(No Model.)

C. S. VAN NUIS.

LIGHTNING ARRESTER.

No. 500,726. Patented July 4, 1893.

Fig. 1.

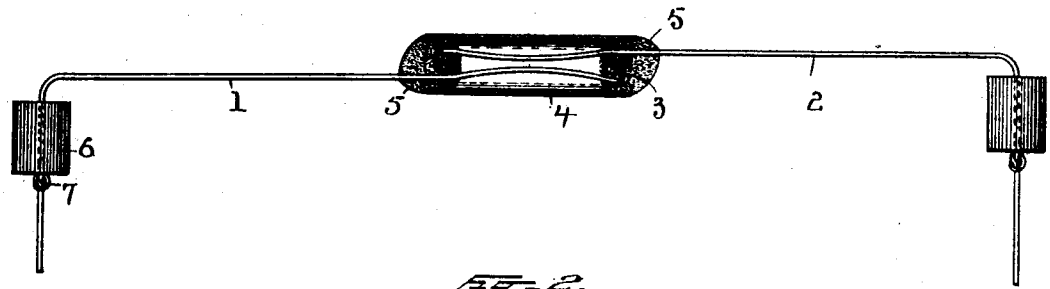


Fig. 2.

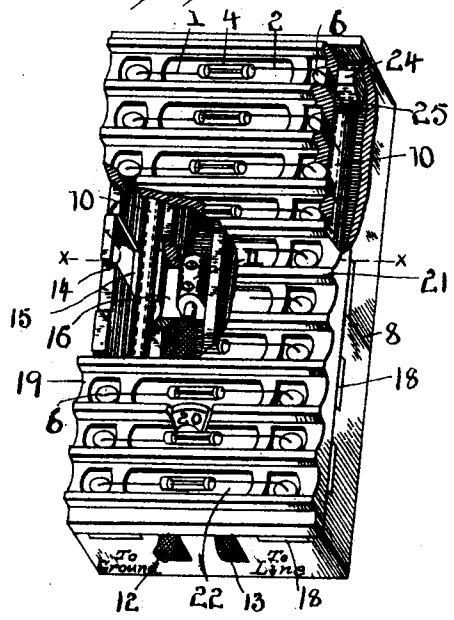
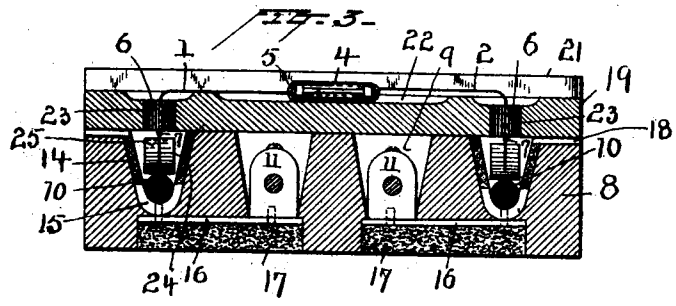


Fig. 3.



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CHARLES S. VAN NUIS, OF NEW BRUNSWICK, NEW JERSEY.

LIGHTNING-ARRESTER.

SPECIFICATION forming part of Letters Patent No. 500,726, dated July 4, 1893.

Application filed August 20, 1892. Serial No. 443,598. (No model.)

To all whom it may concern:

Be it known that I, CHARLES S. VAN NUIS, a citizen of the United States, residing at New Brunswick, in the county of Middlesex and State of New Jersey, have invented a certain new and useful Improvement in Lightning-Arresters, of which the following is a specification.

The present invention relates to lightning arresters of such character that each arrester is destroyed by a single use.

The main object of the invention is to provide a simple, economical and improved construction of arrester adapted for general use, especially upon circuits using a ground return, and improved means for supporting several arresters and for throwing them successively into condition to operate, and the invention consists in the lightning arrester and in the several combinations hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a view, partly in section, of one of the improved arresters, being about twice the scale used in actual practice on five hundred volt circuits. Fig. 2 is a perspective view, with parts broken away, of the improved holder or reservoir, with several lightning arresters in place thereon; and Fig. 3 is a section thereof, on a larger scale, on line *x*—*x* of Fig. 2.

In my Patent No. 478,383, dated July 5, 1892, is described an arrester having sections of fusible wire in line with each other end to end, the meeting ends being separated by a short space, so that the wires were mechanically connected but electrically separated; several such arresters were mounted so as to move forward bodily into operative position, one after another, as lightning discharges occurred. According to the patent, the meeting ends of the wires are connected to opposite sides of insulating beads. This construction is good, but it is found in practice that sometimes the sections of wire become a little loose, thus allowing the ends of the wires looped through the beads to come nearer together destroying or injuring the arrester. This is avoided by the present improvement. The bodily movement of all the reserve arresters, each time one arrester is used up, is also avoided and the movement of small circuit closing conductors substituted.

