(No Model.) 2 Sheets—Sheet 1.

A. J. WURTS.

LIGHTNING ARRESTER.

No. 571,103. Patented Nov. 10, 1896.

Fig. 1.

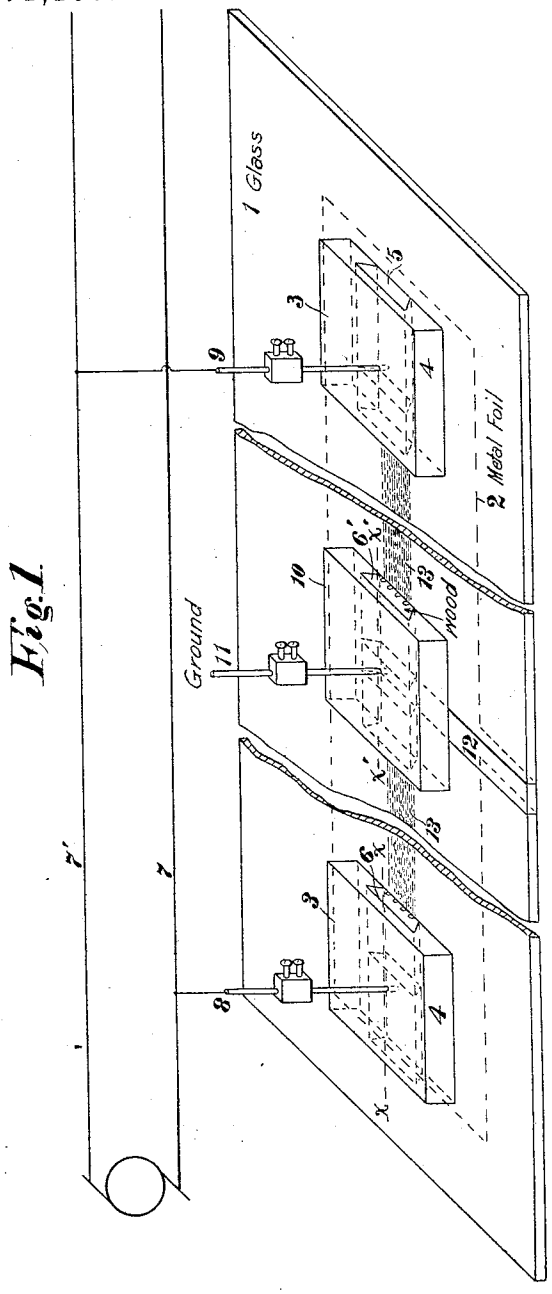


Fig. 4.

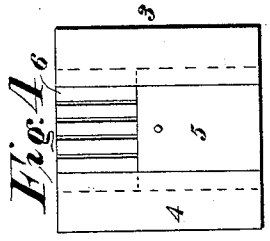


Fig. 3.

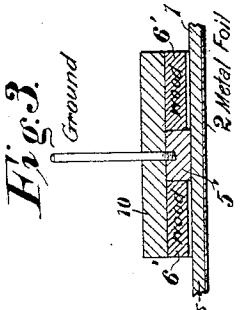
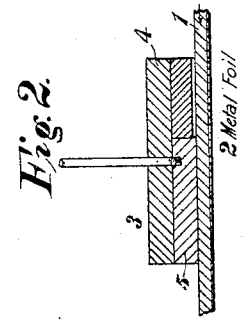


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

A. J. WURTS.

LIGHTNING ARRESTER.

No. 571,103. Patented Nov. 10, 1896.

Fig. 5.

