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J. H. VAIL.

SYSTEM FOR INSULATION OF ELECTRIC CONDUCTOR WIRES.

(Application filed Feb. 26, 1898.)

(No Model.)

Fig. 1.

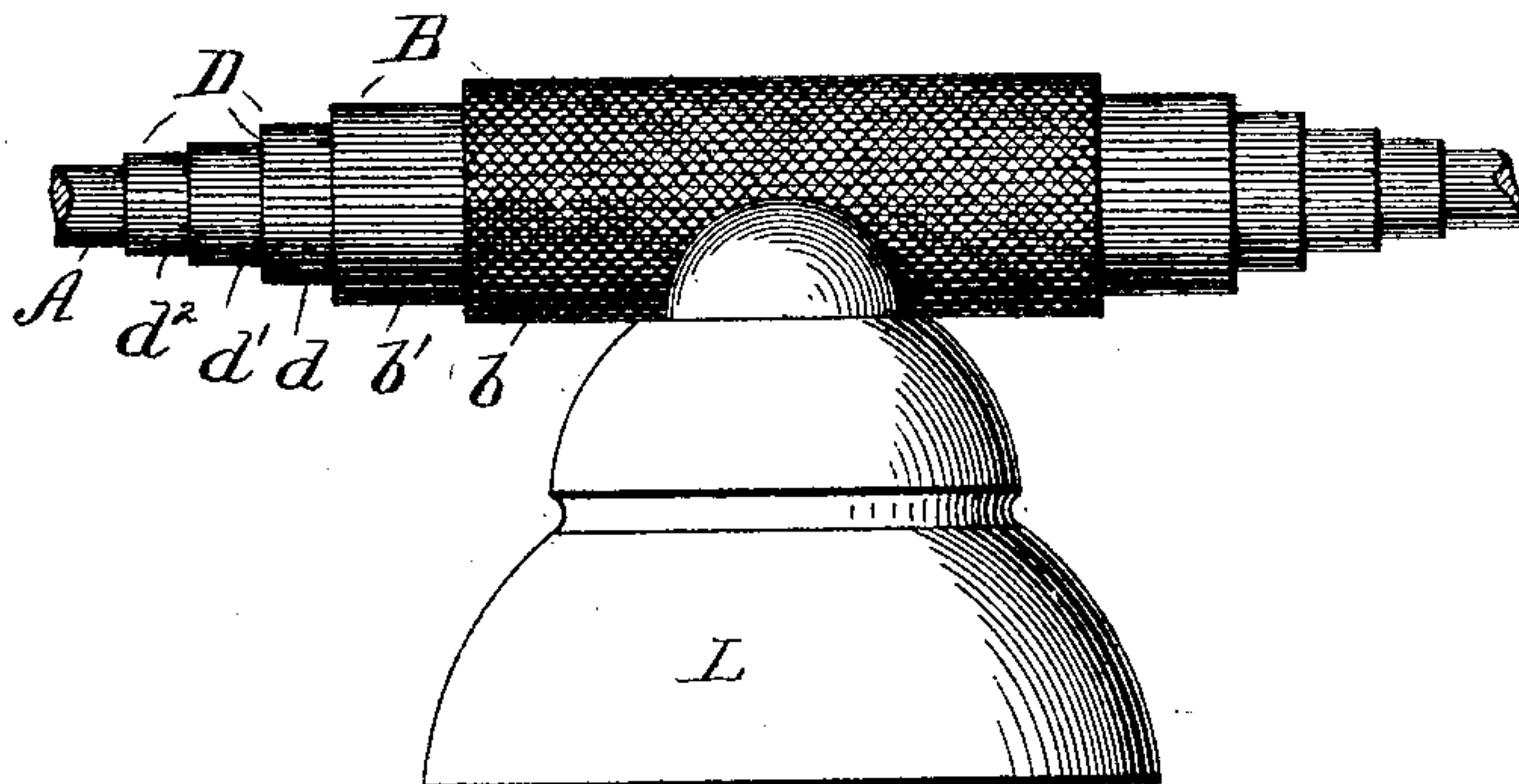


Fig. 2.

