

(No Model.)

2 Sheets—Sheet 1.

T. GUILLEAUME.

MEANS FOR INSULATING ELECTRIC CONDUCTORS.

No. 571,760.

Patented Nov. 24, 1896.

Fig. 1.

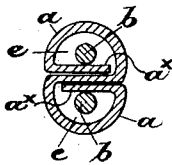


Fig. 2.

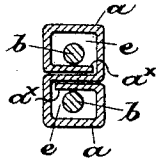


Fig. 3.

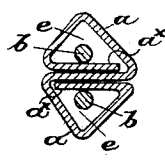


Fig. 4.

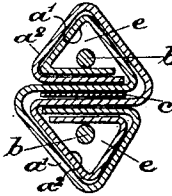


Fig. 5.

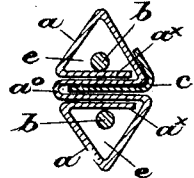


Fig. 12.

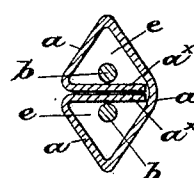


Fig. 6.

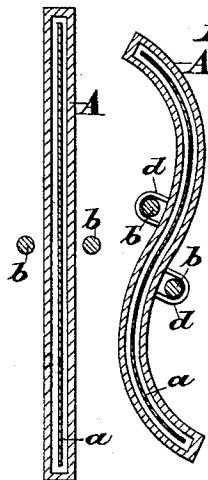


Fig. 7.



Fig. 8.

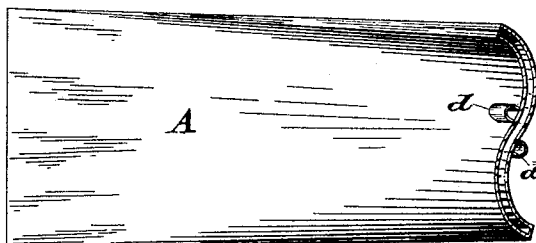


Fig. 9.

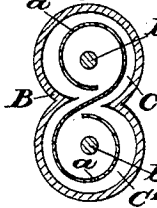
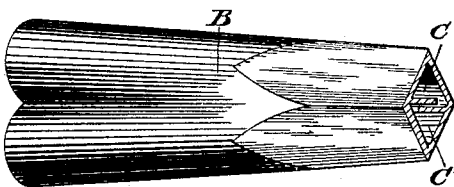


Fig. 10.



Fig. 11.



Witnesses.

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Inventor.

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(No Model.)

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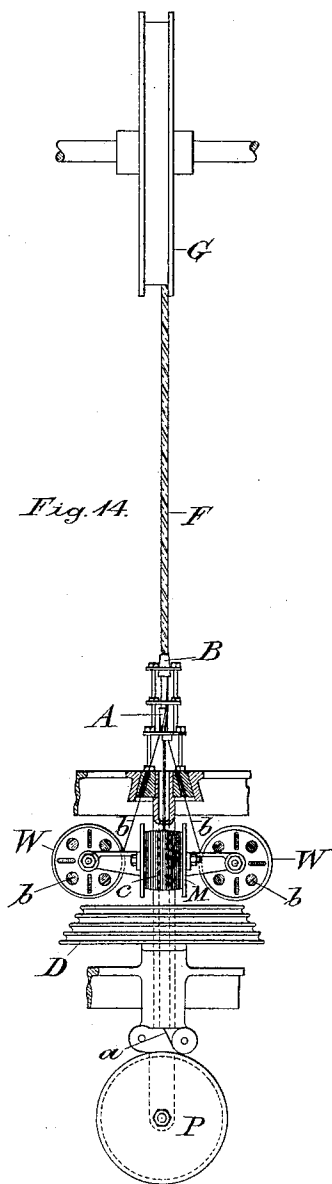


Fig. 14.

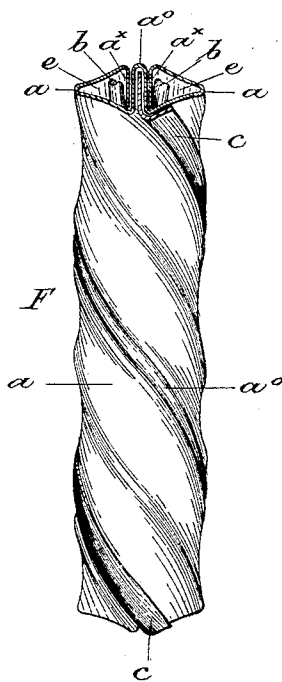


Fig. 13.

