W. W. DEAN.

LIGHTNING ARRESTER.

APPLICATION FILED APR. 26, 1909.

959,120.

Patented May 24, 1910.

2 SHEETS—SHEET 1.

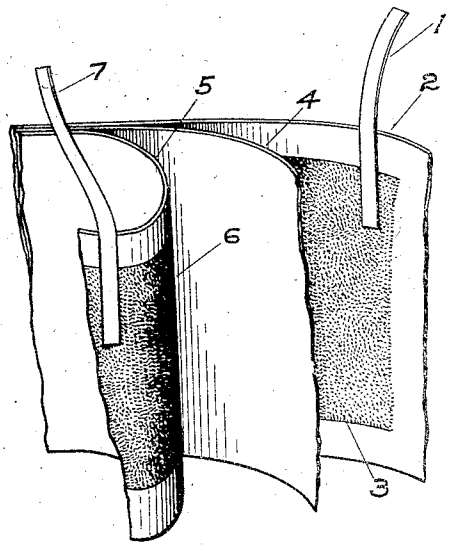

FIG. 1

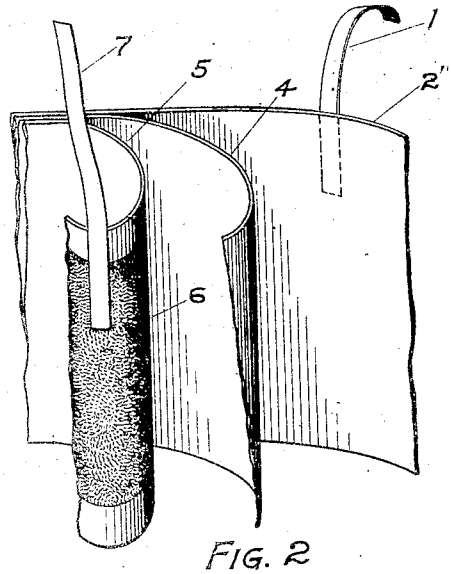

FIG. 2

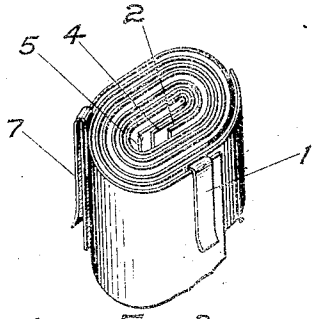

FIG. 3

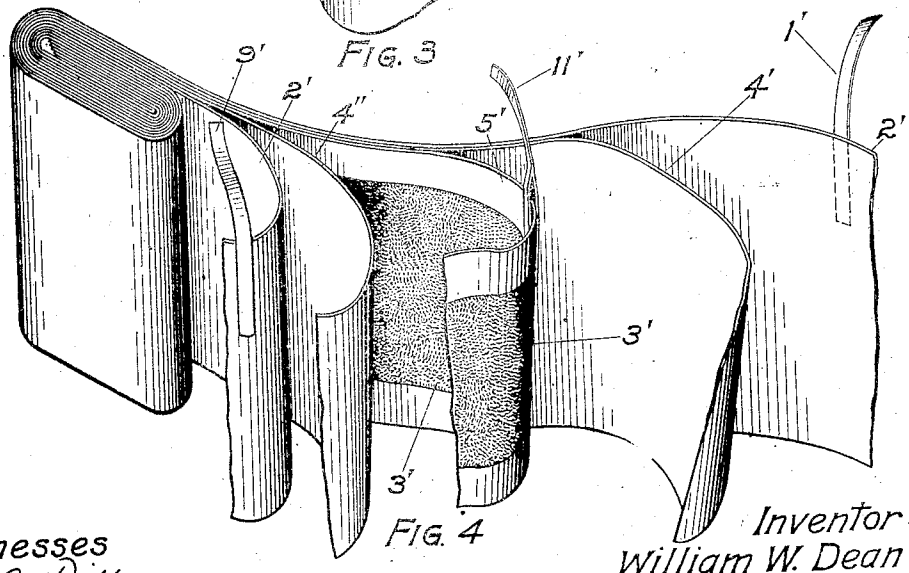

FIG. 4

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2 SHEETS—SHEET 2.