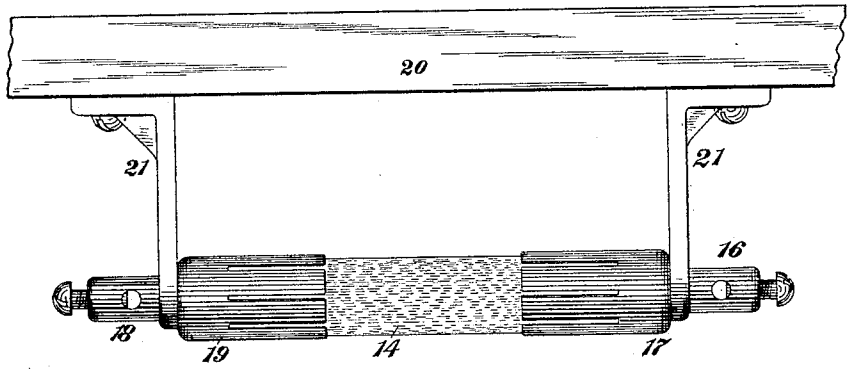
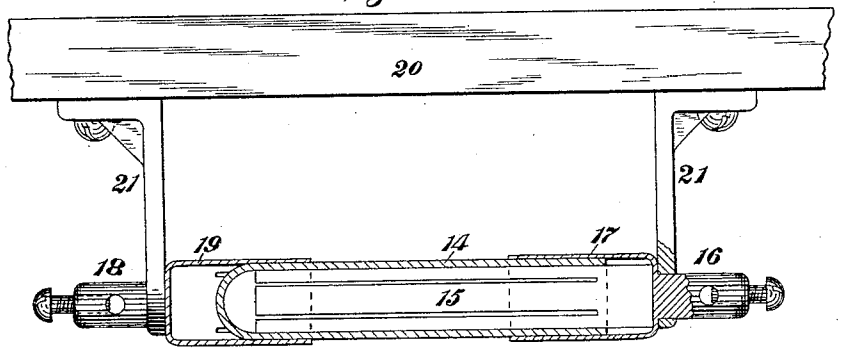


Fig. 6.



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UNITED STATES PATENT OFFICE.

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LIGHTNING-ARRESTER.

SPECIFICATION forming part of Letters Patent No. 571,103, dated November 10, 1896.

Application filed March 11, 1896. Serial No. 582,792. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER JAY WURTS, a citizen of the United States, residing in Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Lightning-Arresters, (Case No. 688,) of which the following is a specification.

My invention relates to means, generally known as "lightning-arresters," employed for protecting electrical machines and apparatus from the injurious effects of static charges derived from the atmosphere, and it has for its object to provide a device of this general character which shall preclude the formation of a dynamo-arc between its terminals and which shall insure the grounding of static charges accumulated upon the line, whatever within widely-separated limits may be the potential of the circuit to be protected.

It has heretofore been considered necessary to connect several lightning-arresters in series in order to properly protect high-potential circuits, for the reason that the dynamo-arc could not otherwise be either suppressed or promptly extinguished on account of the necessarily small space separating the electrodes. Trouble has also been experienced with lightning-arresters employed in connection with low-potential circuits by reason of the bridging or beading over of the terminals due to the fusing action of static discharges. It is therefore obviously desirable to increase the space between the electrodes of the spark-gap as far as is possible without precluding or materially impeding static discharges between the same. It has been demonstrated that a disruptive discharge will pass more easily over a solid insulating-surface between two electrodes than through the air between such electrodes when the insulating-surface is not present. This is believed to be due to the fact that in passing over the insulating-surface the discharge separates the molecules of air from the molecules of the insulating-surface, and in so doing performs less work than when the discharge passes directly through the air, for the reason that the molecules of air are not in such intimate contact with those of the insulating-surface as are the molecules of air with each other. It has also been demonstrated that if two electrodes be placed on the same surface of a sheet of insulating material, and one of them be connected to a conducting-body—such, for example, as a metallic sheet adjacent to or a coating upon the opposite surface of the insulating-sheet—a materially longer spark can be obtained between the electrodes over the insulating-surface than could be obtained if one of the electrodes were not connected to the conducting-body upon the opposite side. The conducting-body upon the side of the insulating-plate opposite to that of the electrodes serves to give a condenser action to the apparatus, in consequence of which the air on the side of the plate opposite to such conducting-body is repelled, and the path between the electrodes is thus more readily and easily traversed by the discharge than is the case when the normal relation between the molecules of air and those of the insulating-surface exists. The effect of such an organization of apparatus upon the passage of a static discharge is so great that it has been found, for example, that a twenty-four-inch spark may be obtained between the electrodes when they are shunted by one and three-fourths-inch air-gap. It will therefore be readily seen that it is practicable by means of my invention to separate the electrodes of lightning-arresters a very much greater distance than has heretofore been possible.

