W. H. ELLIOTT.

LIGHTNING ARRESTER.

APPLICATION FILED FEB. 18, 1911.

1,066,476. Patented July 8, 1913.

Fig. 1

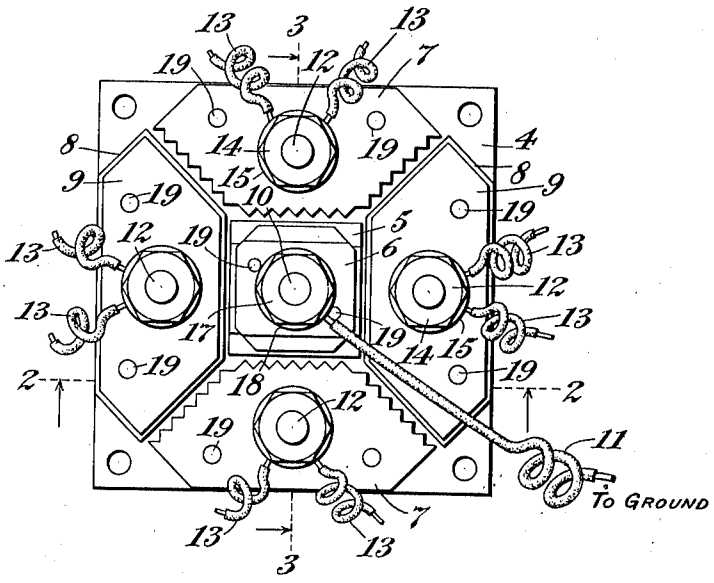


Fig. 2

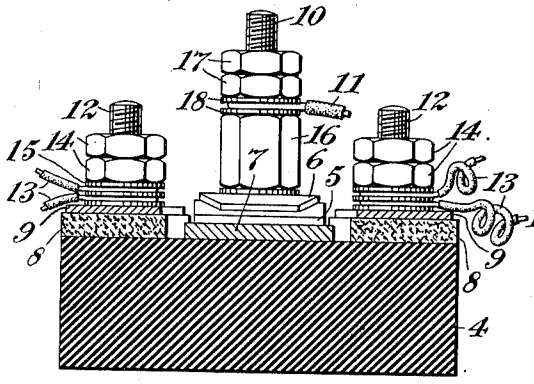
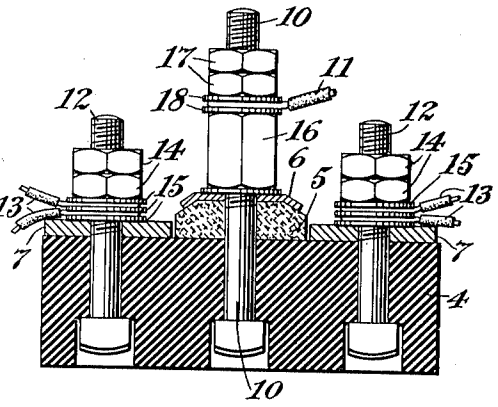


Fig. 3



Witnesses:
Wm. Ashley Kelly
Victor D. Bond

Inventor:
William H. Elliott
by Henry W. Williams
Attorney

UNITED STATES PATENT OFFICE.

WILLIAM H. ELLIOTT, OF ALBANY, NEW YORK, ASSIGNOR TO THE HALL SIGNAL COMPANY, A CORPORATION OF MAINE.

LIGHTNING-ARRESTER.

1,066,476. Specification of Letters Patent. Patented July 8, 1913.

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To all whom it may concern:

Be it known that I, WILLIAM H. ELLIOTT, a citizen of the United States, residing at Albany, in the county of Albany and State of New York, have invented certain new and useful Improvements in Lightning-Arresters, of which the following is a specification, reference being had therein to the accompanying drawings, forming part thereof.

My invention relates to lightning arresters and more particularly to lightning arresters for railway signaling circuits.

Among the general objects of my invention are simplicity and inexpensiveness of construction, and a high degree of effectiveness of operation.

More particular objects are compactness, the effective subdivision and distribution of heavy charges, and the prevention of short circuiting or of cross circuiting by the lodgment of particles in the spark-gaps.

Other objects and advantages will hereinafter appear.

