No. 758,638. PATENTED MAY 3, 1904.

L. R. GAW.

LIGHTNING ARRESTER.

APPLICATION FILED JUNE 3, 1903.

NO MODEL.

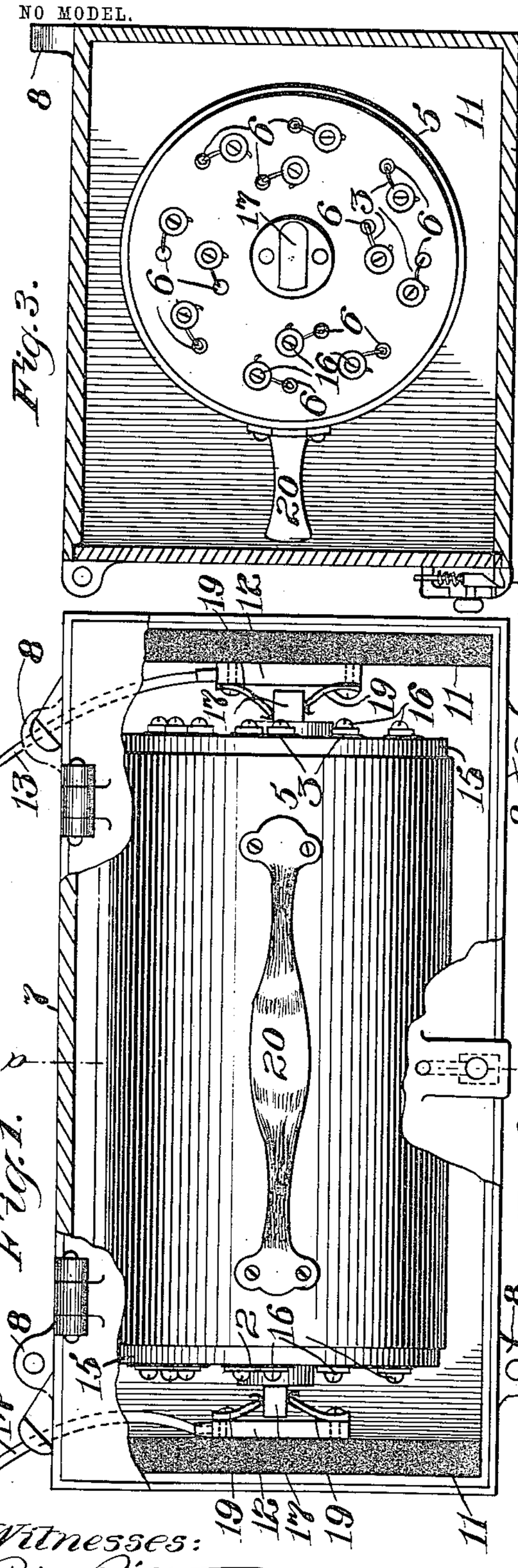

Fig. 3.

Fig. 5.

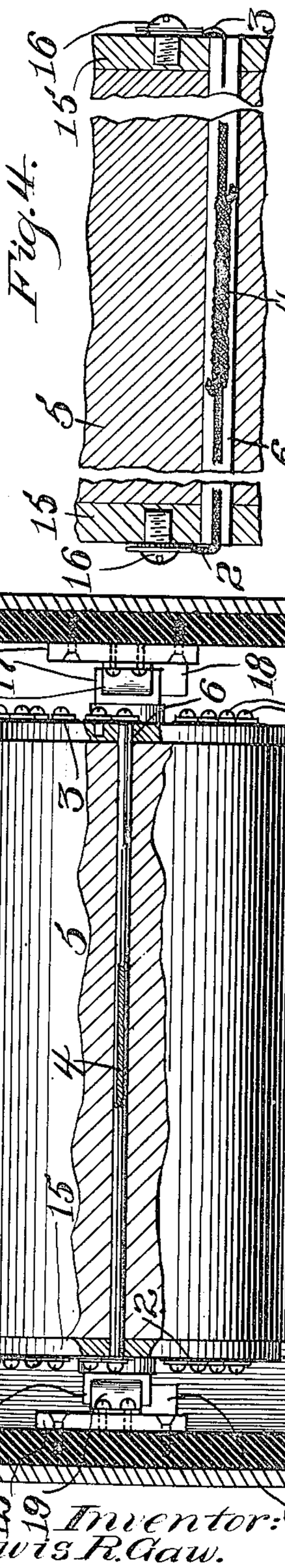

Fig. 4.

Fig. 1.

Fig. 2.

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UNITED STATES PATENT OFFICE.

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LIGHTNING-ARRESTER.