In the accompanying drawings, Figure 1 is a perspective view of a double-pole lightning-arrester adapted for use with high-potential circuits and constructed in accordance with my invention. Fig. 2 is a detail sectional view on line $x\,x$ of Fig. 1. Fig. 3 is a similar view on line $x'\,x'$, and Fig. 4 a plan view of one of the end blocks shown in Fig. 1 reversed in position. Fig. 5 is a side elevation of a lightning-arrester for low-potential circuits, and Fig. 6 a longitudinal section of the same.

Reference being now had particularly to Figs. 1 to 5 of the drawings, 1 is a plate of insulating material, preferably of glass or some analogous substance, although any other suitable insulating material may be employed, and 2 is a sheet of conducting materal, pref-

erably metal foil, applied to the under side of the plate as a coating. As indicated in the drawings, however, this coating does not extend to the edges of the insulating-plate. The exact dimensions of the coating are not material, but it is preferably of sufficient length to span the distance between the electrodes. Blocks 3, which may be duplicates of each other, are cemented to the upper surface of the plate 1, near the respective ends of the same, each of these blocks having substantially the construction of the terminal block shown and described in Patent No. 532,354, granted to me January 8, 1895, the block consisting of a body of insulating material, preferably of wood, provided with a dovetailed groove or recess, in one end of which is a metal terminal piece 5, and in the other end of which is a piece 6, preferably of hard wood, provided with longitudinal shallow grooves burned into its face, constituting what I have termed a "discharge-wedge."

One of the terminal plates or pieces 5 is connected to one side, 7, of a high-potential circuit by a conductor 8, and the other to the other side, 7′, of such high-potential circuit by a conductor 9. A block 10 is cemented to the upper surface of the plate midway between the blocks 3, and this block 10 is substantially the same in construction as the block 3, except that the metallic terminal piece 5′ is located at the middle of its dovetailed recess or groove, and grooved blocks 6′, in all respects like the parts 6 above described, are located at each side of the terminal piece 5′. This terminal piece 5′ is connected to earth by means of a conductor 11. It is also electrically connected with the conducting sheet or coating 2, preferably by means of a strip of metal foil 12, extending to the edge of the plate 1, over the same, along the top, and under the terminal piece 5′. Either the whole of the upper surface of the plate 1, if constructed of glass, is ground or the spaces between the pieces 6 and 6′ are ground or roughened, and these last-named spaces rubbed with plumbago or some similar conducting material, as indicated at 13, in order to facilitate the passage of the static discharge from either or both of the conductors 8 9 to the terminal piece 5′, and thence to the ground. This construction of apparatus also tends to facilitate the passage of the dynamo-current, but to a less degree, and the production and maintenance of an arc is prevented by the non-arcing terminal blocks. It will be understood from the foregoing description that these terminal blocks 3 and 10 may be separated a distance very much greater than has been possible with apparatus heretofore employed without materally impeding the passage of static discharges. It will also be understood that while a double-pole lightning-arrester is shown the invention is equally applicable to a single-pole arrester.

