(No Model.)

J. B. WILLIAMS.

INSULATED ELECTRIC CONDUCTOR.

No. 452,725. Patented May 19, 1891.

Fig. 1.

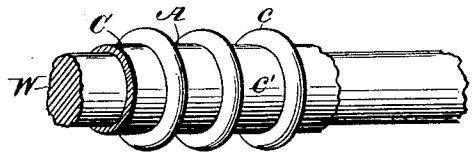


Fig. 2.

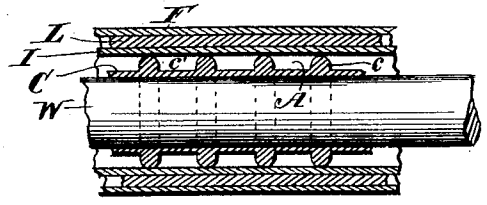


Fig. 3.

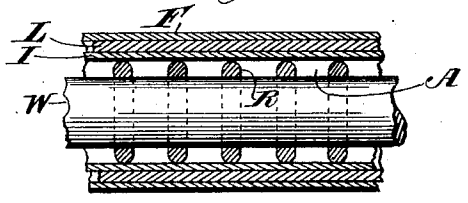
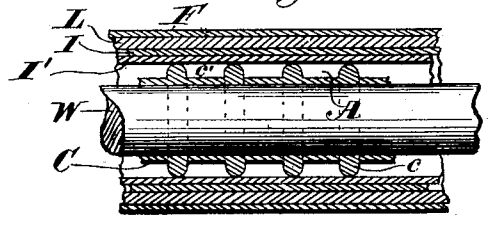


Fig. 4.



Witnesses.
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UNITED STATES PATENT OFFICE.

JAMES B. WILLIAMS, OF OAKLAND, CALIFORNIA.

INSULATED ELECTRIC CONDUCTOR.

SPECIFICATION forming part of Letters Patent No. 452,725, dated May 19, 1891.

Application filed November 12, 1890. Serial No. 371,168. (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, Alameda county, California, have invented certain new and useful Improvements in Insulated Electric Conductors; and I do 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, reference being had to the accompanying drawings, and to the letters marked thereon, which form part of this specification.

The object of my 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 dielectric in direct contact with the conductor or in contact with a layer of fibrous material closely wrapped around the same, the thickness of the dielectric, the size of the conductor, and the kind of material used and the conditions of use being the same in both cases.

The novelty of my invention consists in the means employed to attain this object and in the construction and adaptation of the parts; and it consists, primarily, in forming between the dielectric and the conductor isolated or non-communicating air-spaces, together with certain intermediate and supplementary aids to insulation, whereby the efficiency of the insulation is materially increased.

In an application for Letters Patent of the United States, filed July 10, 1890, Serial No. 358,268, I have described and claimed certain forms of insulated electric conductors in which the results named above are obtained, and which I believe to be new and to be more efficient than the ordinary conductors now in use under the same conditions; and the invention which is the subject of the present application may be considered as an addition to and an improvement upon the invention described and claimed in the application above referred to. In brief, the invention described in that application consisted of the combination, with a central conductor, of an exterior insulating-layer or dielectric and means placed intermediate the same and composed of insulating material closely adhering to the surface of the conductor and in close contact with the corresponding interior surface of the insulating-layer, whereby air-spaces were formed between the conductor and its said insulating-layer or dielectric. In that application I show a specific form of my invention, in which the air-spaces referred to are communicating. The present application has more particular reference to that form of my invention in which the said air-spaces are not communicating.

In the drawings, in which 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 conductor surrounded by the separating device in the form of a cylindrical covering provided with embossed annular projections and ready for the application of the dielectric. Fig. 2 is a longitudinal medial section of the same after the dielectric and its exterior coverings have been applied. Fig. 4 is a similar view of the same, showing an intermediate covering placed between the separating device and the dielectric; and Fig. 3 is a similar view of the conductor provided with the intermediate covering or separating device in the form of rings.

In the drawings, W represents 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.

C represents the intermediate covering or separating device placed around the conductor W and between it and the insulating-layer or dielectric I. As explained in the application above referred to, its purposes are fourfold: first, to prevent the insulating-layer from coming into direct contact with the conductor; second, to form non-communicating or isolated air-spaces between the insulating-layer and the conductor, so that should the insulating-layer or dielectric become defective or damaged in any way, and thus permit the leakage in of moisture or other objectionable matter, it would be confined to a limited space and the efficiency of the insulated conductor as a whole be but slightly lessened thereby; 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 intermediate covering or separating device may consist of any suitable material possessing insulating properties and which remains more or less flexible under ordinary conditions of manufacture and use.