In carrying out my invention a spark-gap terminal forms a common ground for a plurality of line-receiving spark-gap terminals which are arranged in sparking relation with the ground terminal and which are also in sparking relation among themselves, providing thereby a plurality of paths to the ground for very heavy charges. Electrically selective discharge bodies, that is to say, discharge bodies which act as insulators for and prevent the passage of low tension direct currents, but which freely permit the passage of extremely high tension or alternating currents, are arranged with a spark-gap between them or with a spark-gap between such a selective body and an unselective or more freely conductive body, thereby providing maximum protection against the escape of the currents employed in service and yet providing for the free discharge of alternating and high tension currents, such as a lightning discharge. A double discharge path or double spark-gap is provided, one of these spark-gaps being formed by the above mentioned selective body and the other spark gap being formed by a conductive body in contact with or in other electrical connection with such selective body, the latter spark-gap being wider than the former and providing an additional path of discharge for heavy high tension currents or charges. Bridging or cross circuiting between adjacent spark-gap terminals is prevented by making at least one of the terminals of the shorter spark-gaps of selective material and also, as a feature of my invention, by offsetting or placing at different levels adjacent metallic or other freely conductive plates, preventing thereby the lodgment of particles between two freely conductive plates and the consequent building up of a cross circuiting bridge.

My invention more particularly includes a central freely conductive plate located upon a block of electrically selective material, such central plate being surrounded by a plurality of freely conductive plates, alternate plates of which rest upon electrically selective plates, spark-gaps being formed between adjacent plates and between the surrounding plates and the central plate and block.

My invention also includes several details of construction and combinations of parts, as will appear from the following description.

I shall now describe the lightning arrester embodying my invention which is illustrated in the accompanying drawings and shall thereafter point out my invention in claims.

Figure 1 is a plan view of the lightning arrester. Fig. 2 is a section on a plane indicated by the line 2—2 of Fig. 1. Fig. 3 is a section on a plane indicated by the line 3—3 of Fig. 1.

The lightning arrester has an insulating base 4, of hard rubber, porcelain, or other suitable insulating material, such base being shown as square in plan and of rectangular cross section and as having holes at its corners for receiving usual attaching screws. Mounted upon the base 4 are a central spark-gap terminal for connection to the ground, and line-receiving spark-gap terminals surrounding the central terminal and each in sparking relation with the central terminal and with adjacent line-receiving terminals, four of these line-receiving terminals being shown. The central spark-gap terminal includes an electrically selective discharge block 5 and an overlying freely conductive discharge plate 6. The line-receiving spark-gap terminals comprise, in alternate arrangement, a line-receiving terminal including a freely conductive dis-

charge plate 7 and a line-receiving terminal including an electrically selective discharge plate 8 and also including an overlying freely conductive discharge plate 9.

The electrically selective discharge block 5 and the electrically selective discharge plates 8 may be composed of a granular electrically selective material, such as carborundum, and this material is employed in the lightning arrester illustrated in the drawings. This material is known to possess in a large degree the property of giving very high resistance, amounting substantially to insulation, to direct currents such as are used in railway signaling apparatus of the direct current type, while it quite freely conducts extremely high tension and alternating currents, such as constitute lightning discharges. The freely conductive plates 6 and 9 may be of metal, for example, brass, as also may the other parts of the device otherwise than herein particularly specified.

The central discharge block 5 is shown as square in plan and of a thickness sufficient to raise the central plate 6 to a higher level than the line-receiving plates 9, which overlie the selective plates 8. Likewise, the selective discharge plates 8 are of such thickness as to raise the metallic discharge plates 9 above the level of the intermediate or alternately arranged metallic discharge plate 7, shown as mounted directly on the base 4. The upper surface of the central block 5, along its edges adjacent to the plates 7, is beveled so as to taper toward the plates 7, and the central plate 6 is bent down, as shown, over this tapered portion of the block 5 to bring the corresponding edges of the central plate 6 into proper sparking relation with the adjacent edges of the plate 7, the corners of the bent down portions of the plate 6 being removed to obviate their coming too close to the raised plates 9.

The spark gaps provided to the ground connection extend between each of the four lateral boundary surfaces or edges of the central spark-gap terminal and the adjacent edges of the surrounding line-receiving spark-gap terminals. The spark-gaps provided between the line-receiving terminals extend in radial directions from the corners of the central spark-gap terminal toward the corners of the base 4. These outer or line-receiving spark-gap terminals, including the metal plates 7, and the metal plates 9 and carborundum plates 8, do not extend completely out to the corners of the base 4, clearance spaces being left (Fig. 1) for the placing of the attaching screws. The lower line-receiving plates 7 are provided with serrated discharge edges to increase the sparking effect, but the roughness of the discharge edges of the granular carborundum bodies, such as the plates 8, is such that no serrations are necessary.

