P. H. THOMAS.

ELECTRIC INSULATOR.

APPLICATION FILED DEC. 17, 1917.

1,373,576. Patented Apr. 5, 1921.

Fig. 1.

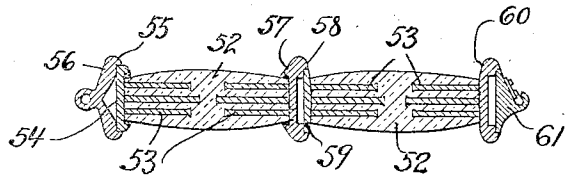
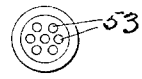


Fig. 2.



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By his Attorney

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UNITED STATES PATENT OFFICE.

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ELECTRIC INSULATOR.

1,373,576. Specification of Letters Patent. Patented Apr. 5, 1921.

Original application filed May 16, 1913, Serial No. 767,995. Divided and this application filed December 17, 1917. Serial No. 207,452.

To all whom it may concern:

Be it known that I, PERCY H. THOMAS, a citizen of the United States, and resident of Upper Montclair, county of Essex, State of New Jersey, have invented certain new and useful Improvements in Electric Insulators, of which the following is a specification.

This application is a division of my application Serial No. 767,995 filed May 16, 1913, now United States Letters Patent No. 1,250,387, issued December 18, 1917.

My invention relates to insulators for high tension electric lines, such as power transmission lines. More particularly my insulator is of the suspension type and is adapted to extra-high tension service.

It is found that the size and cost of high tension insulators, such as are used for high transmission voltages, become excessive as the voltage is raised, and that when several insulators are used in a string to support the line, that the potential of the line is not divided equally between them. As a result after a certain number of units have been put in one string little gain is found in adding more units. My invention provides an insulator which is relatively free from these defects and is at the same time cheaper and easier to construct and more convenient in form. I also utilize a novel mechanical principle in insulators of this type in that I may rely on vitreous material in tension.

I prefer to use insulating material for the main body of my insulator of porcelain, glass or other vitreous material, which has a very high dielectric quality and is capable of being obtained of great uniformity and high quality. This material has certain mechanical limitations, however, due to manipulation in manufacture so that many desirable forms and methods of construction cannot be used. The insulators here shown, however, are well adapted to the characteristics of the materials available for high tension insulators.

The ability of any particular insulating device to stand electric strain is known to depend far more on the distribution of the electric stress in the dielectric or insulating material than on the thickness of the dielectric and I have taken advantage of this principle in my insulator. I have also used such forms of construction whereby a greater thickness of insulating material is practicable than in the ordinary insulator constructions.

I also provide a form favorable for resisting the effects of heavy rain or mist which tend to cause a breakdown of an insulator. I provide an insulator that will have a relatively great mechanical strength as well as good electrical characteristics.

My invention will be understood by reference to the accompanying drawings, in which Figure 1 is a sectional view of a type of semi-rigid suspension insulator and Fig. 2 is a cross-section of the insulator shown in Fig. 1.

Figs. 1 and 2 show a form of insulator where a number of small pieces, extensions, or rods are used arranged to get a better hold on the porcelain than with a single pipe piece, for example and yet form electrically speaking substantially a single conductor or electrode. By this construction thinner porcelain walls than heretofore are obtained, which is an advantage from a manufacturing point of view. This insulator is shown as made up of two parts, semi-rigidly fastened together. Other numbers of units than the two shown may be used. The porcelain pieces are shown at 52, the rods used for carrying the load and forming the electric field are shown at 53 and the metal caps at the top and bottom of the porcelain pieces are shown at 54, 58, 59 and 60. The piece 56 carries the piece 54 and the other supporting pieces are fitted together mechanically to give strength and to shed the rain as is shown. There are ribs or ridges 55 and 57 on the pieces 56 and 58 which are filled with cement and serve to hold the porcelain from breaking out under strain. Similar means may be used with the other porcelains. I sometimes prefer to extend the center rod 53 to give the effect of a somewhat rounded terminal at the central portion of the porcelain, similar to pieces 48, Fig. 6, of the patent referred to to give a somewhat more uniform electric field. This train of insulators will swing as a unit and not each unit on the other as may be the case when the connection between units is flexible. The piece 61 carries the line conductor.

