(No Model.)

W. J. BELCHER.

INSULATOR.

No. 535,660. Patented Mar. 12, 1895.

Fig. 1.

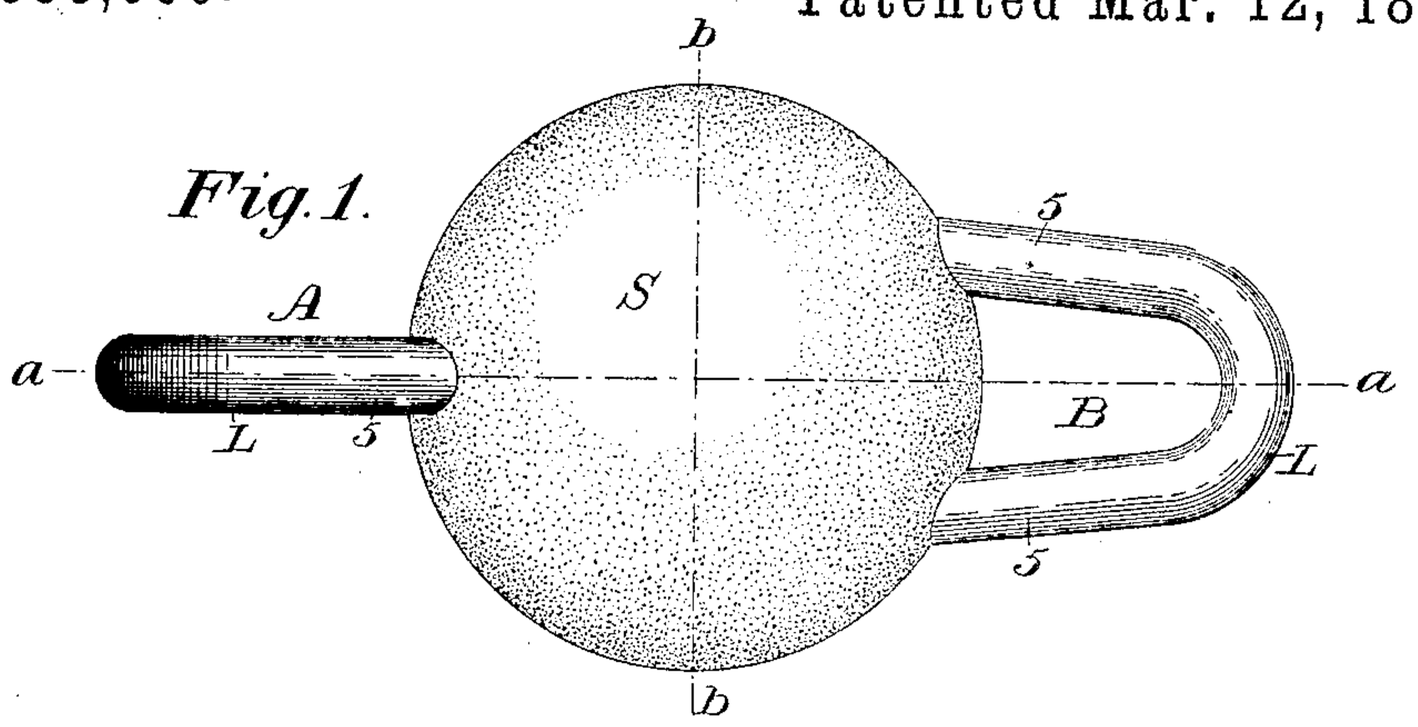


Fig. 2.