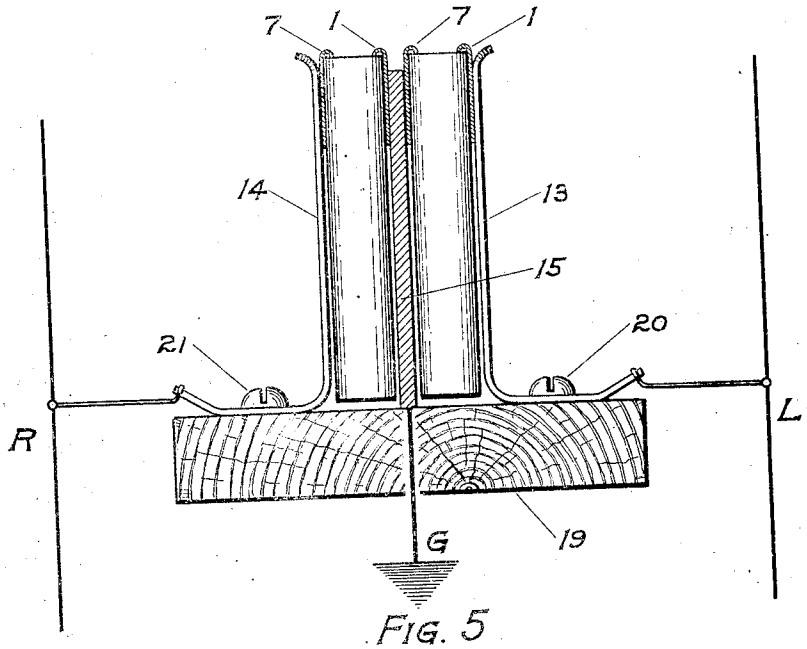

FIG. 5

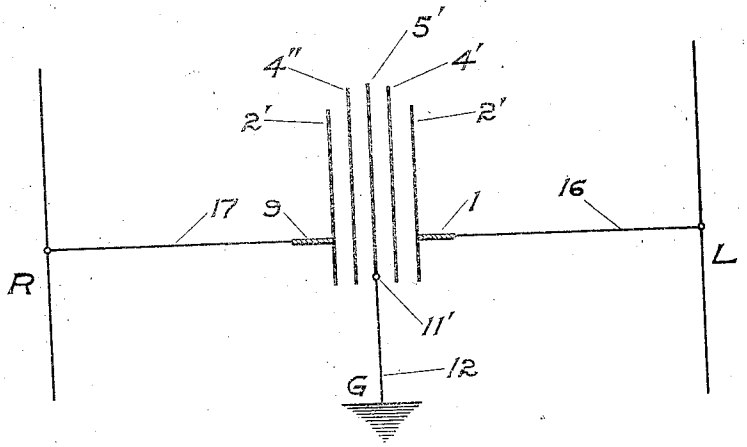

FIG. 6

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UNITED STATES PATENT OFFICE.

WILLIAM W. DEAN, OF ELYRIA, OHIO, ASSIGNOR TO THE DEAN ELECTRIC COMPANY, OF ELYRIA, OHIO, A CORPORATION OF OHIO.

LIGHTNING-ARRESTER.

959,120. Specification of Letters Patent. Patented May 24, 1910.

Application filed April 26, 1909. Serial No. 492,232.

To all whom it may concern:

Be it known that I, WILLIAM W. DEAN, a citizen of the United States, residing at Elyria, in the county of Lorain and State of Ohio, have invented certain new and useful Improvements in Lightning-Arresters; and I hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Hitherto, particularly in telephone work, lightning arresters consisting of two pieces of metal separated by an air gap or three pieces each so separated from the other, and the center one grounded, have been in general use; but these have proven to be unreliable and unsatisfactory. Other forms used consist of two carbon blocks separated by a strip of celluloid or other insulating material. While these are more reliable, the arrester must be renewed whenever a spark penetrates the celluloid and burns it out. This requires a trip by the trouble man after each storm, and renders the cost of operating rural lines almost prohibitive.