SPECIFICATION forming part of Letters Patent No. 758,638, dated May 3, 1904.

Application filed June 3, 1903. Serial No. 159,858. (No model.)

To all whom it may concern:

Be it known that I, LOUIS R. GAW, a citizen of the United States, residing in Asbury Park, in the county of Monmouth and State of New Jersey, have invented certain new and useful Improvements in Lightning-Arresters, of which the following is a specification.

This invention relates to that class of safety devices which are designed for the protection of power, lighting, telephone, and telegraph lines and other electrical circuits from lightning and other electrical discharges of high potential.

The general species of such devices to which the present improvements pertain embody in their construction an interposed insulator or non-conductor other than the so-called "air-gap" and which while possessing sufficient resistance to prevent the passage of the ordinary current or currents for which the particular line is designed is yet readily pierced or broken down by lightning or other high-potential discharges.

A further important feature of the present improvements relates to the provision of a plurality of paths for the high-potential discharges. In virtue of this feature of the invention the line is protected from a subsequent discharge or discharges even though a preceding discharge has broken down or disrupted the path taken by it in a manner precluding the passage of a subsequent discharge thereover. A lightning-arrester when made in accordance with this latter feature of my present improvements constitutes a protection to the line against a number of discharges following each other in rapid succession and which experience has shown often occurs.

I have found that the ordinary cotton or silk insulation used on insulated electric wires offers a resistance sufficient to prevent the leakage of electricity conveyed by circuits such as enumerated above, but that such insulation is readily pierced or broken down by a lightning or other discharge of high potential. I have further discovered that an efficient device for protecting electrical circuits may be made by joining together the ends of insulated wires from which the insulation has not been removed and which are respectively connected with the positive and negative sides of the circuit. Experience has demonstrated that a convenient and efficient joint for connecting the ends of the lengths of wire is formed by twisting their insulated sections together. If the joint is made in this manner, there will thus exist between the positive and negative sides of the circuit a thickness of insulation double that existing on each wire, although, of course, I do not restrict myself to any definite amount of such intervening insulating material nor to the use of the ordinary insulation provided on insulated wires. I may, for instance, increase the amount of such insulation to an amount somewhat in excess of that referred to, as will appear in the appended detailed description.

The drawings accompanying the present specification set forth an embodiment of the present invention.

In the drawings, Figure 1 is an elevation, part being broken away, of a box or casing in which a block or holder for supporting the connected insulated wires forms fuses or arresters whose ends are connected to the positive and negative sides of the circuit. Fig. 2 is a part elevational, part sectional, view, the plane of the section being at right angles to the plane of Fig. 1 and a portion of the holder being broken away to show an opening therethrough, in which one of the pairs of connected insulated wires or arresters is located. Fig. 3 is a sectional view on the plane of the line *a a* in Fig. 1, the holder, however, being shown in elevation. Fig. 4 is an enlarged detail view of the holder, portions adjacent to the ends thereof being broken away and the ends of the connected lengths of insulated wires being attached to binding-posts on the end faces of the holder. Fig. 5 is an enlarged detail view illustrating a form of joint which may for convenience be used in attaching the insulated ends of the wire together.

Similar characters of reference designate corresponding parts in all the figures.

Wires for conveying electricity are oftentimes wound with cotton or silk insulation,

and for convenience I may use wires so insulated for the manufacture of the present arrester, although it is to be understood that I do not confine myself to the use of wires insulated with such specific material or insulated in the special manner exhibited by insulated wire purchased in the market. In the making of the present arrester I take for convenience of manufacture wire provided with the usual or customary thickness of cotton or silk insulation, since I find by experience that such wire answers the conditions required in service of a lightning-arrester constructed in accordance with the present invention. One such length of wire is connected to the positive side of the circuit and another to the negative side thereof (it being understood, of course, that either one of these sides may be formed by a ground circuit) and bring their unconnected ends into close relation, leaving, however, the insulating material intervening between such ends. Such a relation is set forth in Fig. 5, in which one length of wire is designated by 2 and a length of wire connected with the former is designated by 3. The insulation 4 on the ends and adjacent portions of the wires which are connected is not removed, so that when the ends are joined together no metallic contact exists, and hence a metallic circuit is not present. The ends of the wires are conveniently connected one with the other by twisting them together, for instance, in the manner indicated in Fig. 5. In such condition it is apparent that two thicknesses of insulation—that is, the insulation on the two wires—intervene between the metal of one wire and the metal of the connected wire. The discharge must therefore pierce this double thickness in passing from one wire—that is, from the positive—to the other wire or negative side of the circuit. The free or unconnected ends of the lengths of wire are attached, respectively, to the positive and negative sides of the circuit. In order to increase the resistance interposed between the two sides of the circuit by the arrester, I may leave the insulation upon one or upon both of the ends which are connected directly to binding-screws or other fastening means. In Fig. 5 the insulation is left upon one only of the wires which are to be connected to the binding-screws, while the other end of the arrester is bared or has its insulation removed. The joint and, in fact, the entire length of the arrester may be dipped in shellac or other insulating material to prevent the entrance of moisture to the insulation.