I is the insulating-layer or dielectric surrounding the covering C, and which only touches the outer portions of the same, and which is made sufficiently stiff to prevent of its collapsing under usual conditions and being pressed in toward the surface forming the inner wall of the air-spaces A.

L is a water-proof protecting-covering applied over the dielectric in the usual manner and generally made of lead, and F is a further water-proof layer composed of fibrous material saturated with a water-proof paint and used outside of the layer L when its use is deemed desirable. When the said air-spaces are not to be continuous or intercommunicating, one form of my separating device is formed of the covering in the form of a cylinder *c'*, provided with annular embossed projections *c*, which, when the device is placed in position, are each continuous and form a structure consisting of connecting-rings substantially parallel with each other and at right angles to the axis of the conductor in which they have a common center, and the outermost surfaces of which are substantially equidistant therefrom and form with the insulating-layer or dielectric I isolated air-spaces A. This cylindrical covering C and its embossed annular projections may be made of any material and in any manner suitable for use under the conditions imposed by the uses to which the finished conductor is to be put. In Fig. 3 of the drawings I have illustrated a modification of this form of my device which is useful under conditions where economy is a desideratum. In this form it will be observed that I omit that portion of the cylindrical shell C—viz., *c'*—which is intermediate the annular embossed projections *c*, as shown in Figs. 4 and 5, and make the separating device of independent rings R, suitably prepared and placed on the conductor at intervals and suitably secured thereto, and which, taken together, form a very satisfactory and cheaper equivalent for the device shown in Figs. 1 and 2, and inclose with the dielectric and the conductor isolated air-spaces A.

In Fig. 3 I have illustrated a second intermediate covering I', which is simply a cylindrical shell made of suitable material and surrounding the separating device C, and which is in the main a support placed over the same for use where the dielectric is composed of very soft materials.

When the air-spaces formed between the conductor and the dielectric are intercommunicating or form continuous passages, as described in the application above referred to, it is possible, whenever moisture enters the air-spaces from any cause, to remove it by passing a current of warm dry air through the air-spaces, as described in an application made by me for Letters Patent of the United States, Serial No. 358,441; but when the air-spaces are not communicating or continuous, as in the invention herein described, it is difficult to remove any moisture which may enter the air-spaces, and the use of the cylindrical shell I', referred to in the last preceding paragraph, becomes important, as it serves as a support and strengthens the dielectric. This shell may be made of any insulating material or of fibrous material saturated with an insulating material compatible with the conditions of use to which the insulated conductor is to be put.

I do not restrict my invention to the specific form shown. Equivalents of my separating device are very numerous and may be devised by the exercise of the purely mechanical skill of the competent workman. A wide range of forms and materials may be successfully employed.

Having thus described my invention, what I claim as new is—

1. The combination, with an electric conductor and its surrounding insulating-layer or dielectric, of means having insulating properties interposed at intervals between the conductor and the insulating-layer, whereby isolated or non-communicating air-spaces are formed between the conductor and the insulating-layer, substantially as shown and described.

2. The combination, with an electric conductor and its surrounding insulating-layer or dielectric, of means having insulating properties and composed of a flexible material interposed at intervals between the conductor and the insulating-layer, whereby isolated or non-communicating air-spaces are formed between the conductor and the insulating-layer, substantially as shown and described.

3. The combination, with an electric conductor and its surrounding dielectric provided with an intermediate structure consisting of insulating material, whereby non-communicating air-spaces are formed between the conductor and the dielectric, of a covering, also composed of insulating material, placed intermediate the said structure and the dielectric and adapted to support the latter.

4. The combination, with an electric conductor W and its surrounding insulating-layer or dielectric, of the separating device C, consisting of an interior shell *c'*, suitably secured to the conductor and provided with embossed annular projections *c*, the outer surfaces of which are substantially equidistant from the axis of the conductor and in contact with the interior surface of the said insulating-layer, whereby isolated air-spaces A are formed between the conductor and its dielectric, as shown and described.

5. The combination, with an electric conductor and its surrounding insulating-layer or dielectric, of rings composed of more or less flexible material possessing insulating properties, secured at intervals on the conductor and having a common center in its axis, and the outer surfaces of which are in contact with the interior surface of the dielectric, whereby isolated air-spaces A are formed between the conductor and the dielectric, as set forth.

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

JAMES B. WILLIAMS.

Witnesses:
WM. RAIMOND BAIRD,
JAS. P. DOWNS.