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HIGH VOLTAGE STRAIN INSULATOR.

APPLICATION FILED APR. 4, 1910.

1,054,469.

Patented Feb. 25, 1913.

Fig. 1.

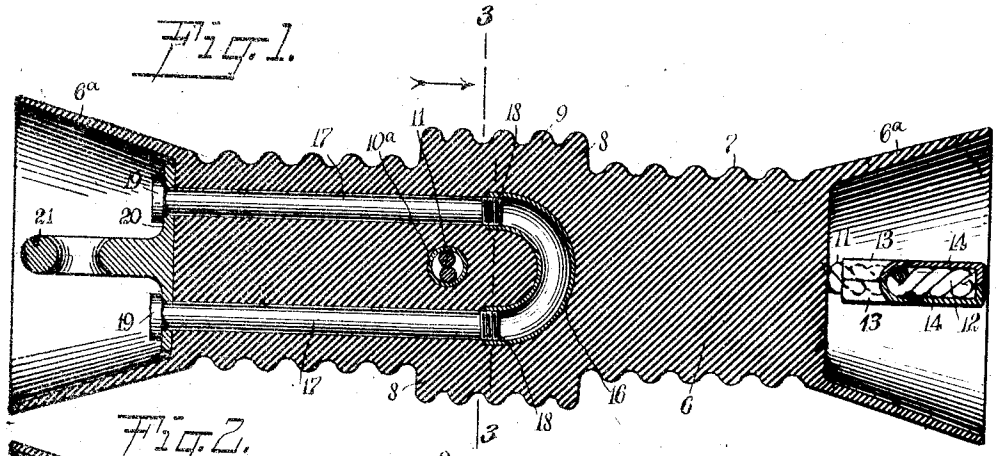



Fig. 2.

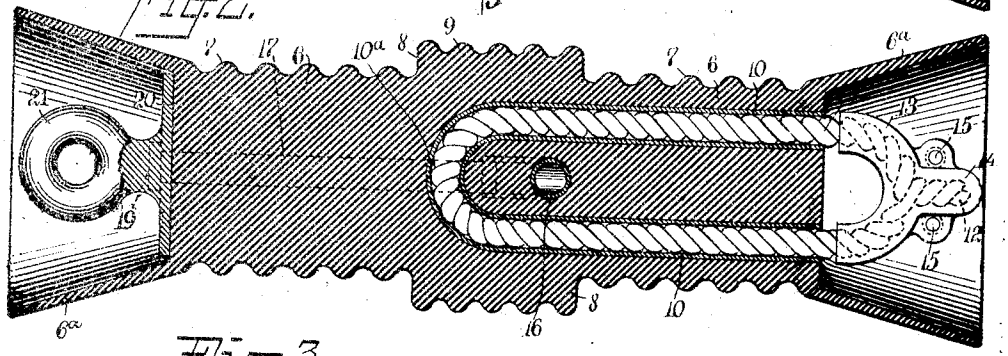



Fig. 3.

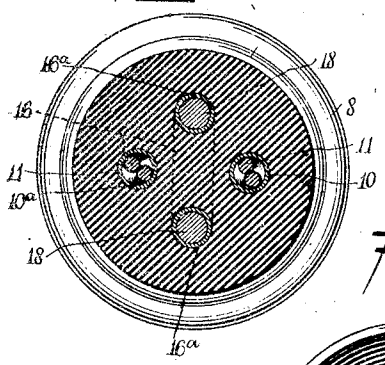



Fig. 5.

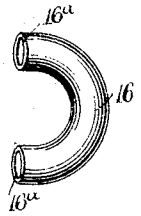
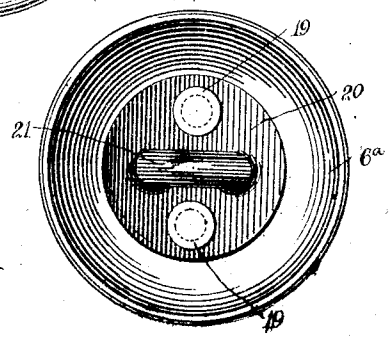



Fig. 4.

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# UNITED STATES PATENT OFFICE.

LOUIS STEINBERGER, OF NEW YORK, N. Y.

## HIGH-VOLTAGE STRAIN-INSULATOR.



1,054,469. Specification of Letters Patent. Patented Feb. 25, 1913.

Application filed April 4, 1910. Serial No. 553,216.

*To all whom it may concern:*

Be it known that I, LOUIS STEINBERGER, a citizen of the United States, and a resident of the city of New York, borough of Brooklyn, in the county of Kings and State of New York, have invented a new and Improved High-Voltage Strain-Insulator, of which the following is a full, clear, and exact description.

