

(No Model.)

J. B. WILLIAMS.
INSULATED ELECTRIC CONDUCTOR.

No. 471,588.

Patented Mar. 29, 1892.

Fig. 1.

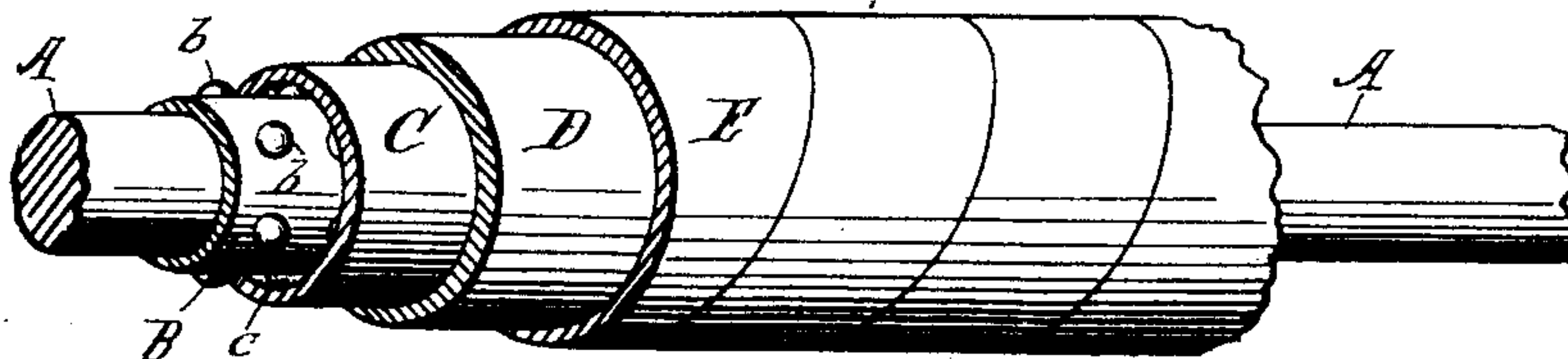


Fig. 2.

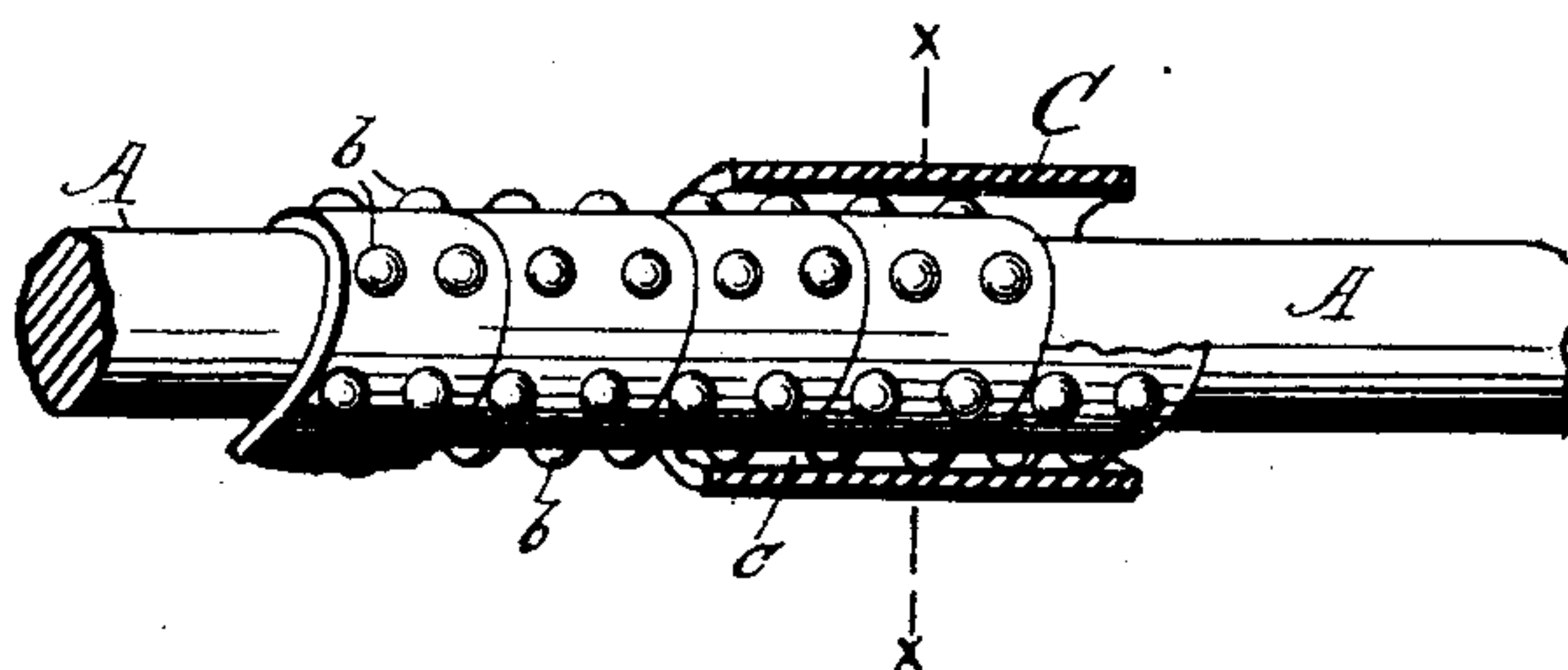
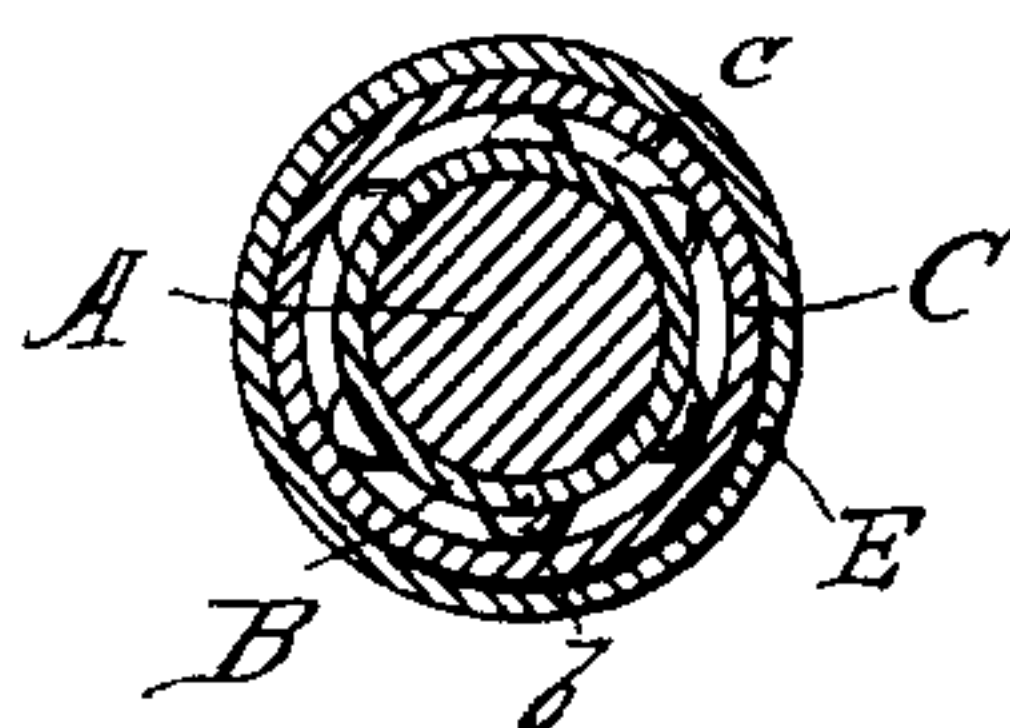