My invention relates to that form of lightning arrester in which two conducting materials separated by an insulating material, are connected to the line leads. In my invention one or both of these conductors consists of finely divided or microscopic conducting material which may be deposited upon either surface of the insulator or upon the surface of other insulators, and the two separated by the insulating material. The purpose of this is to cause the lightning arrester to automatically restore itself to operative conditions after each discharge. After each discharge the finely divided metal proximate to the point of perforation, is found to have been dissipated and the two conducting surfaces are still insulated from each other. It is thought that when the discharge of lightning pierces the insulator, the intense heat of the spark volatilizes the finely divided conducting material, or the surfaces thereof in proximity to the point of perforation so that the rest of the finely divided conducting material is insulated by this space from the area of the other conductor exposed by the perforation. The finely divided metal around the perforation seems, to a certain extent, to be blown away from the perforation by the force of the discharge, leaving the edges thereof bare of conducting material. It is probable that some of the metal is fused, and while in such condition, is carried away from the edges. Other unknown agencies and causes may contribute to the successful operation of this device, but whatever be the causes or agencies which make it successful, the protection sought is more particularly set forth in the appended claims. The lightning arrester is thus not disabled by a single discharge of lightning. I preferably employ a precipitate of tin fixed together by some adhesion material, but any form of finely divided conducting material may be used.

Subsequent discharges will puncture the insulation at other points, always where the insulation is weakest, and always insulating the puncture from the conductors. The life of my arrester will depend upon the area dissipated at each discharge, and at the initial area given the conducting surface. I limit the latter to prevent introducing any condensance in my circuit, as the creation of a condenser there will derogate from the merits of my device. I may also make these layers into a package by placing their surfaces together and folding them back and forth in the well known way certain fabrics are folded, or I may leave the whole flat and place it against the plane surface of the telephone set.

While I have described and claimed a lightning arrester, it is with the understanding that this is only one form of overload danger to which electrical apparatus is exposed, and it will be apparent that my device will offer protection against any and all these. I contemplate its use for any analogous purpose, and as a protector of electrical apparatus generally.

In case I use for my insulating material sheets of paper or analogous substances, I may roll them together with the sheets of conducting material, leaving the terminals exposed.

My invention will be best understood by reference to the following description when taken in connection with the accompanying illustrations, showing several specific embodiments thereof, while its scope will be more particularly pointed out in the appended claims.

Figure 1 is a view showing two sheets of paper having their interior surfaces covered

with this finely divided conducting material, and separated by a sheet or insulation. Fig. 2 represents a modification of Fig. 1, one of the terminals being shown as a sheet of conducting material. Fig. 3 shows the sheets rolled together with the terminals exposed ready for use. Fig. 4 shows a further modification showing alternate sheets of conducting and insulating material. Any of the conducting materials may consist of a finely divided conductor. Fig. 5 is a view of the circuits showing my lightning arrester in use. Fig. 6 is a modification of Fig. 5.

Referring to the drawings and to the embodiment of my invention there shown: in Fig. 1, 1 is a terminal of one of the lines which is connected to the finely divided conductor 3, spread on the surface of a sheet of paper 2. 4 is a sheet of insulating material, such as paper, laid upon the surface of the sheet 2, and in contact with the conducting material 3. Upon this is placed a third sheet 5 upon whose surface is spread another layer of conducting material 6. The terminal 7 is in contact with 6.

In Fig. 2 I show the sheet 2″ of the tin foil or other conducting material which I substitute for sheet 2 in Fig. 1.

Fig. 4 shows a terminal 1′ connected to a conductor 2′ which may be either a sheet of tin foil or a sheet of paper covered with this finely divided conducting material. Upon this I lay a sheet of insulation 4′, upon this a sheet of paper 5′ having both surfaces covered with finely divided conducting material. Both of these surfaces are connected with the terminal 11′. Superimposed upon this is a sheet 4″ of paper, and on this, another sheet 2′. All these may be rolled together as shown in Fig. 5.

By connecting each of the terminals 1′ and 9′ to one of the line leads, and the terminal 11′ to the ground, I construct the form of lightning arrester illustrated diagrammatically in Fig. 6, where the conductor 16 connects the terminal 1′ to the left line lead, and the conductor 17 connects the terminal 9′ to the right line lead. The terminal 11′ is grounded through 12′.

In Fig. 5 I show a method of using all forms shown in Figs. 1, 2 and 3. 15 represents a conductor grounded at G. Each 13 and 14 show terminals connected to contacts 20 and 21 which are those connected to the line leads L and R. I slip a lightning arrester, such as is shown in Fig. 3, between the terminals 14 and 15, and another between 13 and 15, so that the contacts 1 and 7 make connection with these terminals.

