 6 reduced in diameter, the metallic caps 4 being fitted over the reduced ends and held rigidly by cement or other means, as 7. For maximum efficiency the container should be evacuated of air, but this is not essential in all cases.

The inner container 8 comprises a cylinder of mica, or other suitable transparent fireproof insulating material, of a somewhat smaller diameter than the interior diameter of the outer container, the opposite ends of the cylinder being closed by relatively heavy base pieces or disks 9 of refractory insulating material such as porcelain.

Each of the closures or base pieces 9 is formed with an annular groove 10 on its periphery, and metallic bands 11 are fitted over the periphery of the disks having struck-in portions 12 extending into the grooves 10, the intervening portions of the cylinder 8 being carried into the grooves and being held rigidly by the struck-in portions 12. At equi-distant points about the circumference of the bands 11 said bands are formed with extensions comprising spring fingers 13 bent diagonally and yieldingly engaging the inner surface of the outer container.

The electrodes, as 14, are fitted to the opposing inner surfaces of the base pieces 9, being held in fixed relation thereto by suitable fastening means, as for instance, the screws 15 extending through the base pieces and serving conveniently as binding posts for the attachment of the leading in-wires 16. The leading in-wires may obviously be electrically connected with the electrodes independent of the electrodes fastening means, if desired, but the structure illustrated is at present thought to be preferable.

The leading in-wires are each preferably of two sections, a relatively solid section extending through the material of the outer container, being sealed in said material in a well understood manner, and being electrically connected as at 17 with the adjacent caps 4; and a relatively flexible section soldered or otherwise conveniently connected with the inner end of the solid section as at 18. The flexible section is preferably, though not necessarily, made of a multiplicity of fine twisted wires.

The entire space within the outer container beyond the outer end surfaces of the inner container is filled with resilient insulating fireproof material, such as mineral wool, asbestos fiber, or the like, as at 19, this material filling in around the leading in-wires but not interfering with the flexing of the flexible portions thereof. The fingers 13 form a sort of screen across the space between the two containers and prevent any of the fibrous material from finding its way along the sides of the inner container. The walls of the inner container are intended to protect the outer casing and the leading in-wires. In some instances, however, the heat of exceedingly heavy charges would tend to destroy the leading in-wires. This tendency is practically overcome by the presence of the fireproofing material surrounding the leading in-wires.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense. It is also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention, which as a matter of language, might be said to fall therebetween.

Having thus described my invention what I claim as new and desire to secure by Letters Patent, is:

1. A lightning arrester comprising a container, a second container movable in all directions within the first container, electrodes within the inner container, resilient means engaging between said containers for cushioning relative movement between said

containers, and leading-in wires for the electrodes extending through said cushioning means.

2. A lightning arrester comprising a container, an electrode within said container movable in all directions relatively thereto, cushioning means for cushioning said movements, a leading in wire for said electrode extending through said cushioning means, a second electrode, and means for making electrical connection with said second electrode.

3. A lightning arrester comprising a vacuous container, an electrode within said container, a support for the electrode movable relatively to the walls of the vacuous container, spring fingers extending between said support and the walls of the vacuous container for cushioning the relative movements, a second electrode, and means for making electrical connections with said electrodes.

4. A lightning arrester comprising a vacuous tubular container, an electrode within said tubular container and laterally movable toward the side walls thereof, cushioning means between said electrode and the side walls of said container, a second electrode, and means for making electrical connections with said electrodes.

5. A lightning arrester comprising a vacuous container having an end wall, an electrode within said container spaced from said end wall and movable relatively thereto, cushioning means extending between said electrode and said end wall, a second electrode, and means for making electrical connections with said electrodes.

6. A lightning arrester comprising a container having side and end walls, an electrode within said container movable relatively to said side and end walls, cushioning means extending between said electrode and said end walls, a leading-in wire extending through said cushioning means, being electrically connected with said electrode, independently formed cushioning means extending between said electrode and said side walls, a second electrode, and means for making electrical connection with said second electrode.