Fig. 3.



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UNITED STATES PATENT OFFICE.

JAMES B. WILLIAMS, OF OAKLAND, CALIFORNIA.

INSULATED ELECTRIC CONDUCTOR.

SPECIFICATION forming part of Letters Patent No. 471,588, dated March 29, 1892.

Application filed April 9, 1891. Serial No. 388,289. (No model.)

To all whom it may concern:

Be it known that I, JAMES B. WILLIAMS, a citizen of the United States, residing at Oakland, in the county of Alameda and State of California, have invented certain new and useful Improvements in Insulated Electric Conductors; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The object of the present invention is to produce an insulated electric conductor which shall have a higher insulation-resistance and a lower electrostatic capacity than insulated conductors made in the manner now usually employed—*i. e.*, by placing the insulating-layer or dielectric in direct contact with the conductor or in contact with a layer of fibrous material closely wrapped around the conductors—the size of the conductor, the thickness of the dielectric, the kind of material used, and the conditions of use being the same in both cases.

The novelty of the present invention consists in the means employed to attain this object and in the construction and adaptation of parts; and it consists, primarily, in interposing between the insulating-layer or dielectric and the conductor air-spaces, which are formed by bosses or projections on an interposed covering, together with certain intermediate and supplementary aids to insulation, whereby the efficiency of the insulation is materially increased.

In the drawings the same letters refer to the same parts in all of the figures.

Figure 1 is a perspective view of a chosen form of my invention, showing the various layers of material cut away, so as to display the different coverings of the conductor in their relative positions. Fig. 2 is a similar view of the conductor provided with the intermediate covering or separating device, showing the bosses or projections. Fig. 3 is a transverse section on the plane of the line *xx* of Fig. 2.

In all the views the parts are shown in relative positions only and not in necessarily relative sizes.

In the drawings, A designates the central

metallic conductor. I have shown it in cylindrical form, and it may be single, stranded, or tubular; but it should be substantially circular in cross-section.