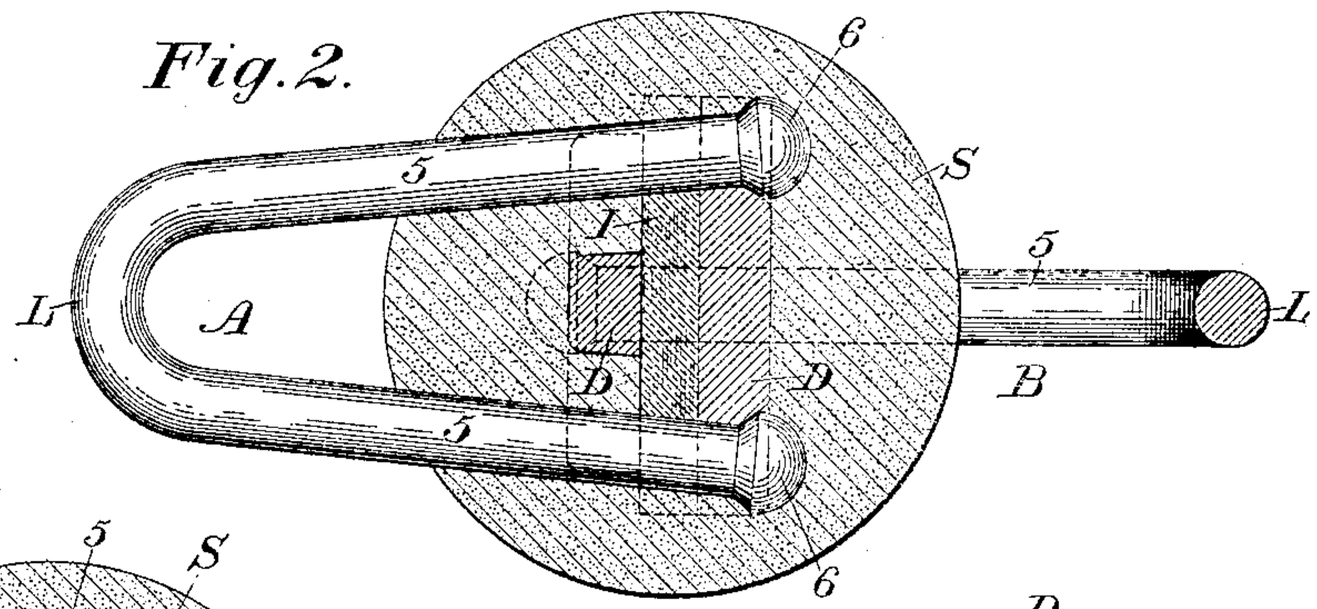


Fig. 3.

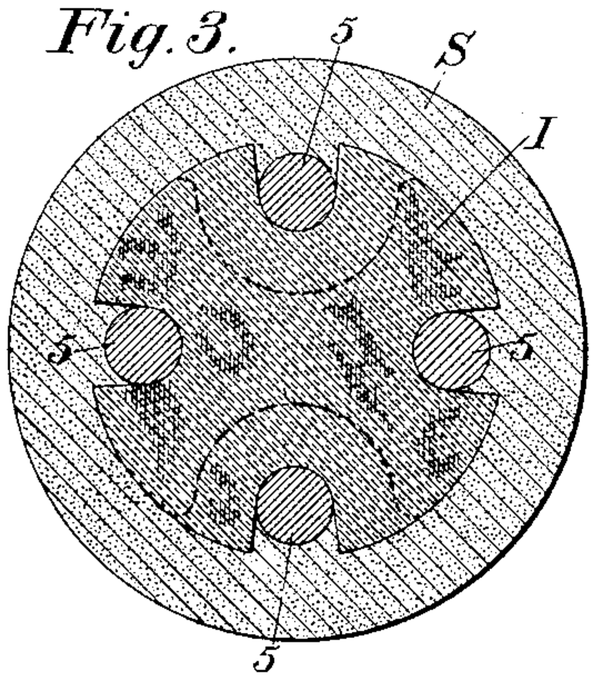


Fig. 4.

Fig. 5.

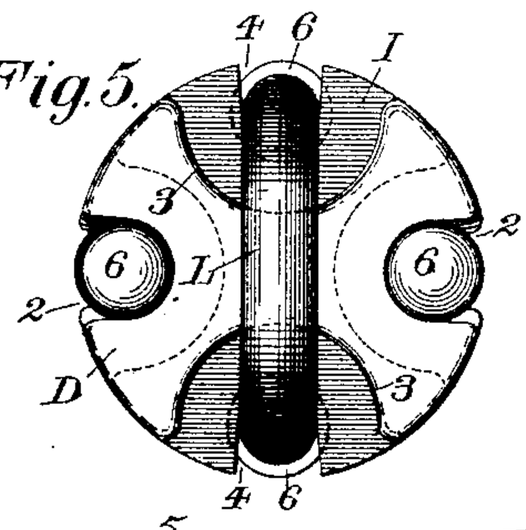


Fig. 6.

