(No Model.)

J. B. WILLIAMS.

PROCESS OF TREATING CONDUCTORS.

No. 452,091. Patented May 12, 1891.

Fig. 1.

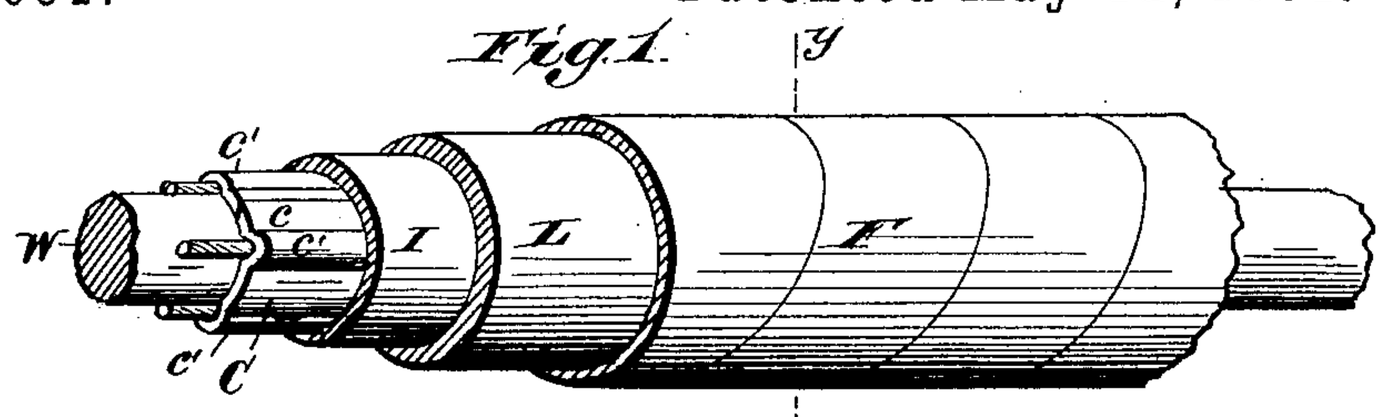


Fig. 2.

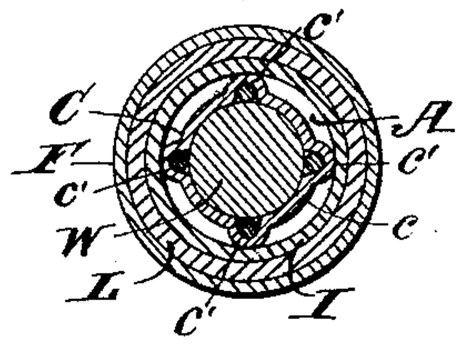


Fig. 3.

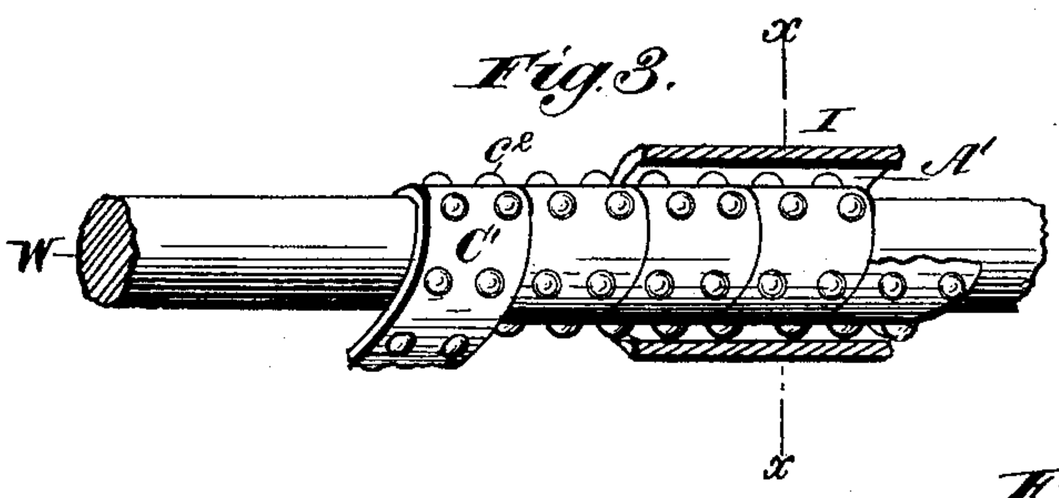


Fig. 4.