In addition to the advances made in this art by my improved arrester stated above, I furnish an arrester which is cheap of construction and when covered with a coating of shellac or other liquid insulator, is durable and is not liable to be short circuited by conductors accidentally or intentionally placed between the conducting members. Arresters are sometime short circuited by atmospheric moisture, but my coating of insulation renders my arrester impervious to moisture and obviates any such troubles. I also contemplate the use of small sheets of these materials made into a small package with the surfaces flat against one another. While I have shown my improved lightning arrester mounted in these particular ways, it is obvious that I may mount it in any way to protect apparatus from lightning discharges. It will also be obvious to those skilled in the art, that numerous and extensive departures from the form and the details of the apparatus here shown, may be made without departing from the spirit of this invention, the same being herein shown solely for the purpose of clearly illustrating one specific embodiment thereof.

I claim:

1. As a means for protecting electrical apparatus from disruptive discharges, an insulator and conductors, one of which latter consists of finely divided conducting material adapted to be punctured and dissipated at the puncture by the discharge.

2. As a means for protecting electrical apparatus from disruptive discharges, two conductors and an insulator between them, one of said conductors consisting of finely divided conducting material adapted to be punctured and dissipated at the puncture by the discharge.

3. As a means for protecting electrical apparatus from disruptive discharges, a conductor consisting of finely divided conducting material adapted to be punctured and dissipated at the puncture by the discharge.

4. In a lightning arrester, the combination of two sheets of finely divided conducting material separated by an insulator.

5. In a lightning arrester, a sheet of insulation having both sides coated with a layer of finely divided conducting material and a strip of insulation on either exterior side of the first named strip.

6. In a lightning arrester, the combination of a conductor, finely divided conducting material, a sheet of insulation upon one of whose surfaces the finely divided conducting material is deposited, and a sheet of insulation between the conductor and the finely divided conducting material.

7. In a lightning arrester, the combination of a conductor, finely divided conducting material, an insulator between the two, terminals to the conductors, the whole folded together into a roll with the terminals exposed.

8. In a lightning arrester, the combination of a conductor, an insulator in contact therewith, insulation upon whose surfaces are deposited finely divided conducting ma-

terial, contacting with said insulator, a third conductor, and a second insulator between said third conductor and the insulating material.

9. In a lightning arrester, a layer of conducting material, a layer of insulation, a layer of finely divided conducting material, a second layer of insulation, a second layer of conducting material, terminals for said conductors, all folded together with the terminals exposed.

10. In a lightning arrester, the combination of two conductors, a sheet of finely divided conducting material and sheets of insulation between said conductors, and said sheet of finely divided conducting material.

11. In a lightning arrester, insulators, a sheet of microscopic conducting material between said insulators, and a sheet of conducting material on the outside of one of the insulators.

12. In a lightning arrester consisting of a strip of paper coated on one side with finely divided conducting material, a layer of conducting material, and a strip of thin paper all wound together in the form of a roll, the paper being placed between the layer of conducting material and the coated surface of the first named strip of paper.

13. A lightning arrester consisting of a strip of paper, a layer of finely divided conducting material on either side of said strip of paper, two other layers of conducting material, strips of insulation placed between the conducting material, and all wound together into a roll.

14. A lightning arrester consisting of two layers of finely divided conducting material, a strip of insulation between said layers, and two other strips of insulation, one on either exterior side of the whole.

15. As a means for protecting electrical apparatus from high voltage discharges, a line lead, a ground lead, a conductor of solid material attached to each lead, an insulator between said conductors adapted to be punctured at high voltage discharges, one of said conductors adapted to be dissipated by the discharge in the vicinity of the puncture to isolate the puncture from the body of the conductor.

16. In a lightning arrester, conductors, an insulator puncturable by the lightning discharges and a conducting substance, whose volatile point is such that the conducting substance in proximity to the puncture is dissipated at each discharge, insulating the puncture from the remaining conductor.

17. In a lightning arrester, an insulator adapted to be penetrated by lightning discharges, and conductors of solid material adapted to be volatilized at the puncture by the discharge to insulate the puncture from the conductors.

18. In a lightning arrester, an insulator non-insulating at high voltages, and conductors of solid material adapted at high temperatures to be dissipated at the non-insulation points to isolate those points from the remaining conductors.

19. In a lightning arrester, conductors, an insulator adapted to be punctured at high voltage discharges, and a conductor of solid material adapted to be dissipated by the discharge at the punctures to isolate the puncture from the body of the conductor.

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

WILLIAM W. DEAN.

Witnesses:
R. G. SANDS,
F. O. RICHEY.