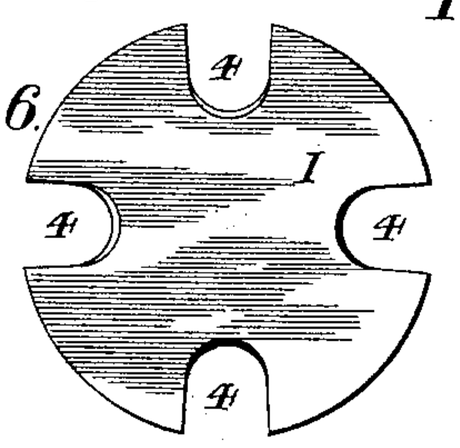


Fig. 7.

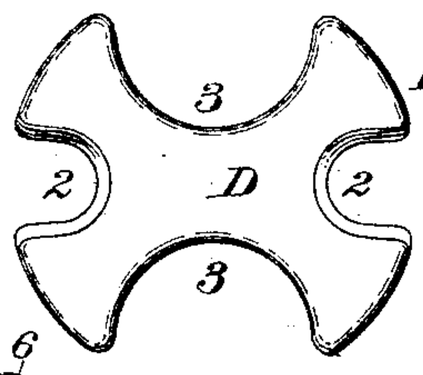
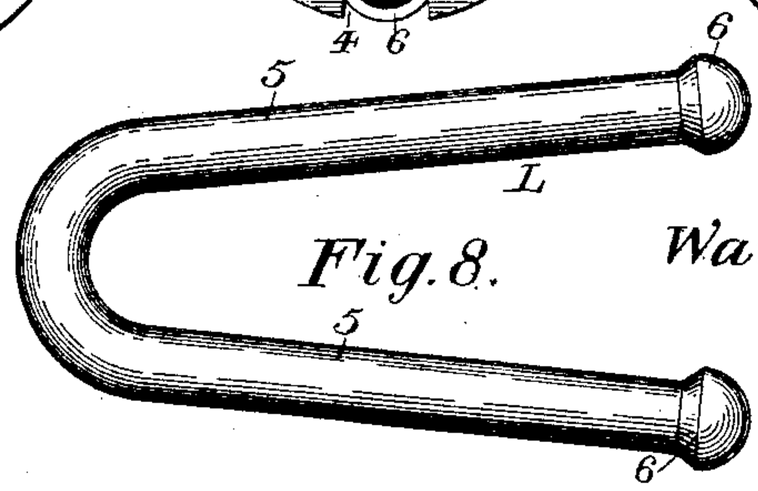


Fig. 8.



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UNITED STATES PATENT OFFICE.

WARREN J. BELCHER, OF HARTFORD, CONNECTICUT, ASSIGNOR TO THE BILLINGS & SPENCER COMPANY, OF SAME PLACE.

INSULATOR.

SPECIFICATION forming part of Letters Patent No. 535,660, dated March 12, 1895.

Application filed January 16, 1895. Serial No. 535,087. (No model.)

To all whom it may concern:

Be it known that I, WARREN J. BELCHER, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Insulators, of which the following is a specification.

This invention relates to insulators; the object being to furnish an improved insulator or connection of that class adapted for electrically separating two conductors having an end connection, the invention being especially applicable to the insulation of a conductor of a high-tension main, such as an over-head conductor for an electric railway system, from the guy-wire usually connected to and supporting such high-tension conductor.

In the drawings accompanying and forming a part of this specification, Figure 1 is a side elevation of an insulator embodying my invention. Fig. 2 is a longitudinal section of the same, in line *a*—*a*, Fig. 1. Fig. 3 is a transverse section thereof in line *b*—*b*, Fig. 1. Fig. 4 is a side elevation of the same, corresponding in position to Fig. 2 and showing the outer insulation, or non-conductive mass, removed. Fig. 5 is an end elevation, looking from the right hand in Fig. 1, and also showing the outer insulation removed. Fig. 6 is a detail, side elevation of the insulating pressure-plate for electrically separating the oppositely-disposed members of the joint. Fig. 7 is a similar view of one of the conductive-plates or members for interlocking the several parts of the joint and which will be hereinafter more fully described. Fig. 8 is a similar view of one of the connecting links co-operating with the conductive plates, and it will also hereinafter be more fully described.

Similar characters designate like parts in all of the figures.