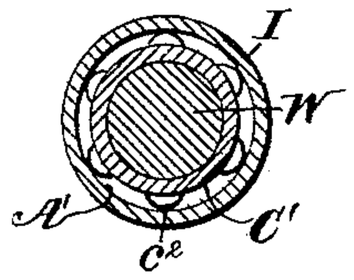


Fig. 5.

Fig. 6.

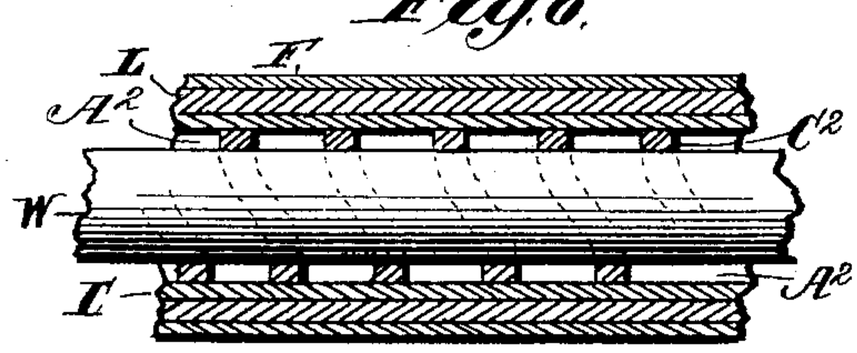
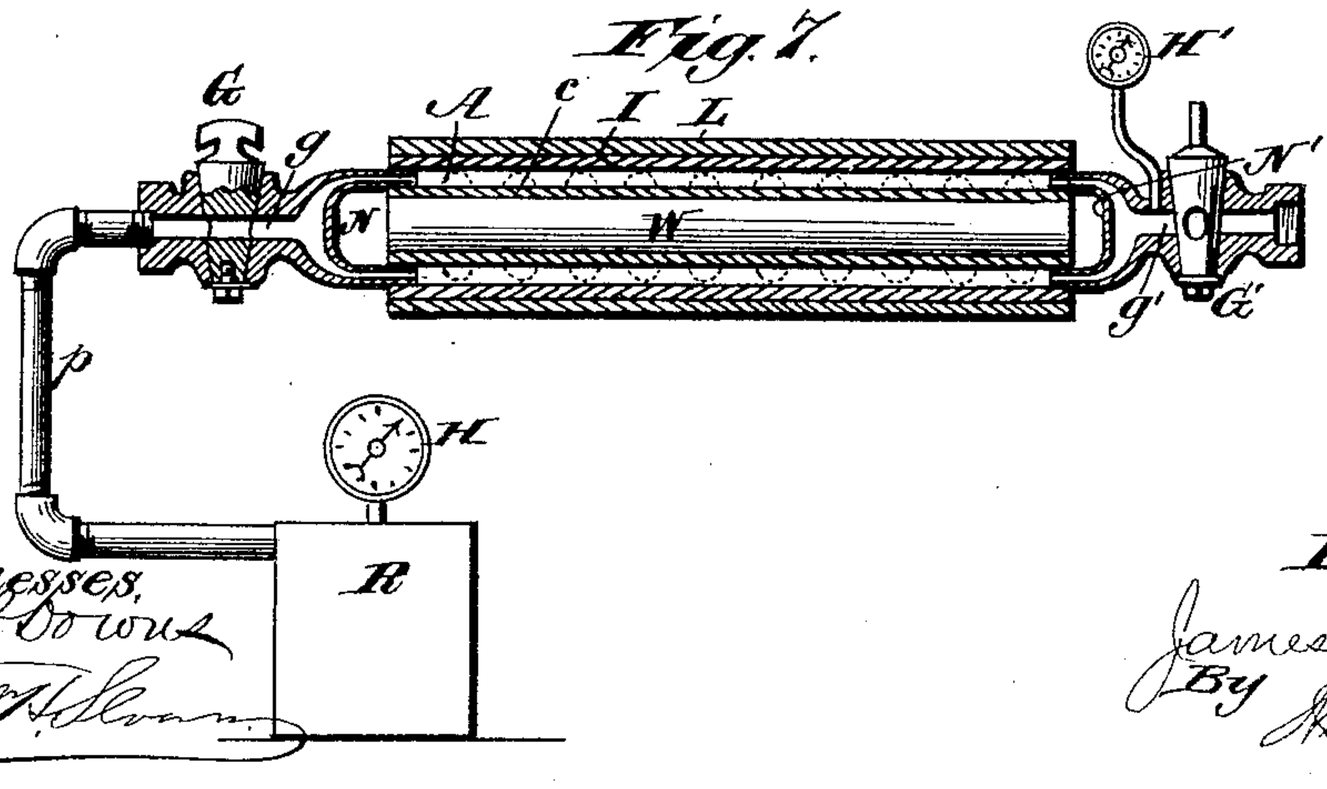


Fig. 7.