7. A lightning arrester comprising a container, an electrode movable within said container, a leading in-wire extending through the wall of said container, being electrically connected with said electrode, said leading in-wire being flexible to permit relative movement of said electrode toward and away from the point of entrance of the leading in-wire through the wall of the container, cushioning means to limit the flexing of the leading in wire, a second electrode, and means for making electrical connection with said second electrode.

8. A lightning arrester comprising a vacuous container, an electrode movable within said vacuous container toward one wall thereof, a leading in-wire for the electrode sealed through the wall of the container toward which said electrode is adapted to move, cushioning means extending between said electrode and said mentioned wall, a second electrode, and means for making electrical connection with said second electrode.

9. A lightning arrester comprising a vacuous container, an electrode movable within said vacuous container toward one wall thereof, a leading in-wire for the electrode sealed through the wall of the container toward which said electrode is adapted to move, said leading in-wire being flexible so as to permit movement of the electrode toward said mentioned wall, a second electrode, and means for making electrical connection with said second electrode.

10. A lightning arrester comprising a vacuous container, an electrode carrying member movable within said vacuous container toward one wall thereof, an electrode carried thereby, a leading in-wire sealed through the wall of the container toward which said electrode carrying member is adapted to move, said leading in-wire being electrically connected with the electrode, said leading in-wire being flexible for permitting movement of the electrode carrying member toward said wall, resilient means inclosing said leading in-wire and serving to cushion the movement of the electrode carrying member, a second electrode, and means for making electrical connection with said second electrode.

11. A lightning arrester comprising a vacuous container, an electrode carrying member movable within said vacuous container toward one wall thereof, an electrode carried thereby, a leading in-wire sealed through the wall of the container toward which said electrode carrying member is adapted to move, said leading in-wire being electrically connected to the electrode, fireproofing material inclosing said leading in-wire and serving to limit the movement of said electrode carrying member, a second electrode, and means for making electrical connection with said second electrode.

12. A lightning arrester comprising a vacuous container, an electrode carrying member movable within said vacuous container toward one wall thereof, an electrode carried thereby, a leading in-wire sealed through the wall of the container toward which said electrode carrying member is adapted to move, said leading in-wire being electrically connected with the electrode, resilient fireproofing material disposed for protecting the leading in-wire and being adapted to yieldingly limit the movement of the electrode carrying member, a second

electrode, and means for making electrical connection with said second electrode.

13. A lightning arrester comprising a vacuous container, an electrode carrying member movable within said vacuous container toward one wall thereof, an electrode carried thereby, a leading in-wire sealed through the wall of the container toward which said electrode carrying member is adapted to move, said leading in-wire being electrically connected with the electrode, a body of asbestos fiber within said container disposed for protecting said leading in-wire, a second electrode, and means for making electrical connection with said second electrode.

14. A lightning arrester comprising a vacuous container, an electrode carrying member movable within said vacuous container toward one wall thereof, an electrode carried thereby, a leading in-wire sealed through the wall of the container toward which said electrode carrying member is adapted to move, said leading in-wire being electrically connected with the electrode, a body of asbestos fiber filling said container between the electrode carrying member and said wall, a second electrode, and means for making electrical connection with said second electrode.

15. A lightning arrester comprising a vacuous container, an electrode carrying member movable within said vacuous container toward one wall thereof, an electrode carried thereby, a leading in-wire sealed through the wall of the container toward which said electrode carrying member is adapted to move, said leading in-wire being electrically connected with the electrode, a body of loose asbestos fiber surrounding said leading in-wire and extending between said wall and said electrode carrying member so as to serve as a cushion for yieldingly limiting the movement of said electrode carrying member, a second electrode, and means for making electrical connection with said second electrode.

16. A lightning arrester comprising a vacuous tubular container having side walls and an end wall, an electrode carrying member within said container movable toward said side walls, an electrode carried thereby, a leading in-wire extending through the end wall of the container and being electrically connected with the electrode, said leading in-wire being laterally flexible for permitting unobstructed movement of said electrode carrying member toward said side walls, means for yieldingly limiting movement of said electrode carrying member toward said side walls, a second electrode, and means for making electrical connection with said second electrode.