A central bolt 10 holds in place the block 5 and the central plates 6 and also serves as a binding post for the ground wire 11. Bolts 12, one for each line-receiving terminal, hold in place the plates 7 and the plates 8 and 9, these bolts serving also as binding posts for the line wires 13. Circuit wires or line wires 13 may conveniently enter and leave by each of the posts 12, as shown in the drawings. Usual nuts 14, acting upon washers 15, serve the double purpose of clamping in place the circuit wires 13 and the corresponding spark-gap plates. The embodiment of the invention illustrated in the drawings permits of the connection of four such circuit wires or line wires, each entering and leaving the arrester by the same posts 12. A combined spacing block and retaining nut 16 on the central bolt 10 clamps in place the central plate 6 and the carborundum block 5, and also spaces the outgoing ground wire 11 away from the surrounding spark-gap terminals and their posts 12. The ground wire 11 is shown as clamped in place by the usual nuts 17 and washers 18. Dowel pins 19 of usual form, carried by the metal plates 6, 7 and 9, are provided for holding the spark-gap terminals in fixed position.

It will be noted that all of the metal plates are so arranged that there are large spark gaps between them, although they are in different planes, thus providing for an emergency discharge from metal plate to metal plate.

In operation, a high tension charge in any line will pass from the corresponding line-receiving terminal direct to the grounded central terminal, but it may also be distributed in part among the several line-receiving terminals, and pass from them to the ground terminal; and if the high tension charge is sufficiently heavy, then general distribution and sparking escape may take place by way of all the spark-gaps including the wider spark-gaps between the metal plates. Should particles find lodgment in any of the narrower spark-gaps, that is to say, between one of the serrated plates 7 and the central carborundum block 5, or between such a plate 7 and one of the carborundum plates 8, or between such a carborundum plate 8 and the central carborundum block 5, such lodged particles would not connect two metal plates, but would only connect carborundum with carborundum or carborundum with metal, and thereby, because of the electrically selective properties of the carborundum, the normal functions of the arrester would not be substantially disturbed, the only effect being to slightly reduce the initial sparking resistance of the arrester. Short circuiting or cross circuit-

ing between the metal plates is obviated because of the width of the spark-gaps and of the offset relation of these plates, thereby offering no opportunity for the lodgment of conducting particles connecting these plates.

It is obvious that various modifications may be made in the construction shown in the drawings and above particularly described within the principle and scope of my invention.

I claim:

1. A lightning arrester comprising an insulating base, an electrically selective discharge plate and a freely conductive discharge plate, these plates being supported at the same level on the base and in sparking relation, and a second freely conductive plate supported upon said selective plate and at a higher level than the first freely conductive discharge plate.

2. A lightning arrester comprising a base of insulating material, an electrically selective discharge block mounted on the base, a conductive plate in contact with the outer side of such block, a plurality of electrically selective plates of less thickness than such block and mounted on the base and forming spark-gaps with the central block but not with each other, and a plurality of conductive plates surrounding the central block, alternate plates of which rest upon the outer sides of the selective plates and alternate plates of which rest upon the base between the selective plates, these latter conductive plates forming spark-gaps with the selective plates and also with the central selective block, and all of the surrounding conductive plates forming wider spark-gaps with the central conductive plate and also each with its adjacent surrounding plates.

3. A lighting arrester comprising a base of insulating material, an electrically selective discharge block mounted on the base, a conductive plate in contact with the outer side of such block, a plurality of electrically selective plates of less thickness than such block and mounted on the base and forming spark-gaps with the central block but not with each other, and a plurality of conductive plates surrounding the central block, alternate plates of which rest upon the outer sides of the selective plates and alternate plates of which rest upon the base between the selective plates, these latter conductive plates forming spark-gaps with the selective plates and also with the central selective block, and all of the surrounding conductive plates forming wider spark-gaps with the central conductive plate and also each with its adjacent surrounding plates, the central selective block being tapered on its outer side toward each of the surrounding conductive plates mounted on the base and the central conductive plate having edge portions extending along the tapered surfaces of the central block toward the surrounding conductive plates on the base.

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

WILLIAM H. ELLIOTT.

Witnesses:
J. M. TITTSUALD,
J. E. THOMPSON.