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UNITED STATES PATENT OFFICE.

JAMES B. WILLIAMS, OF OAKLAND, CALIFORNIA.

PROCESS OF TREATING CONDUCTORS.

SPECIFICATION forming part of Letters Patent No. 452,091, dated May 12, 1891.

Application filed July 11, 1890. Serial No. 358,441. (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 the Processes of Treating 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 provide a process whereby certain forms of insulated electric conductors may be advantageously manufactured, or treated after manufacture; and its novelty consists in the steps of the process and their relation to each other, as will be hereinafter more fully set forth.

In applications made by me for Letters Patent of the United States, filed July 10, 1890, Serial No. 358,268, and filed November 12, 1890, Serial No. 371,167 and Serial No. 371,168, I have described and claimed a form of insulated electric conductor which I believe to be new and to be more efficient than the ordinary conductors now in use under similar conditions. In brief, my insulated conductor consists of the combination, with a central conductor substantially circular in cross-section, of a surrounding dielectric, and an intermediate covering or separating device placed between the conductor and the dielectric, whereby they are separated and air passages or spaces formed between them. I show in these applications several forms of this separating device, and explain in detail how they may be made and applied to the conductor; and for a better understanding of the matter I shall in this application use substantially the same drawings for purposes of illustration.

In the drawings, Figure 1 is a perspective view of the conductor surrounded by the dielectric, parts being cut away to show its different coverings in their relative positions. Fig. 2 is a transverse central section of the same on the plane of the line *y y* in Fig. 1. Fig. 3 is a perspective view of the second kind of intermediate covering, showing the dielectric in partial section. Fig. 4 is a transverse section of the same on the plane of the line *x x* in Fig. 3. Fig. 5 is a perspective view of the third kind of intermediate covering surrounding the conductor. Fig. 6 is a central longitudinal section of the same and of its surrounding layers; and Fig. 7 is a sectional view of the apparatus employed for carrying out the treatment of the dielectric by warm air under pressure.

In the drawings, W is the central metallic conductor. I is the dielectric surrounding the same.

C′, C, and C² are the different forms of the intermediate covering or separating device, which is in all cases secured to the exterior surface of the conductor, and which touches the interior surface of the dielectric only at the extremities of the raised portions of the device, which are substantially equidistant from the axis of the conductor.

In the form illustrated in Figs. 1 and 2 the device C is provided with longitudinal corrugations *c′*, raised above the surface of the covering *c*, which separate the dielectric I from the conductor W and leave the air-space A between them.

In the form illustrated in Figs. 3 and 4 the device C′ is provided with bosses or projections *c²*, which serve the same purpose as the corrugations *c′* in the form just mentioned, and leave the air-spaces A′ between the conductor W and the dielectric I.

In the form illustrated in Figs. 5 and 6 the device C² consists of strips of suitable material wound around the exterior surface of the conductor W and forming one continuous air-space A² between it and the dielectric I. Over the dielectric, after it is placed in position, I place, under conditions requiring its use, a water-proof protecting-covering L, generally made of lead, and, if deemed desirable, an additional outer covering F, consisting of fibrous material treated with a water-proof paint.

N and N′ are suitable nozzles inserted at the ends of the conductor between the intermediate covering and the dielectric, and are each provided with a cock G and G′, having passages *g* and *g′*. The nozzle N is connected by means of the pipe *p* to a reservoir R, which is adapted to contain warm dry air,

and provided with a pressure-gage H, communicating with its interior. A similar pressure-gage H′ is placed intermediate the cock C′ and the insulated conductor W. The nozzle N′ opens into the outer air.