In Figs. 5 and 6 is shown a lightning-arrester adapted for low-potential circuits, such, for instance, as those employed in telegraphy and telephony. In the circuits employed for this class of work the lightning-arresters usually employed have consisted of two electrodes brought into such close proximity to each other that when a discharge occurred the electrodes were liable to be bridged or beaded over. This difficulty is entirely avoided by the employment of the apparatus here shown, in which 14 is a glass tube, the outer surface of which is preferably ground and rubbed with plumbago, as indicated in Fig. 5. Inside of this glass tube 14 is a metal tube 15, preferably slotted, as indicated, in order that it may be readily inserted into the tube 14 and closely fit the same. This tube 15 may be in the form of metal foil, however, if desired, instead of the sheet metal indicated in the drawing. This inner tube or coating 15 is electrically connected at its outer end to one binding-post 16 of the lightning-arrester. The electrode 16 is also connected with the outer surface of the tube 14 by means of a slotted metal tube 17, the internal diameter of which is substantially the same as the external diameter of the tube 14. The other binding-post 18 of the arrester is connected with the outer surface of the tube 14 by a metal tube 19, also preferably slotted in order to make a close fit between the said parts. The lightning-arrester thus constructed may be attached to any desired supporting-base 20 by means of brackets 21 or by any other suitable means.

It will be understood from the foregoing illustration and description that disruptive discharges will occur between the ends of the metal tubes 17 and 19, connected, respectively, with the binding-posts 16 and 18 over the surface of the glass tube 14, the passage of the discharge being facilitated by the particles of plumbago adhering thereto, and that the distance between the inner ends of the tubes 17 and 19 is sufficiently great to preclude any bridging of the space between them by reason of the fusing together of the parts.

The special forms of apparatus shown and described are merely illustrative, and I do not therefore desire to be understood as limiting my invention as regards the specific apparatus employed.

I claim as my invention—

1. A lightning-arrester comprising a non-conducting body and a pair of separated terminals, provided with arc-suppressing means, and located in close proximity to one surface of said body, and means for repelling the air from said surface.

2. A lightning-arrester comprising a non-conducting body, a pair of separated terminals located in close proximity to one surface thereof, and a thin conducting-film between said terminals, and means for repelling the air from said surface.

3. A lightning-arrester comprising a non-conducting body having a comparatively smooth surface, a pair of separated terminals

in contact therewith and provided with arc-suppressing means, a thin, conducting-film between the same, and means for repelling the air from said surface whereby the passage of electrical discharges is facilitated.

4. A lightning-arrester comprising a non-ducting plate, a pair of terminal blocks upon one side thereof, each of which embodies a metal terminal and an adjacent discharge-wedge, a thin metal sheet upon the opposite side of the non-conducting plate and a metal strip connecting said metal sheet with one of said metal terminals.

5. A lightning-arrester comprising a non-conducting body, a pair of separated terminals in contact with one face thereof, a conducting-film on said face between the terminals, a conducting-body upon the opposite face of the non-conducting body and spanning the distance between the terminals and electrically connected with one of them.

6. A lightning-arrester comprising a conducting and a non-conducting body in contact with each other, a pair of separated terminals in contact with the side of the non-conducting body opposite said conducting-body, a thin coating of plumbago between said terminals and a metal connection between one of said terminals and the conducting-body.

7. A lightning-arrester for high-potential circuits comprising a non-conducting plate, a pair of terminal blocks cemented to one face thereof each having a metal terminal piece and an adjacent discharge-wedge, conducting-film between said terminal blocks and a coating of metal foil upon the opposite side of said non-conducting plate and an electrical connection between the same and one of the terminal blocks.

8. A lightning-arrester comprising a plate formed of glass or analogous material, a pair of discharge-wedge terminal blocks cemented to one side thereof and a coating of metal foil upon the opposite side and an electrical connection between the same and one of the terminals, the surface of said plate between the terminal blocks being ground and provided with a thin coating or film of plumbago.

9. A lightning-arrester comprising a plate formed of non-conducting material, two terminal blocks for connection with the respective sides of an electric circuit and an intermediate block for connection to the ground, all cemented to one side of the plate and provided with arc-suppressing means, a metal coating on the opposite side of the plate and an electrical connection between the same and the middle terminal block.

In testimony whereof I have hereunto subscribed my name this 7th day of March, A. D. 1896.

ALEXANDER JAY WURTS.

Witnesses:
WESLEY G. CARR,
HUBERT C. TENER.