17. A lightning arrester comprising a vacuous tubular container having side walls and an end wall, an electrode carrying member within said container movable toward said side walls, an electrode carried thereby, a leading in-wire extending through the end wall of the container and being electrically connected with the electrode, said leading in-wire being laterally flexible for permitting unobstructed movement of said electrode carrying member toward said side walls, a plurality of spring fingers projecting from said electrode carrying member toward the inner surface of the side walls for yieldingly limiting movement of the container toward said side walls, a second electrode, and means for making electrical connection with said second electrode.

18. A lightning arrester comprising a vacuous tubular container having side walls and an end wall, an electrode carrying member within said container movable toward said side walls, an electrode carried thereby, a leading in-wire extending through the end wall of the container and being electrically connected with the electrode, said leading in-wire being laterally flexible for permitting unobstructed movement of said electrode carrying member toward said side walls, a plurality of spring fingers formed upon said electrode carrying member projecting diagonally therefrom into engagement with the inner surface of the side walls for yieldingly limiting movement of the electrode carrying member toward said side walls, a second electrode, and means for making electrical connection with said second electrode.

19. A lightning arrester comprising a vacuous tubular container having side walls and an end wall, an electrode carrying member within said container movable toward said side walls, an electrode carried thereby, a leading in-wire extending through the end wall of the container and being electrically connected with the electrode, said leading in-wire being laterally flexible for permitting unobstructed movement of said electrode carrying member toward said side walls, a member supported upon said electrode carrying member being formed with a plurality of laterally projecting portions comprising spring means spaced about the marginal edge of said electrode carrying member extending toward said side walls adapted for cushioning movement of said electrode carrying member toward said side walls, a second electrode, and means for making electrical connection with said second electrode.

20. A lightning arrester comprising a vacuous container, an electrode carrying member within said container movable toward one of the walls thereof, an electrode carried thereby, a resilient fibrous material interposed between said electrode carrying member and said mentioned wall, means

carried by said electrode carrying member projecting toward other walls of said container adapted for preventing migration of said fibrous material between said electrode carrying member and said other walls, a second electrode, and means for making electrical connection with said electrode.

21. A lightning arrester comprising a vacuous container, an electrode carrying member within said container, an electrode carried thereby, a leading in-wire extending through a wall of said container and being connected with said electrode, a fireproofing material for protecting said leading in-wire, means supported upon said electrode carrying member adapted for retaining said fireproofing material in position for protecting said leading in-wire, a second electrode and means for making electrical connection with said second electrode.

22. A lightning arrester comprising a container, an electrode within said container movable relatively thereto, a leading in-wire extending through a wall of the container being connected with said movable electrode, said leading in-wire comprising a relatively inflexible portion through the wall of the container, and a relatively flexible portion electrically connected with the first portion adapted for permitting unobstructed relative movement between the electrode and the container, a second electrode, and means for making electrical connection with said second electrode.

23. A vacuum lightning arrester comprising an exhausted container, an electrode within said container movable relatively thereto, a leading in-wire sealed through the wall of the container electrically connected with the electrode, said leading in-wire being relatively inflexible for a portion of its length and relatively flexible for another portion of its length, the relatively flexible portion being adapted for permitting movement of the electrode relatively to the container, fireproofing means for protecting the relatively flexible portion, a second electrode, and means for making electrical connection with said second electrode.

24. A vacuum lightning arrester comprising an exhausted container, an electrode within said container movable relatively thereto, a leading in-wire sealed through the wall of the container electrically connected with the electrode, said leading in-wire comprising a relatively solid part for a portion of its length, and a stranded part for another portion of its length, the solid part being sealed through the wall of the container, and the stranded part being adapted to provide a flexible connection between the electrode and the solid part, a second electrode, and means for making elertrical connection therewith.

25. A lightning arrester comprising a tubular container, a pair of electrodes movable within said container, spacing means for spacing said electrodes apart, means connecting the spacing means with the electrodes having parts for limiting the relative movement between the electrodes and the container, and means for making electrical connection with said electrodes.