The improved lightning arrester consists of separate wires 1, 2, preferably of brass, and of such size that they will be quickly vaporized or destroyed by the dynamo current which will pass after a lightning discharge through them. The adjacent or meeting ends of these wires are preferably curved slightly, as shown, and when being assembled are brought to within about one-twentieth of an inch apart at the point where they are nearest together by being placed in a suitable holder, and when in that position are secured by wax pellets 3. By thus curving the ends slightly, the desired nearness of the conductors can be obtained, and the overlapping ends can be held in such position that there shall be no danger of actual electrical connection between the conductors. When the conductors have thus been secured in the proper relative position, a glass tube 4 is slipped over the overlapping ends and secured in place, and the tube tightly closed by the non-conducting wax or cement 5. This inclosing tube serves merely to keep dust and moisture from the overlapping ends of the conductors, and prevents all danger of said conductors being accidentally electrically connected. 6 are rubber or other insulating plugs on the outer ends of the conductors 1, 2. Said conductors are preferably knotted at 7 to hold said plugs thereon, the knots being formed, and the long ends of the conductors inserted through the plugs before the ends are overlapped and secured as above described.

8 is a porcelain or other insulating block or box, having several grooves or channels 9 extending nearly from end to end thereof. Within the two outer channels are carbon rods 10, and in the two inner grooves are connecting devices 11, to one of which a ground wire 12 may be connected, and to the other of which a wire 13, connected to line, may be connected. Within the side grooves, in suitble depressions 14, are U-shaped pieces 15, adapted to grasp the carbon rods and to make good electrical contact therewith, said pieces 15 being joined to the connecting devices 11 by metal cross-plates 16, as shown, these plates being put in from the bottom of the block and covered with non-conducting wax or material 17. The depressions 14 above

the pieces 15 are also filled with wax or plastic material, flush with the main wall of the groove, as shown in Fig. 3. The top of the box or block is provided at several points with notches 18 on the sides and at the bottom, communicating with the side grooves, to form outlets for vapors formed by burning the fuses.

19 is a porcelain plate forming a cover for the grooved block or box. This plate may be secured in place by any suitable means, such as one or more thumb-screws 20, and is provided with a series of transverse ribs 21, with depressions 22, and with holes 23 along opposite edges, adapted to receive the rubber or other insulating plugs 6 on the arresters. Several arresters are put in place on this cover by forcing the rubber plugs into the holes 23. The ends of the conductors 1, 2, below the knots 7, are of such length that when inserted as just described they stand near to, but out of contact with, the carbon rods 10, as most clearly shown in Fig. 3.

24 are light wedge-shaped blocks of carbon, the edges 25 of which are adapted to wedge between the ends of the conductors 1, 2, and the carbon rods 10, and to connect the same, as indicated in Figs. 2 and 3. The wedges are of such size and shape that however placed in the grooves they will surely operate to connect the arrester terminals with the rods 10, but are loose in the grooves so as to move easily. Being light, they are readily held by the ends of the arrester wires; at the same time, by wedging in between said ends and the rods 10, positive electrical connections are established, which, however, are too light contacts to carry an electrical current equal to the capacity of the arrester wires; so that when the overload occurs, which melts these wires, the ends supporting the wedges are readily volatilized, and are among the first parts of the arrester to disappear under the influence of the consuming arc. The effect of the three breaks (namely, at the center and at the terminals of the arrester) in the circuit during the vaporization of the arrester, is beneficial to the remaining parts of the apparatus, by reducing the temperature of the arc. While the wedge shaped conductor is preferred it is not always essential, as other forms may be used, though generally with less advantage.

When the devices described are to be used, several arresters are inserted and the holder placed in an upright position, with the carbon wedges 24 between the ends of the upper conductors 1, 2 and the carbon rods 10, as indicated in Fig. 2, thus putting the first arrester in position to operate but leaving all the others disconnected. When a lightning discharge occurs, the entire first arrester will be instantly destroyed by the heat caused by the current which will follow the discharge across the gap of the arrester, and the wedges 24 will fall down against the succeeding arrester, putting it into condition to operate, and so on, for each successive discharge. The main portions of the arresters being outside of the cover, the hot vapors produced by the destruction of the conductors can readily escape and will do no damage. The ribs 21 prevent these vapors, and hot particles of metal, extending to the succeeding conductors and injuring them. The small quantities of gases which are formed within the grooves 9 can readily escape through the openings 18. Should water beat into these openings at the side of the box, it will do no damage since it will run out at the bottom and will not fill up the grooves and short-circuit the conductors. When the arresters are exhausted, the holder can be refilled with very little trouble and expense. By overlapping the meeting ends of conductors 1, 2, they extend nearly parallel and quite near together for a considerable distance, say a third of an inch, and this is found preferable to having such meeting ends approach each other at a single point only.