My improved insulator consists of two conductive, opposing, principal members, each of which, in the preferred form thereof herein shown, consists of two parts operatively connected with each other, and an intermediate, insulating member arranged in the combination to hold said principal members separated by its resistance to compression, and also adapted, by reason of this construction, and the relation thereof to said principal members, to hold these conductive parts rotatively and transversely separated, notwithstanding the covering mass usually employed for protecting the directly coacting parts of the device may be omitted; or, having been in place, may have been removed, by accident or otherwise. My improved insulator, therefore, is in the nature of a safety-device, and is especially intended for use in connection with electric-railway apparatus, where great strength is required, and where positive means should be provided for preventing short-circuiting of the oppositely-disposed conductive members, or tension-members of said insulator.

The two principal or tension-members of the insulator are, or may be, as herein shown, of duplicate construction, and are linked together the one through the other, an insulating pressure-plate being interposed between and separating said tension-members, and engaging said members to limit the transverse movement of one of such members relatively to the other, and to thereby positively hold said tension-members longitudinally and rotatively out of contact.

The tension-members are shown formed with their ends overlapping, in transverse and longitudinal direction and having bearing faces for directly compressing the intermediate insulating member, to thereby entirely relieve the insulating member from tensile and shearing strain. These tension members, which are designated in a general way by A and B, are each composed of a bearing-plate or stress-exerting member, and a loop or link, forming a strain-receiving member; and these two parts are preferably made separate and connected with each other, as will be more fully described hereinafter.

In the preferred embodiment thereof, herein shown and described, D—D designate in a general way a pair of conductive stress-exerting members or plates, preferably duplicates in their construction, and hence in the organization of their parts. Each of these plates is shown herein as having a pair of relatively-small, peripheral recesses, such as 2, and a pair of relatively-large, peripheral recesses, such as 3, the similar recesses being

shown disposed, each pair, upon one of the axes of the plate, so that such axis will pass through the centers of the corresponding recesses. It is not essential, however, that these recesses should be disposed in the manner just described, the principal requisite being that each of said conductive plates shall have one pair of substantially similarly-disposed and relatively-small recesses, and that each plate shall also have a pair of substantially similarly-disposed and relatively-large recesses.

For the purpose of electrically separating the conductive members or plates, D, from each other, I have shown herein an insulating member, such as a plate, I, interposed between said conductive members. This insulating member is preferably of high resistance, and should be capable of withstanding a considerable amount of compression. For the purposes hereof I have found that gutta-percha, or hard rubber, forms a suitable means for electrically separating the conductive elements of the joint. This insulating plate engages the tension-members to limit the rotative movement of one of said members relatively to the other, and said plate is shown herein as having an interlocking engagement with both of said members in transverse direction, it being provided with a plurality of peripheral recesses 4, which recesses correspond in conformation and location with the relatively-small recesses, 2, of the conductive plates. The walls of said recesses 4, constitute locking means for engaging the strain-receiving members of the joint and maintaining the principal conductive members, A and B, against rotation, relatively to each other, in lateral direction.

As a means for securing the conductive and insulating members in operative relation to one another, I provide a pair of connecting members, such as the links L—L, which are adapted to engage the walls of the relatively-small recesses 2, or the faces of the conductive plates adjacent to the walls of said recesses, and thereby hold said plates. These recesses 2 are shown herein as having those walls which are engaged by the links L, beveled, so as to positively hold the headed ends of said links. Each of the links or strain-receiving members L, is shown as comprising two similar, longitudinally-ranging arms 5, connected by a U-shaped bend and having their free ends headed, as shown at 6, and preferably beveled on the under sides of said heads, to engage the corresponding beveled walls of the recesses 2. The two arms of said links or strain-receiving members are preferably disposed at a slight inclination to, and away from, each other, for a purpose which will be hereinafter more fully explained.