My invention relates to strain insulators for high voltage electric conductors to be used in various relations and for various purposes, such as power transmission, and for guy wires or cables employed as stays for towers or for poles, masts and other supports used in wireless telegraphy and telephony, as well as in ordinary commercial work.

I seek, among other things, to provide an insulator which is compact and simple in construction, low in cost, and capable of withstanding a considerable mechanical stress and very high voltages, the insulator thus being, as far as practicable, proof against the evils of leakage, arcing and puncturing.

Among the purposes sought to be accomplished by aid of my invention are the following: I. To provide the insulator body with an opening of such form that a flexible tension member may be inserted for some distance straight into the body of insulating material, and extended out again so as to encircle a considerable mass of the insulating body. II. To facilitate the use of a flexible suspension member, such as a piece of cable, in connection with a brittle body portion, the mechanical pressure of the flexible suspension member being distributed as equally as possible upon the brittle body portion, so as to protect the latter from the injurious effects of mechanical strains distributed unequally. III. To provide the insulator body with a passage of peculiar form for holding a suspension member, and to line this passage with tough material in order to protect the inner surface of the insulator body from undue abrasion. IV. To provide within the body of insulating material a metallic member having generally the form of a semi-ring for gripping against a portion of the insulator body, and tension members detachably connected with the ends of this semi-ring for exerting thereupon the mechanical strain to which the insulator is subjected. V. To connect the tension members last mentioned, with a plate engaging one end of the insulator body and provided with an eye for enabling the insulator body to be suspended. VI. To provide a flexible suspension member having the form of a section of cable with its ends twisted together into a single strand, and a clamp made in halves, said halves being disposed upon opposite sides of said link and together provided with a recess for receiving said single strand and concealing the same. VII. To provide a body of insulating material having metallic tension members extending a considerable distance into it and crossing each other. VIII. To facilitate the removal of the tension members inserted from time to time into the body of insulating material. IX. To strengthen the body of insulating material by reinforcing the same around the points where the tension members cross each other inside of the insulating body, the reinforcing material thus added serving also the additional purpose of preventing arcing over from one end of the insulator to the other. X. To provide the reinforcing portion last mentioned with corrugations for still further improving its insulating qualities. XI. To provide an insulator possessing the highest possible form of electric insulation combined with great mechanical strength. XII. To provide certain internal parts of the structure with yielding members. XIII. To provide certain internal parts of the structure with members for resisting mechanical stresses. XIV. To provide certain internal parts of the structure with hollow members to operate in conjunction with the strain members. XV. To provide tension members with fastening members of such conformity as to enable one to attach or remove them at will. XVI. To protect from the weather a portion of the insulating member, terminal, conductor or guy as the case may be, which may be employed in connection with the insulator. XVII. To protect the line wire or guy wire from falling in the event that the insulating member or any part thereof becomes injured or destroyed. XVIII. To give the various parts such conformity as will tend to prevent leakage, arcing or puncturing under the influence of currents of high potential, and to adapt the device for application in various relations.

Reference is to be had to the accompanying drawings forming a part of this speci-

fication, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a central longitudinal section through my improved strain insulator; Fig. 2 is a longitudinal section of the same, but taken in a plane at right angles to the section indicated in Fig. 1; Fig. 3 is a cross section on the line 3—3 of Fig. 1, looking in the direction of the arrow; Fig. 4 is an end elevation showing the insulator as it would appear to a person standing at the left of Fig. 1; and Fig. 5 is a detail of a hollow metallic semi-ring employed in the body of the insulator and which I designate, for convenience, as a stirrup.

A body 6, of insulating material, say porcelain or "electrose," has generally the form of a solid cylinder and is provided with annular corrugations 7 and with a portion 8 of greater diameter than the rest of the body portion, this portion 8 being provided with corrugations 9. A U-shaped tube 10 is made of metal and embedded within the body portion. This U-shaped member consists essentially of two straight cylindrical portions connected together by a portion $10^a$ having the form of a semi-ring integral with the two straight portions. A link 11 is made of a section of cable which is first threaded through the U-tube and its ends twisted together so as to form a single strand 12 extending directly away from the body portion of the insultaor. A clamp 13 is made in halves, each having substantially a Y-form, these two halves being secured directly together by aid of bolts 15. The clamp when completed contains a receptacle 14 into which a twisted portion 12 extends and is thereby concealed from view. The portion 14 is disposed in the path of the greatest strain to which the clamp is subjected, and upon this account greatly strengthens the clamp and the link 11.