What I claim is—

1. In a lightning arrester, the combination of fusible wires 1, 2, having adjacent but electrically separated ends, a tube 4 surrounding said adjacent ends and tightly closed around the same, whereby dust and moisture are kept from such adjacent ends without inclosing the entire conductors, substantially as described.

2. A lightning arrester consisting of conductors with adjacent but electrically separated ends, said conductors being of such conductivity as to be instantly fused by a line current following a lightning discharge, whereby the lightning arrester circuit will be opened, and a closed tube surrounding said adjacent ends of the conductors, from which tube said fusible conductors extend, substantially as described.

3. A lightning arrester consisting of overlapping but electrically separated fusible conductors, the overlapping ends being curved toward and then away from each other and being secured in fixed relative position, and a short section of tube inclosing said overlapping bent ends, substantially as described.

4. The combination of fusible wires 1, 2, binding pellets 3 for holding the wires in proper relative position, an inclosing tube, and the fillings 5 for closing the tube, substantially as described.

5. The combination, in a lightning arrester, of conductors with ends near together but electrically separated, and plugs thereon near the outer ends of said conductors, by means of which the arresters may be connected to a suitable support, substantially as described.

6. The combination in a lightning arrester, of conductors with ends near together but electrically separated, and insulating plugs thereon near the outer ends of said conductors, by means of which the arresters may be connected to a suitable support, said con-

ductors being bent or knotted near the ends to hold said plugs in place, substantially as described.

7. The combination of a holder for lightning arresters, several lightning arresters arranged thereon, each consisting of conductors with electrically separated ends, mechanically held near together, ground and line conductors, the connection between which is interrupted at said electrically separated ends of one arrester and at similar ends as well as at outer ends of other arresters, and a movable conducting device connecting one of said other arresters at a time in operative condition, substantially as described.

8. The combination of a plate, several lightning arresters arranged in order thereon, each consisting of conductors with ends electrically separated but mechanically held near together, the outer ends of said conductors passing through said plate and terminating near but out of connection with conductors adapted to be connected to ground and to line respectively, and movable conducting devices connecting one lightning arrester at a time to said ground and line conductors, substantially as described.

9. The combination of several stationary lightning arresters one above another, ground and line conductors near to but insulated from the conductors thereof, and one or more conductors movable by gravity for connecting the arresters successively to line, substantially as described.

10. The combination of a plate having several holes therein, lightning arresters, consisting of wires electrically separated but having ends near together and having insulating plugs near their free or outer ends, supported in said holes by insertion of said plugs, conductors behind said plate, near to but out of contact with which the ends of the lightning arrester conductors terminate, and movable conductors adapted to connect said lightning arrester conductors and said other conductors successively, substantially as described.

11. The combination of a grooved block or box, carbon rods or similar conductors in two grooves thereof adapted to be connected to ground and to line respectively, a cover for said grooved block or box, lightning arresters on said cover and having ends extending through the cover into proximity to said carbon rods or conductors, and movable conductors for connecting said arresters successively to the carbon rods, substantially as described.

12. The combination of a grooved block or box, carbon rods or similar conductors in two grooves thereof adapted to be connected to ground and to line respectively, a cover for said grooved block or box, lightning arresters on said cover and having ends extending through the cover into proximity to said carbon rods or conductors, and movable conductors for connecting said arresters successively to the carbon rods, there being openings to allow escape of vapors from said box, substantially as described.

13. The combination of several lightning arresters, conductors adapted to be connected to ground and to line respectively near to but out of contact with the lightning arrester wires, and wedge shaped conductors for connecting the same, substantially as described.

14. A lightning arrester consisting of sections of fusible conductor with adjacent but electrically separated ends, conductors connected or adapted to be connected to line and to ground respectively, and means having a less carrying capacity for current than the fusible conductors connecting the latter to the first mentioned conductors, whereby when a discharge occurs and a dynamo current passes over the arrester branch heat will be developed at the outer ends of the fusible conductors as well as at the central break, substantially as described.

This specification signed and witnessed this 15th day of August, 1892.

CHARLES S. VAN NUIS.

Witnesses:
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EUGENE CONRAN.