If, upon an examination of the insulated conducted after the water-proof protecting-covering L has been applied, it is found that the dielectric has been forced into the air-spaces between it and the conductor during the process of its manufacture, so that the air-spaces, where it is intended that they should be continuous, have been partially destroyed, or if the dielectric is not sufficiently compact and substantially circular in cross-section when the air-spaces, either partial or complete, do exist, then by the process which I am about to describe I make the dielectric compact, make it rest lightly on all or the greater portion of the raised surfaces of the intermediate covering or separating device, and restore the air-passages to their proper condition. After the dielectric has received its outer water-proof protecting-covering L it is kept comparatively straight and placed in a suitable chamber of convenient length—say two hundred feet—where it may be so arranged that it shall project a few inches outside thereof at each end. This chamber must be so arranged that it can be closed and uniformly heated, to say, 200° Fahrenheit. The air-spaces at each end of the conductor are then made to communicate with each other, if they do not already do so. The nozzles N and N′ are then introduced between the intermediate covering and the dielectric at each end of the latter and secured in place, and thus placed in communication with each other through the air spaces or passages formed between the dielectric and the conductor. One of the nozzles N is made to communicate by means of the pipe *p* with the reservior R, containing air under a pressure which can be varied, and to which is attached a pressure-gage communicating with its interior. The other nozzle N′ is made to communicate with the atmosphere. This nozzle is also provided with a pressure-gage H′, placed intermediate the cock G′ and the conductor W. The indications of these two gages should be exactly alike at all the pressures which are to be used in the treatment. The chamber containing the insulated conductor is then gradually and continuously heated to a temperature sufficient to render the whole mass of the material of which the dielectric is composed slightly adhesive. This temperature and the length of time required for this purpose can be ascertained by previous experiment. The stop-cock G is then opened, and the air from the reservoir under a low pressure is gradually admitted to the air-spaces through the pipe *p* and the nozzle N communicating therewith until it is known that the air has passed the entire length of the dielectric, when the stop-cock G′ farthest from the reservoir is gradually closed and the pressure of the air is gradually increased and maintained until the dielectric under its influence is made sufficiently compact, substantially circular in cross-section, and to rest lightly on all or the greater portion of the raised portions of the intermediate covering or separating device. The degree of pressure to be exerted and the length of time required to effect this purpose must be ascertained by previous experiment, and for the sake of convenience tables may be made to facilitate reference thereto. After being so treated the finished conductor is allowed to cool, the pressure being maintained until cold, when it is then removed from the chamber and is ready for use. Whenever the dielectric does not require this special treatment by air under pressure, the air-spaces between it and the conductor need not necessarily be made continuous; but it is desirable to have them so, because if moisture does happen to get into them, which under some conditions of use is likely to occur, it can be nearly or quite removed by passing warm dry air through the spaces in the manner described. For obvious reasons, also, this special treatment should be avoided by carefully forming the dielectric of such materials and in such manner that it will not be required. I have found this method of subjecting the insulated conductor to the action of warm dry air under pressure an efficient process whereby the vulcanization of the materials of which the dielectric is composed may be effected. As is well known, vulcanization is usually accomplished by means of steam on account of the ease with which its temperature and pressure may be controlled; but steam cannot in practice be made perfectly dry, and the efficiency of the usual product of such vulcanization is much impaired by the presence of moisture during the process of treatment. Hence it is by no means a good medium for this purpose in many instances. When the process which I have described is to be used for purposes of vulcanization, the chamber in which it is effected must be capable of getting heated to, say, 300° Fahrenheit, and the apparatus must be also capable of keeping the air under pressure up to, say, seventy-five pounds per square inch, and the dielectric should be surrounded by a flexible metallic sheath preferably made of lead.

Different materials may of course be employed to form the dielectric, and they will naturally require different degrees of temperature, different conditions of pressure, and different lengths of time, in order that the best results may be obtained, and this data can best be secured by previous experiment in each case.

What I claim as new is—

1. The process of treating an insulated electric conductor, consisting of a conductor surrounded by a dielectric with intermediate air-spaces between them, which consists in first raising the said dielectric to a suitable temperature; second, passing warm dry air

through the said air-spaces, and, third, in maintaining the air under pressure in said intermediate air-spaces, as set forth.

2. The process of treating an insulated electric conductor formed as described, which consists in first heating the conductor in a closed chamber until the materials of which its dielectric is composed become slightly adhesive; second, in passing warm dry air through the air-spaces between the conductor and the dielectric, and, third, in maintaining the air under pressure within said air-spaces, as set forth.

3. The process of vulcanizing the materials of the dielectric of an insulated electric conductor of the form described, said dielectric having been formed in position without vulcanization, which consists in subjecting it to the action of warm dry air under pressure contained in the intermediate spaces between the conductor and the dielectric, the temperature, degree of pressure, and length of time required being suited to the particular materials employed in each instance.

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

JAMES B. WILLIAMS.

Witnesses:
WM. RAIMOND BAIRD,
WM. M. ERNST.