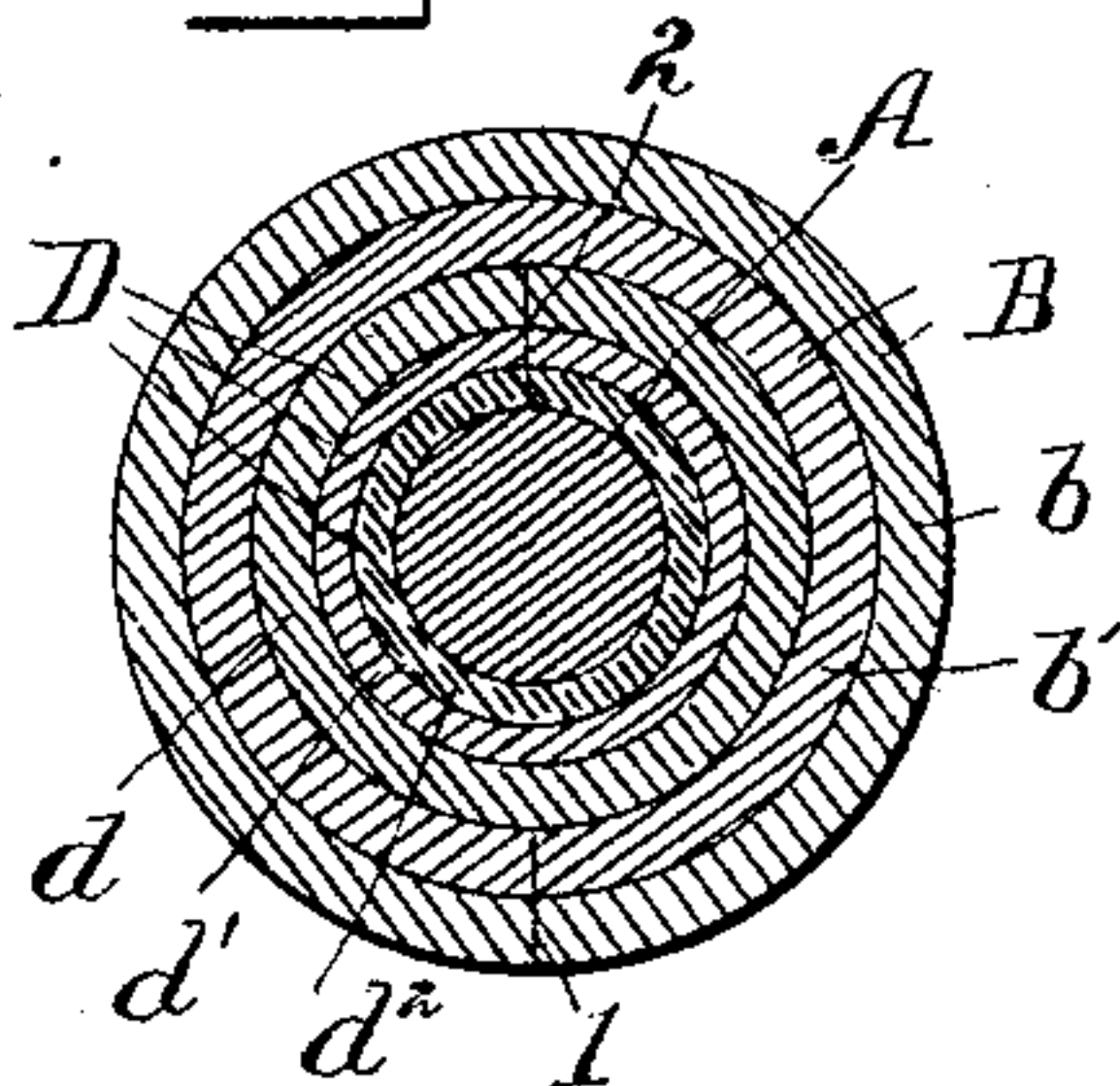


Fig. 3.