I do not limit my invention to the particular construction shown but claim as well any other embodiment of the same ideas obtaining substantially the same results by

equivalent means and coming within the scope of the claims.

A part of my invention, therefore, is an insulator adapted to secure a relatively uniform distribution of electric field at the critical points, which will greatly increase the voltage that the insulator will stand, and to get simple mechanical forms relying in some instances on the tensile strength of porcelain.

A suitable distribution of the electrostatic field in the portion of the main body of the porcelain or other insulating material lying between the metal attachment pieces is important, as well as in the air surrounding the insulating member, since this will provide greater reliability with a given minimum thickness of porcelain, or a thinner material as may be appropriate. This control of the field within the porcelain may be attained by properly shaping the opposing faces of the metallic attachment pieces. For example, as in Figs 1 and 2, where there are a plurality of opposing faces on each attachment piece, the several faces of each attachment piece being on a mathematical surface, approximately a plane surface and generally parallel to the similar surface containing the faces of the second attachment pieces.

The distribution of these electrostatic stresses in the porcelain or other insulating material can be made more perfect by making the above mentioned plane surfaces slightly convex toward each other, as shown in Figs. 1 and 2, where the central metallic figures may be advanced slightly over the outer figures, as described above.

I claim:

1. A line insulator including an external attachment and an insulating member of vitreous material having three portions, a central portion subjected to the tension load carried by the insulator and insulating the metal parts of one end of the insulator from the metal parts on the other, and two end portions each provided with means for receiving and distributing the tension stress from the external attachment, said means consisting of a group of metallic rods inserted in and secured to each end portion, said groups of rods being symmetrically arranged around a circle thus submitting the full cross section of the insulating member to a substantially uniformly distributed mechanical tension stress, together with means for distributing the external mechanical load among the rods of each group.

2. A line insulator including an external attachment and an insulating member of vitreous material having three portions, a central portion subjected to the tension load carried by the insulator and insulating the metal parts of one end of the insulator from the metal parts on the other, and two end portions each provided with means for receiving and distributing the tension stress from the external attachment, said means consisting of metallic rods inserted in and secured to each end portion, said groups of rods being symmetrically arranged with respect to point of application of the force and distributing the stress substantially uniformly through the cross section of the insulating member.

3. A line insulator including an external attachment and an insulating member of vitreous material having three portions, a central portion subjected to the tension load carried by the insulator and insulating the metal parts of one end of the insulator from the metal parts on the other, and two end portions each provided with means for receiving and distributing the tension stress from the external attachment, said means consisting of metallic attachment pieces distributed substantially uniformly through the body of said end portions and receiving equal portions of the load on the insulator, thus producing the result that no particular portion of the brittle material will receive more than its share of the total tension stress.

4. A line insulator including an external attachment and an insulating member of vitreous material having three portions, a central portion subjected to the tension load carried by the insulator and insulating the metal parts of one end of the insulator from the metal parts on the other, and two end portions each provided with means for receiving and distributing the tension stress from the external attachment, said means consisting of a terminal piece with a group of separated prongs symmetrically and individually secured to each end portion of said brittle tension member, all the prongs on one end portion being at one polarity and the prongs on the other end portion at the opposite polarity.

5. A line insulator including an external attachment and an insulating member of vitreous material having three portions, a central portion subjected to the tension load carried by the insulator and insulating the metal parts of one end of the insulator from the metal parts on the other, and two end portions each provided with means for receiving and distributing the tension stress from the external attachment, said means consisting of groups of thin metal rods connected to terminal pieces and lying parallel to the direction of the tension, the rods connected to each terminal piece being confined to the end portion of the brittle material lying adjacent to the said terminal pieces.

6. A line insulator including an external attachment and an insulating member of vitreous material having three portions, a central portion subjected to the tension load

carried by the insulator and insulating the metal parts of one end of the insulator from the metal parts on the other, and two end portions each provided with means for receiving and distributing the tension stress from the external attachment, said means consisting of a group of attachment pieces all electrically and mechanically connected and equally loaded and symmetrically placed and attached, one group for each end portion.

In testimony whereof I have signed this specification.

PERCY H. THOMAS.