At 16 is a hollow metallic member having the form of a semi-ring, the ends of which are provided internally with threads $16^a$. The member 16, because of its peculiar office, I designate as a stirrup. It is embedded within the body of insulating material and leading down to its ends are two straight passages of considerable length. Extending through these passages are bolts 17 having threaded ends 18 which are screwed into the ends of the stirrup. The bolts 17 are provided with heads 19 and extend through a disk 20. Integrally connected with this disk is an eye 21, shown more particularly in Fig. 4.

The link 11, being from its nature a tension member, necessarily places upon the body of insulating material a considerable mechanical strain when the insulator is in use. It is very important that this strain shall be distributed as nearly equally as possible upon different portions of the insulator body. This distribution of the strain is effected in two distinct ways. First, the flexibility of the link 11 allows each part of it to yield slightly if necessary, and this prevents any one portion from sustaining all, or any excessive portion, of the strains in question. Again, the U-tube 10, by receiving the strain from a plurality of points within it and transferring these strains to the body portion, must necessarily tend to distribute them, as these strains can not be transmitted from the flexible link 11 through the U-tube to the body portion of the insulator, without more or less equilization of the strains and the conversion thereof into a comparatively steady uniform bearing pressure.

The net result is that owing to the equalization and proper distribution of the strains upon the body of insulating material, the latter is virtually strengthened, or at least its capability to bear different degrees of strain is virtually increased, and this increase is rendered still greater because of the mechanical strength of the U-tube which is of metal, and by its anchorage within the body member tends to still further distribute the strains to points remote from their application.

The action of the bolts 17 and stirrup 16 is such as to distribute mechanical strains applied to the eye 21. The stirrup 16, because of its form as a semi-ring, and further because of its being hollow and made of thin metal, can undergo slight degrees of distortion and in so doing is caused to fit more neatly against the adjacent portions of the body member of the insulator. The mechanical strain exerts a straight pull upon the bolts 17 in the general direction of the axis thereof, and this strain being applied to the ends of the semi-ring 16 and slightly distorting this ring if necessary, strains are of course distributed to great advantage in preventing breakage of the body member. Again, the semi-ring 16, having a form which is arcuate in the plane of the greatest width of the member, and the portion $10^a$ of the U-tube having a form which is arcuate in cross section (compare 16 and $10^a$, Fig. 1), it will be seen that the general direction of extent of the semi-ring 16 is approximately concentric to the circular cross section of the portion $10^a$ of the U-shaped member. This arrangement affords great strength and still further promotes a proper distribution of the mechanical strain. It will be noted, however, that (see Fig. 1) the semi-ring 16 projects slightly beyond the outermost portions of the bolts 17, and being of metal it practically renders thinner the covering of insulating material outside of the semi-ring and adjacent to the outermost portions of the body member. Partly on this account I add

the portion 8 of insulating material, so as to increase the diameter of the body member directly through a zone occupying the proximate middle of the body portion. This portion 8 being thus built up and serving as a reinforcement for the insulator body at its point of greatest strain, serves also the purpose of a portion for improving generally the insulation afforded, and the addition of the corrugations 9 still further carries out this object.

Mounted upon the two ends of the body 6 of insulating material, are collars $6^a$, forming a hollow or cup-shaped end portion on the body 6, which serve to shelter the metallic parts contained within them, thereby protecting these parts from undue exposure to the weather. It will be noted that the outer ends of the collars $6^a$ extend fully to the outermost limits of the eye 21 and the clamp 13, so that the innermost portions of the collars are always dry and dry spaces are always adjacent to the various metallic parts nearest the body 6 of insulating material.

Owing to the novel construction of my strain insulator, it will be observed that for any given zone of insulation body, it provides the greatest possible insulating surface for the prevention of surface leakage and also the tendency to arc and to puncture, thereby producing a very large factor of safety. The disposition of the strain members relatively to each other and to the insulating member is such that the insulator is entirely exempt from all but compression strains, and hence possesses exceptionally great mechanical strength, combined with the highest possible form of electrical insulation.

These insulators may be used separately or any number of them may be linked or connected together, or connected to insulators of different form, in any preferred manner, so as to increase the aggregate insulation for supporting a line, dead ending, guying or in any other relation where currents of very high potential are employed.

I do not limit myself to the exact form nor to the details of any or all of the parts above shown and described, nor do I limit myself to any particular construction of the extending collars on the ends of the body portion; nor to use at all times hollow members within the passages. Nor do I limit myself to the use of any prescribed materials, as in some instances I may employ the insulating material well known in this art, as "electrose", or I may employ porcelain or any other suitable material.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. A high voltage insulator, comprising a body member of moldable insulating material provided with a passage extending thereinto, a tubular metallic lining embedded within said body member and extending through said passage and tension mechanism connected with said body member and provided with an eye disposed opposite said tubular metallic lining for the purpose of supporting said body member.