B is the intermediate covering or separating device placed between the conductor A and the insulating-layer or dielectric C. Its purposes are, first, to prevent the insulating-layer from coming in direct contact with the conductor; second, to provide air-spaces between them; third, to support the insulating-layer and keep it substantially concentric with the conductor, and, fourth, to furnish comparatively few paths by which the electric current can escape from the conductor. This covering or separating device may consist of any suitable material possessing insulating properties and which remains elastic and more or less flexible under ordinary conditions of manufacture and use.

By the terms "elastic" and "more or less flexible" I mean that if the insulated conductor is to be kept comparatively straight during its manufacture, placing, and use the materials need to be elastic only and possess a very slight degree of flexibility; but if it is to be bent under these conditions the degree of flexibility required will be greater and sufficient to prevent buckling or rupture.

By the term "ordinary conditions" I mean such conditions as insulated conductors of the class herein described would naturally be subjected to by an intelligent and skilled workman. For instance, that the insulated electric conductor during the manufacture, placing, and use thereof should be kept as straight as possible and that if bent or coiled the curves should be large.

The covering B is provided with bosses or projections *b*, which serve to support the insulating-layer or dielectric C and keep it away from those portions of the covering which are directly in contact with the conductor A, forming between the dielectric and the covering air-spaces *c*. The insulating-layer or dielectric surrounds the covering B and touches only the outer portions or bosses thereof, and it is made sufficiently stiff to prevent collapsing under usual conditions.

D is a water-proof protecting-covering, usually made of lead and applied over the die-

lectric in the usual manner, and E represents a further covering or layer composed of fibrous material, saturated with a water-proof compound and outside the ring D when its use is deemed desirable or necessary.

The covering B may be of strips previously prepared and wound around the conductor.

The general nature of my invention will be readily understood from the above description, and I now propose to describe the best means known to me of carrying out the same and to specify the materials which should preferably be employed therein and the methods of constructing and putting together the several parts.

The intermediate covering B or its equivalent, and which I call the "separating device" on account of its obvious functions, I make of any suitable material possessing insulating properties—for instance, of vulcanized rubber (soft)—and treat it with suitable cement to cause it to adhere to the surface of the conductor. It is obvious that the bosses or projections are to be made sufficiently close together to support the dielectric. However formed or of whatever material this device is made, if made of separate pieces afterward united their edges should be closely cemented and the points of contact between it and the dielectric should be as few in number as possible.

Other equivalents of the intermediate covering or separating device will readily occur to the minds of persons skilled in the art, and it is obvious that I may in this respect make wide modifications in detail without departing from the essential feature of my invention.

The insulating-layer or dielectric consists either of a single layer or of two or more single layers united to form one general layer, composed of any well-known insulating material suitable for use in this connection. Under some conditions of use the dielectric may be separately formed in tubes and the conductor already provided with the separating device placed within the same.

Under many conditions of use it is desirable that the insulated conductor should be further protected, and to effect this purpose I apply over the dielectric a water-proof protecting-covering D, which is usually made of lead, and when this material is employed it may be placed in position in the usual manner by a lead press, and if the material of the dielectric is such that it is apt to be injured by the heat of the press a thin layer of paper saturated with good paraffine wax and carefully applied to the outside of the dielectric will be found to afford effectual protection. In any case the dielectric should be kept as cool as possible in its passage through the

press, and the lead sheath should be chilled thereafter at once.

If desired, a layer E of suitable material may be formed outside of the covering D as a further protection. It is preferably put on in the form of a tape or braid and is saturated with a good water-proof paint—one containing a large quantity of elastic, flexible, bituminous matter, for instance. The purpose of this layer is to protect the layer immediately underneath it from the action of moisture or gaseous vapors, and serves at the same time to seal any minute holes which may exist in the lead sheath. Such a covering may be also placed directly over the insulating-layer, as shown in Fig. 3, in cases where no lead sheath is employed and the material of the said insulating-layer is of such a nature that its use is practicable.

The ends of the insulated conductor should always be sealed with water-proof tape during the process of manufacture whenever practicable, and when finished should always be sealed by this or other suitable means, otherwise the insulation-resistance of the conductor is liable to rapidly diminish, owing to the effect of moisture and vapors which may enter the air-spaces attacking the insulating material.

My invention can be applied to concentric cables if special care is taken in selecting the materials which are used in the manufacture of the different layers and in the manner in which these different layers are formed on the conductor; but the feasibility of so doing depends upon the circumstances of each case and can scarcely be predetermined.

The principle upon which the efficiency of my invention depends is that comparatively few paths are furnished by which the electric current can escape from the conductor.

The subject-matter of this application is shown, but not claimed specifically, in another application filed by me July 10, 1890, Serial No. 358,268.

What I claim as new is—

1. The combination, with the electric conductor and the insulating-layer, of the intermediate cover provided with bosses or projections, substantially as described.

2. The combination, with the electric conductor and the insulating-layer, of the intermediate strip provided with bosses or projections and wound spirally around the conductor, substantially as described.

In testimony whereof I hereunto affix my signature in presence of two witnesses.

JAMES B. WILLIAMS.

Witnesses:

HUMPHREY F. MORGAN,
ROSWELL A. DANDARAW.