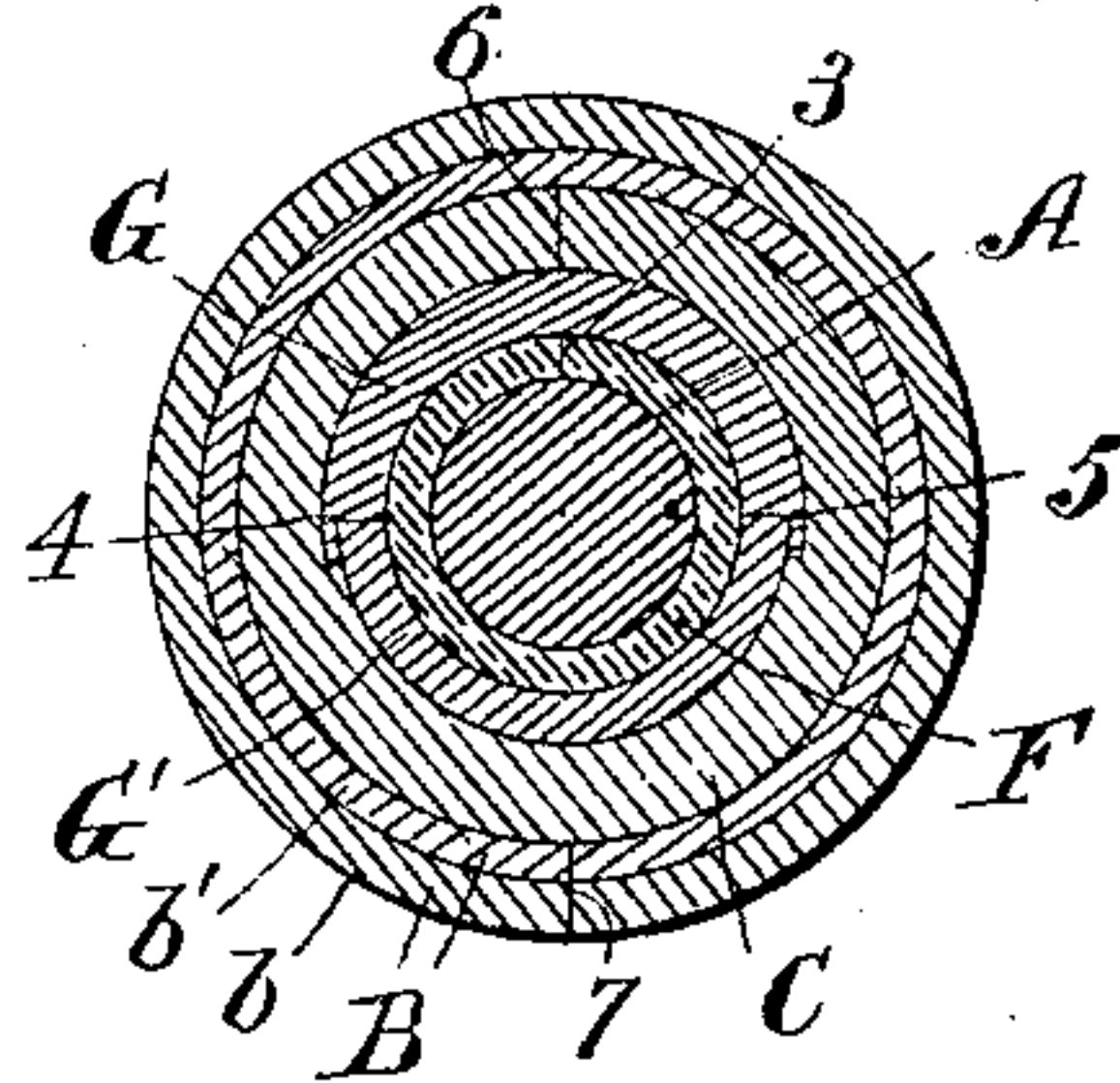
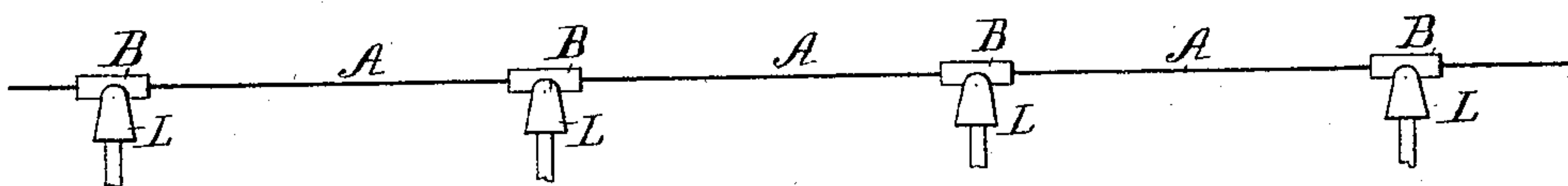