2. A high potential strain insulator, comprising a body portion provided with a U-shaped passage disposed completely inside of the same, a U-shaped lining mounted within said passage for protecting said body portion from abrasion, and a link extending through said passage and through said U-shaped lining.

3. A high voltage strain insulator, comprising a body member of insulating material, provided with a substantially U-shaped passage disposed entirely within said body member, and a hollow member disposed within said U-shaped passage and likewise disposed entirely within said body member.

4. As an article of manufacture, a high voltage strain insulator, comprising a longitudinal body portion of insulating material having integral therewith collars at its opposite ends, said collars extending in the general direction of said body portion and forming cup-shaped end portions, and detachable flexible strain members extending from said body portion into said cup-shaped end portions.

5. A rod type insulator, comprising an elongated body portion of insulating material formed with hollow cup-shaped ends, and flexible strain members having straight portions extending longitudinally through the material of said elongated body and protruding into the hollows of said ends, being received in U-shaped apertures formed in the material of said elongated body opening into said hollow ends.

6. A rod type insulator, comprising an elongated body portion of insulating material having two U-shaped tubular passage-ways formed therein by the material of the body portion extending from opposite ends of the elongated body portion, each U-shaped passage-way having its pair of legs opening through the respective end surfaces of said body portion and extending longitudinally through the material of said body portion in a substantially straight line to a point beyond the center of the body portion, and said passage-way being entirely encircled, concealed and protected by the material of said body portion throughout their extent except as their ends open through the end surface of the body portion.

7. An insulator comprising a body portion of insulating material formed with a hollow cup-shaped end, a flexible strain member having a substantially straight portion extending longitudinally through the material of said body portion and protrud-

ing into the hollow end thereof, and having a bent portion beyond the substantially straight portion within said body portion, the bent portion of said flexible strain member being received in an aperture formed in the material of said body portion, said aperture having a wall portion disposed substantially transversely of the direct line of pull longitudinally of the straight portion of the strain member, and means engaging the strain member beyond the bent portion thereof for maintaining it against bodily withdrawal, whereby the transversely arranged wall portion of the aperture within the body portion is subject to the direct yielding strains of the flexible strain member.

8. A rod type strain insulator, comprising an elongated body portion of insulating material, a pair of strain members, each having a substantially straight portion extending longitudinally through the material of said elongated body and protruding from the respective ends thereof, and each of said strain members having a bent portion beyond the substantially straight portion thereof within said elongated body, the bent portions of said strain members being each received in an aperture formed deep in the material of said elongated body, each of said apertures having a wall portion disposed transversely to the direct line of pull longitudinally of the straight portion of the strain members, the transversely disposed wall portions of the two apertures being in opposed relation, and means engaging the strain members beyond the bent portions thereof for maintaining them against bodily withdrawal, whereby the transversely arranged wall portions of the apertures deep within the elongated body are subjected to the direct strains of the strain members by a compression strain tending to force them toward each other.

9. In a device of the class described, a body of insulating material having a U-shaped passage-way located therein, the ends of said U-shaped passage-way terminating at the end of said body of insulating material, a flexible tension member located within said passage-way and having its ends protruding from the end of said body of insulating material, and a protective casing interposed between said tension member and the walls of said passage-way.

10. In a device of the class described, comprising a longitudinal body portion of insulating material and provided with two U-shaped passage-ways which extend therein from opposite ends, said passage-ways being located at right angles to each other and crossing each other within said body of insulating material, and said body of insulating material adjacent the point where said passage-ways cross each other, having an increased diameter.

11. A device of the class described, comprising a substantially cylindrical body portion of insulating material formed with hollow cup-shaped end portions; strain members located within the body portion of said insulator and extending outwardly therefrom into said hollow end portions; and means fixed to said strain members forming attaching eyes entirely within the hollows of said end portions for connecting said strain members with a conductor.

12. An article of the class described, comprising a substantially cylindrical body portion of insulating material formed with hollow cup-shaped end portions; a U-shaped strain member located removably within the body portion of said insulator, having its free ends extending outwardly therefrom into the hollow of one of said hollow end portions; and separately formed means engaging the projecting ends of said strain member forming an open eye entirely within the hollow of said hollow end portion and protected thereby for attaching a conductor.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

LOUIS STEINBERGER.

Witnesses:
WALTON HARRISON,
PHILIP D. ROLLHAUS