For the convenient mounting of the arrester and to permit the same to be readily inserted in electrical connection with the two sides of the circuit, as well as to enable an arrester that has been "blown out" to be easily removed and a new one inserted, I may employ a removable holder whose opposite ends are connected with the two sides of the circuit. Such a holder is designated by 5 in the drawings, the same being preferably of some insulating or non-conducting material. For convenience a block of wood may be employed through an opening 6, from end to end of which the arrester is inserted. This holder may be held within a protecting-casing—such, for instance, as a box 7—having perforated ears 8, by which it may be attached fixedly in some convenient position. The casing may also bear a hinged closure provided with a catch 10. The holder in the particular construction disclosed in the drawings is supported on non-conducting end plates 11, upon each of which is mounted a metallic or conducting block 12, that at one end of the casing being in electrical connection, as by a wire 13, with one side of the circuit and that at the other in similar connection with the other side of the circuit, as by wire 14. Secured to each end of the carrier 5 is a metallic plate 15, perforations in which are in line with the openings through the carrier and in which the arrester is located. One end of the latter is secured by a binding-screw, such as 16, with one of the aforesaid metallic plates 15, the other end of the arrester being similarly secured to the corresponding plate at the other end of the carrier. From each of the metallic plates 15 extends a lug 17, which when the carrier is in position bottoms upon a stop 18, extending from the metallic block 12, secured to the non-conducting plate 11 at that end. Spring-fingers 19 steady and operate to maintain the inserted carrier in place, which when so located, it is manifest, interposes the arrester between the opposite sides of the circuit. For convenience in manipulating the same the carrier may have a handle 20, as indicated. The construction of the carrier in that it is provided with a plurality of longitudinal openings for the reception of a plurality of arresters such as have been described is indicative of a further feature of the present invention, which embodies, as before stated, the employment of a plurality of arresters all interposed between the opposite sides of the circuit—that is to say, a plurality of connected insulated wires, such as disclosed in Fig. 5, are located in the carrier 5, each arrester being in connection, as aforesaid, with the metal plates 15 at the opposite ends of the carrier. In thus providing a plurality of paths open to the high-potential discharge a means exists for the protection of the line from a number of such discharges taking place in rapid succession. The discharge in passing across from one side to the other will naturally take the easiest path—that is, that particular arrester which presents a less resistance than the others. This variability in the interposed resistance exists between the several arresters, for as ordinarily made there is a variability in the nature of the silk or cotton or other insulation used on the

twisted wires, or there is a slight difference of thickness thereof, or it possesses different hygroscopic properties, &c. Hence a variability in the absolute resistance will exist between the different arresters. Each discharge, therefore, will tend to take place over that one or more of the several arresters whose resistance is less than that of the others. When a discharge takes place through an arrester, the insulation is broken down and the wire is more or less melted. It is evident, therefore, from an inspection at either end of the carrier whether or not an arrester has been blown out, as in the event that it has a blackening or general change in the appearance as compared with the normal condition will be apparent. By providing a plurality of arrester-paths it is also unnecessary to renew the arresters as often as where one alone is employed.

The present invention is particularly useful when applied to the protection of car-motors, being then ordinarily mounted upon some convenient and accessible portion of the car.

Having described my invention, I claim—

1. The combination of a casing, an insulator adjacent to each end of the casing, a conducting-block on said insulators and each having a socket electrically connected with the corresponding side of the circuit, a holder having at each end a metallic plate from which projects a lug adapted to seat in the corresponding socket, said holder being provided with a plurality of passage-ways extending from end to end and through said metallic plates, and a plurality of connected lengths of insulated wire extending through the passage-ways in the holder and having their ends secured to binding-posts on the end plates of the holder.

2. The combination of a casing, an insulator adjacent to each end of the casing, conducting-blocks on said insulators and each having a socket electrically connected with the corresponding side of the circuit, a holder having at each end a metallic plate from which projects a lug adapted to seat in the corresponding socket, said holder being provided with a plurality of passage-ways extending from end to end and through said metallic plates, and a plurality of connected lengths of cotton or silk covered wire extending through the passage-ways in the holder, the wire in each passage-way having one of its insulated ends connected to a binding-post on one end plate of the holder and its other end bared and connected to a binding-post on the other end plate.

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