Fig. 4.



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## SYSTEM FOR INSULATION OF ELECTRIC-CONDUCTOR WIRES.

SPECIFICATION forming part of Letters Patent No. 612,535, dated October 13, 1898.

Application filed February 26, 1898. Serial No. 671,820. (No model.)

*To all whom it may concern:*

Be it known that I, JONATHAN H. VAIL, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Systems for Insulation of Electric-Conductor Wires, of which the following is a specification.

My invention relates to that class of insulation used for the covering of electric conductors to prevent leakage of currents from the conductor to the earth or to other conductors and of which conductors, such as overhead wires, supported on lines of poles in the open air form a very large proportion.

The difficulties now experienced with the present methods of applying insulated covering are that such coverings when made of the best insulating materials protected in the usual manner rapidly disintegrate, rupture, and depreciate in insulating value when exposed to atmospheric influences and also that for insulation against leakage of currents of high potential the cost per lineal foot adds largely to the original cost of the electrical conductor, thus in a measure preventing the application of a thicker covering of high-grade materials. Furthermore, when insulation-covering of such character is ruptured there is no good method of repairing same and raising the resistance of the insulation between the conductor and ground or another conductor to its original value.

The object of my invention is to provide a simple and effective system of insulating conductors from earth and other conductors, permitting the increase of the thickness of insulation to almost any required extent without largely increasing the cost, and also to supply an economical and simple method of improving the insulation of conductors already in place without removing the conductors from position if on a line of poles.

My invention further provides a means of economically applying an insulation of exceedingly high resistance immediately at the danger-point between the conductor and ground or another conductor, thus affording a means of insulating overhead lines against the leakage of alternating or other currents

of very high potentials of ten thousand to fifty thousand volts electromotive force or upward.

It is a well-known fact that in numerous instances the insulation-covering on a line of wire serves no useful purpose between the points where the wire is supported upon the glass or porcelain insulators resting on the cross-arms and that the cost of the superfluous covering on the wire between poles largely augments the total investment. This superfluous insulation also adds considerably to the weight of the wire and to the area which it exposes to the wind, thus materially increasing the strains on the wire.

My invention comprises sleeves or sections of insulating material prepared in a suitable manner and when fitted to the conductor assuming its shape, said sleeves being usually tubular and cut to lengths as required, varying from three inches, more or less, to two feet, more or less, as desired, and split open on one side, preferably in a line parallel with the bore, so that the tubular section may be opened and spring in position over the wire and when closed may be formed in any suitable manner; and my invention consists in the application of two or more of such sleeves or tubular sections of insulating material, one applied over the other in such a manner as to break joints and prevent the penetration of moisture to the inside conductor.

In the accompanying drawings, which form a part of this specification, Figure 1 is a side elevation of an insulator and a wire supported and insulated thereon according to my invention. Figs. 2 and 3 are cross-sections showing different constructions of the insulating-sleeves, and Fig. 4 is a diagram showing a conductor supported at a number of points according to my improved system.