In assembling the several operative elements of my improved insulator the insulating pressure-plate, I, is placed intermediate of the overlapping ends or plate-portions, D, of the tension-members, with the relatively-small recesses, 2, of one of the plates D registering with one pair of the corresponding recesses, 4, in the plate I, and the relatively-small recesses, 2, of the opposite plate D registering with the other pair of recesses, 4, in said plate I. One of the links or strain-receiving members, L, is then sprung over the insulating pressure-plate, and over the conductive plate,—which is remotely disposed relatively to said link,—and is engaged in the recesses 2, of the said conductive plate, and in the corresponding, registering recesses of the insulating plate, so that said insulating plate will be intermediate of the ends of the link, and the heads, 6, of said link will engage the beveled walls of the recesses 2. The other of the links L is then sprung over the insulating plate, and over the other conductive plate, which is also remotely disposed relatively to the second link, and this link is engaged in the recesses 2 of said other, conductive plate and in the other pair of corresponding, registering recesses in the insulating plate, and the heads 6 of such second link will also engage the beveled walls of the recesses 2 engaged thereby. When the parts are thus assembled, it will be evident that each of the tension-members is linked through the other, and is held in interlocking engagement against rotation relatively to the insulating pressure-plate, and is also positively held out of contact, in rotative and longitudinal direction, with the other tension-member, so that a double, locking action is exerted by the insulating plate upon the conductive members of the joint.

The advantage arising, from organizing the several parts so that each pair of the locking recesses of one member will be disposed upon a line perpendicular to the line intersecting the opposite recesses of said member, will be apparent. By reference to Fig. 5 it will be evident that each of the arms of each link L, where said arms pass through the relatively-large recesses of the conductive-plate of the opposite tension-member, will pass through the center of the relatively large recess and will, therefore, lie at the same distance from one conductive wall of said plate as it does from the other, so that every portion of the arm of the link will be at the greatest possible distance from every portion of the conductive plate of the opposite tension-member, through which a short-circuit might be effected. As the interlocking engagement of the insulating and conductive plates and the links is, as before pointed out, positively maintained in lateral direction, it will be seen that a very perfect insulator is formed and one in which it is practically impossible to short-circuit the members and ground the current.

In order to maintain the positive interlocking of the tension-members D and I, in longitudinal direction, the links L are preferably formed, as hereinbefore stated, with their arms 5—5 converging toward the bend or el-

bow of the link, so that a direct strain, exerted substantially along the longitudinal axis of the insulator, and toward the elbow of said link, will tend to wedge said tension-members more firmly in position relatively to each other. By this construction and organization of the several elements a very perfect interlocking engagement is effected, in both lateral and longitudinal direction, and it will be practically impossible to disassemble the several elements of the joint, when operatively connected, by any ordinary amount of rough handling.

The corresponding members of the insulator, viz: the links on the one hand, and the conductive plates on the other hand, are, as before stated, preferably duplicates, so that the several, similar parts of said insulator will be interchangeable, whereby simplicity of construction is assured.

In order to more perfectly protect the insulator from outside influences, and to more perfectly bind the parts together, I have shown in Figs. 1, 2 and 3, the usual incasing, non-conductive mass, or sheath, applied thereto, preferably in the form of a ball of insulating material, S, such being the usual and most convenient form in which to apply a protective covering. When this binder is in position it will be evident that it will be impossible for a short-circuit to be formed through the bridging of the conductive elements by rain or ice, or by any other means due to outside influences; and the high insulation of said conductive members, which is normally perfectly maintained by the insulating pressure-plate I, is rendered absolute by this protective covering.

Having thus described my invention, I claim—

1. In an insulator, the combination with two tension-members linked one through the other, of an insulating pressure-plate between and separating the tension-members and engaging said members to limit the rotative movement of one of said members relatively to the other of them, whereby the tension-members are positively held longitudinally and rotatively out of contact, substantially as described.

2. In an insulator, the combination with two tension-members linked one through the other, of an insulating pressure-plate between and separating the tension-members and engaging said members to limit the rotative movement of one of said members relatively to the other of them whereby the tension-members are positively held longitudinally and rotatively out of contact, and a non-conductive mass incasing said tension-members and the pressure-plate, substantially as described.

3. In an insulator, the combination with two tension-members having their inner ends overlapping both longitudinally and transversely, of an insulating pressure-plate located between the overlapping portions of said members and in transverse interlocking engagement with both of said members, substantially as described.

4. In an insulator, the combination with two tension-members having their inner ends overlapping both longitudinally and transversely, of an insulating pressure-plate located between the overlapping portions of said members and in transverse interlocking engagement with both of said members, and a non-conductive mass incasing said tension-members and the pressure-plate, substantially as described.