26. A lightning arrester comprising a tubular container, a pair of electrodes within said container, spacing means for spacing said electrodes apart longitudinally of the container, means connecting the spacing means with the electrodes having parts extending therefrom toward adjacent portions of the walls of the container adapted for retaining the electrodes substantially concentric with the longitudinal axis of the container, and means for making electrical connection with said electrodes.

27. A lightning arrester comprising a container, spaced electrodes within said container, base pieces for supporting said electrodes, a spacing member extending between said base pieces, means fixing said spacing member to said base pieces being formed with means for retaining said base pieces spaced from the walls of the container, and means for making electrical connection with said electrodes.

28. A lightning arrester comprising a container, spaced electrodes within said container, base pieces for supporting said electrodes, a spacing member extending between said base pieces, means connecting said spacing member with said base pieces being formed with spring fingers extending toward the walls of the container for yieldingly maintaining said base pieces spaced from said walls, and means for making electrical connection with said electrodes.

29. A lightning arrester comprising a container, spaced electrodes within said container, base pieces for supporting said electrodes, a spacing member extending between said base pieces comprising a cylinder inclosing said electrodes and lapping over edge portions of the base pieces, means for connecting the spacing member with the base pieces comprising bands surrounding the edge portions of said base pieces and being formed with struck-in parts engaging the lapping portions of the spacing member, and means for making electrical connection with said electrodes.

30. A lightning arrester comprising a container, spaced electrodes within said container, base pieces for supporting said electrodes, a spacing member extending between said base pieces comprising a cylinder inclosing said electrodes and lapping over edge portions of the base pieces, said base pieces being formed with marginal grooves over which the spacing member extends, portions of said spacing member engaging

within said grooves for fixing said spacing member to said base pieces, and means for making electrical connection with said electrodes.

31. A lightning arrester comprising a container, spaced electrodes within said container, base pieces for supporting said electrodes, a spacing member extending between said base pieces comprising a cylinder inclosing said electrodes and lapping over edge portions of the base pieces, and said base pieces being formed with marginal grooves over which portions of the spacing member extend, means for retaining the base members out of engagement with the walls of the container being formed with means adapted for retaining said spacing member in engagement with the grooves of said base pieces for fixing said spacing member to said base pieces, and means for making electrical connection with said electrodes.

32. A lightning arrester comprising a tubular container having side walls and end walls, spaced electrodes within the container, base pieces for supporting said electrodes, a spacing member extending between the base pieces, leading in-wires for the electrodes extending through the end walls of the container, a loose fibrous insulating material filling the opposite ends of the container beyond said base pieces inclosing the leading in-wires, and means carried by said base pieces adapted for fixing the spacing means to said base pieces being formed with parts serving to retain the loose fibrous material in the end portions of the container.

33. A leading in-wire for vacuum lightning arresters comprising a relatively inflexible part for a portion of its length, and a relatively flexible part for another portion of its length.

34. A leading in-wire for vacuum lightning arresters comprising a solid part for a portion of its length, and a stranded part for another portion of its length.

35. A lightning arrester, comprising a vacuous container, an electrode movable within the container, a guard for the electrode, means retaining said guard in position having parts serving to cushion the movements of the electrode, a second electrode, and means for making electrical connection with said electrodes.

36. A lightning arrester, comprising a vacuous container, an electrode movable within the container, a guard for the electrode, means retaining said guard in position having spring fingers projecting therefrom toward the walls of the container to cushion the movements of the electrode, a second electrode, and means for making electrical connection with said electrodes.

37. A lightning arrester, comprising a vacuous container, a second container movable within the first container, a pair of electrodes within the inner container, means for holding the inner container resiliently supported from the walls of the first container, and leading in wires extending through the wall of the first container and being connected to the electrodes.

38. A lightning arrester, comprising a vacuous container, a pair of electrodes within said container, means within the container holding said electrodes resiliently supported from the walls of the container, and non-supporting leading in wires for the electrodes.

In testimony whereof I affix my signature in the presence of two witnesses.

LEON S. BRACH.

Witnesses:

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