Referring to Figs. 1 and 2, A represents the conductor or wire protected by the removable sectional insulation-covering or sleeve. B is an outer insulation-covering, which may be of stout cotton duck *b* on the exposed surface, lined with a heavy layer of rubber *b'* on the inside, the longitudinal joint being at 1. D is an inside insulation of higher grade of such thickness as may be required, the same



being here shown as composed of three layers  $d$   $d'$   $d''$  of suitable insulating material, the longitudinal joint being at 2.

In Fig. 3 is shown another arrangement of insulation. A represents the conductor; F, an inside course of rubber, which is split or jointed at 3, and G G two semicircular overlapping sections of mica or other suitable material molded into semitubular form and with joints overlapping at suitable points 4 5. C is a heavy layer of rubber with joint at 6. B is an outside covering, the interior layer  $b'$  being rubber or other appropriate material and the exterior layer  $b$  being heavy cotton duck or suitable material and the joint being represented at 7.

Sleeves or sectional insulating-coverings such as are above described may be slipped over a conductor or wire from the side at any desired point and at any time either before or after the wire is put in place; but they are preferably placed on the wire only at those points where the wire is supported on supports or insulators, as indicated in Figs. 1 and 4, where L represents such supports or insulators.

In the application of my insulating means the wire B, being a bare wire, is lifted from the insulator L and the inner tubular section is slipped in position over the wire, the joints being located at any suitable point. The exterior covering or section is then placed in position with its joint at a different point from the joint of the inner section and the woven covering being saturated with hot coal-tar, asphaltum, or some suitable compound to render it weatherproof and the whole secured to the insulator by suitable tie-wire, the coarse covering acting also as a shield to prevent the tie-wire cutting through the insulation. In case a larger number of sections are superimposed, as indicated in Fig. 3, they are put on in succession, with their joints arranged so as to break joint.

Fig. 4 represents a line-wire or electric conductor A resting upon and supported by the glass or porcelain insulators L. At B B B are indicated my removable sections of tubular insulation, showing how the resistance of the insulation may be increased to almost any desired degree at the points of support, while the conductor between the points of support may be devoid of covering.

The joints 1 2 3, &c., can be closed in any suitable manner. Thus for the rubber layers they may be closed by rubber cement, and for the other layers they may be closed by asphalt or similar compounds, as above described. The tubular sections may also be applied to conductors which are provided with the usual insulating-covering which has become deteriorated by exposure. In this

case the sleeves are made large enough to surround the covered wire and are placed at the points of support as above described.

Instead of having the split in the sections straight it may be spirally arranged. In this case in applying the sections they are not slipped on by a direct sidewise motion, but by a slight twisting or spiral motion.

The sectional insulation above described may be applied to the conductor at any point of support for the same—for example, at a pole, cross-arm, line-insulator, bracket, or any other supporting appliance, or any other point where the line may require extra protection or insulation—the same being applied to a conductor, covered or uncovered, that has already been in use and requires an improvement in its insulation, or applied to a new conductor, covered or uncovered, for the purpose of raising and maintaining its insulation to a higher resistance than could otherwise be obtained.

On account of the comparatively small proportion of the wire that is covered by this insulation the thickness and quality of the insulation may be made extremely high without undue expense—far higher than is now considered feasible on account of the expense. In consequence of such extra high insulation the conductors may be supported much closer together upon the cross-arms or other supports than is usually practicable.

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

1. In combination with an electric conductor, an insulating-covering for a portion of same, consisting of a plurality of sleeves, one within another, each sleeve being split, and having its joint or line of division breaking joint with the joint of the adjacent sleeve.

2. In combination with an electric conductor, a tubular section for covering and insulating same, consisting of a plurality of split sleeves of flexible insulating material placed around said conductor, one within another, with their joints cemented with an insulating-cement and placed so as to break joint in the successive sleeves.

3. The combination with an electric conductor supported on a plurality of supports, of insulators surrounding the conductor at each support, but not surrounding the intervening portions of the conductor, said insulators being each formed of a plurality of sleeves of flexible, elastic insulating material, said sleeves being split at one side to enable them to be passed over the conductor, and the splits in adjacent sleeves breaking joint.

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