5. In an insulator, the combination with two tension-members linked one through the other and each having a transverse stress-exerting member and a pair of longitudinal arms secured thereto, and each having also a pair of transverse openings in position and adapted for receiving the longitudinal arms of the opposite tension-member and non-contiguous to said arms; of an insulating member between and separating said stress-exerting members in longitudinal direction, and in transverse interlocking engagement with the longitudinal arms of the tension-members, substantially as described.

6. In an insulator, the combination with two tension-members linked one through the other and each having a transverse stress-exerting member and a pair of longitudinal arms secured thereto, and each having also a pair of transverse openings in position and adapted for receiving the longitudinal arms of the opposite tension-member and non-contiguous to said arms; of an insulating member between and separating said stress-exerting members in longitudinal direction and having transverse openings corresponding in number with the longitudinal arms of the tension-members and in position and adapted to receive said arms and to hold the tension-members against rotative movement relatively to said insulating member, substantially as described.

7. In an insulator, the combination with two tension-members linked one through the other and each having a transverse stress-exerting member and a pair of longitudinal arms secured thereto at the peripheral edges thereof, and each having also a pair of transverse openings in position and adapted for receiving the longitudinal arms of the opposite tension-member and non-contiguous to said arms; of an insulating member between and separating said stress-exerting members in longitudinal direction and having peripheral recesses corresponding in number with the longitudinal arms of the tension-members and in position and adapted to receive said arms and to hold the tension-members against rotative movement relatively to said insulating member, substantially as described.

8. In an insulator, the combination with two tension-members linked one through the other and each having a transverse stress-exerting member formed with a pair of oppositely-disposed and relatively-small peripheral re-

cesses and with a pair of relatively-large peripheral recesses intermediate of said relatively-small recesses, and each of said tension-members having also a pair of connected longitudinal arms in position and adapted to pass through the relatively-small recesses of its stress-exerting member and to hold said member and adapted also to pass through the relatively-large recesses of the other stress-exerting member and non-contiguous to said member; of an insulating member between and separating said stress-exerting members in longitudinal direction, and having relatively-small peripheral recesses registering with the recesses of the stress-exerting members and adapted to receive the longitudinal arms of the tension-members and to hold the tension-members against rotative movement relatively to said insulating members, substantially as described.

9. In an insulator, the combination with two tension-members linked one through the other and each having a transverse stress-exerting member and a pair of diverging longitudinal arms secured thereto, and each having also a pair of transverse-openings in position and adapted for receiving the longitudinal arms of the opposite tension-member and non-contiguous to said arms; of an insulating member between and separating said stress-exerting member in longitudinal direction, and having transverse openings corresponding in number with the longitudinal arms of the tension-members and in position and adapted to receive said arms and to hold the tension-members against rotative movement relatively to said insulating member, substantially as described.

10. In an insulator, the combination with two tension-members linked one through the other and having interchangeable stress-exerting plates formed with a pair of oppositely-disposed and relatively-small peripheral recesses and with a pair of relatively-large peripheral recesses intermediate of said relatively-small recesses, and said tension-members having also interchangeable links formed with longitudinal arms adapted to pass through the relatively-small recesses of its stress-exerting plate and hold said plate and adapted also to pass through the relatively-large recesses of the other stress-exerting plate non-contiguous to said plate; of an insulating plate between and separating said stress-exerting plates in longitudinal direction and having relatively-small peripheral recesses registering with the recesses of the stress-exerting plates and adapted to receive the longitudinal arms of the tension-members and to hold the tension-members against rotative movement relatively to said insulating-plate, substantially as described.

11. In an insulator, the combination with two tension-members linked one through the other and having interchangeable stress-exerting plates formed with a pair of oppositely-disposed and relatively-small peripheral recesses and with a pair of relatively-large peripheral recesses intermediate of said relatively-small recesses, and said tension-members having also interchangeable links formed with diverging longitudinal arms adapted to pass through the relatively-small recesses of its stress-exerting plate and hold said plate and adapted also to pass through the relatively-large recesses of the other stress-exerting plate non-contiguous to said plate; of an insulating plate between and separating said stress-exerting plates in longitudinal direction and having relatively-small peripheral recesses registering with the recesses of the stress-exerting plates and adapted to receive the longitudinal arms of the tension-members and to hold the tension-members against rotative movement relatively to said insulating-plate, substantially as described.

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