Witnesses.

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UNITED STATES PATENT OFFICE.

THEODORE GUILLEAUME, OF MÜHLHEIM-ON-THE-RHINE, GERMANY.

MEANS FOR INSULATING ELECTRIC CONDUCTORS.

SPECIFICATION forming part of Letters Patent No. 571,760, dated November 24, 1896.

Application filed November 2, 1895. Serial No. 567,759. (No model.) Patented in England May 13, 1895, No. 9,442, and in Belgium July 2, 1895, No. 116,373.

To all whom it may concern:

Be it known that I, THEODORE GUILLEAUME, a subject of the German Emperor, residing at Mühlheim-on-the-Rhine, in the German Empire, have invented new and useful Improved Means for Insulating Electric Conductors, (in respect whereof I have applied for, but not yet obtained, a patent in Germany to bear date June 24, 1895, No. F. 8,393, and have caused a patent to be obtained in Great Britain, dated May 13, 1895, No. 9,442, and in Belgium, dated July 2, 1895, No. 116,373,) of which the following is a specification.

This invention relates to the insulation of electric conductors on the "air-space" system, especially those of the type referred to in the specification of Letters Patent granted to me September 27, 1892, No. 483,285, and in which there are two conductors separated from one another by an insulating medium, such as one or more strips of paper or the like, the said invention comprising improved means for forming the air-spaces about the conductors for the better conservation of the air-spaces and for protecting the walls of the latter against crushing.

In the accompanying drawings, Figures 1, 2, and 3 represent in transverse section conductors insulated according to the improved method, Fig. 1 showing circular envelopes, Fig. 2 quadrangular envelopes, and Fig. 3 triangular envelopes. Fig. 4 illustrates a type of construction in which the insulating material is in two thicknesses and in which a metallic strip is introduced. According to Fig. 5 a metallic strip is also interposed; but the entire envelop is formed of a single strip. Figs. 6 and 7 are transverse sections at the entering and delivering ends, respectively, of the forming-tool employed in the initial stage of the manufacture of the improved insulated conductor; and Fig. 8 is an elevation thereof drawn to a reduced scale. Figs. 9 and 10 are views similar to Figs. 6 and 7, illustrating the entering and delivering ends of the die which produces the finished envelop. Fig. 11 is an elevation of this die. Fig. 12 illustrates in transverse section a strip of insulating material folded according to a modified method. Fig. 13 is an elevation of the construction

illustrated in Fig. 5, same showing the product as having been twisted in accordance with the present invention. Fig. 14 is an elevation of a machine adapted for manufacturing or producing the improved insulated conductors.

The insulating material *a*, constituting each tubular air-space, may be circular in cross-section, semicircular, triangular, quadrangular, or polygonal. The angular form is preferred as offering considerably greater resistance to external pressure than is presented by a cylindrical tube, thereby better conserving the air-spaces, the triangular form presenting the additional advantage of economizing space. The strip of insulating material *a* is laid between and about the wires *b b*, so as to inclose them, and its edges are bent inward at *a' a'*, so that they occupy a position in the center of the "double-barreled" tube when completed.

If it be desired to have a metallic strip between the conductors, two insulating-strips *a' a'* are by preference used, as shown in Fig. 4, and the metallic strip *c* interposed, contact between the wires *b b* and the metallic strip *c* being thereby prevented, and the induction-currents generated between the conductors diverted; or the metallic strip *c* may be laid in a special fold *a''* formed in the insulating-strip *a*. (See Fig. 5.) In this case, and where contact with an earth-conductor is desired, the metallic strip *c* may be arranged so as to project a little at the side and be folded against the insulating-strip. Such metallic strip serves not only to divert the induction-currents generated between the two conductors, but also the induction-currents generated between those and neighboring conductors.

In the production of an insulated conductor according to this invention a forming-tool of the general character illustrated in Figs. 6, 7, and 8 is employed, the delivery extremity whereof, Fig. 7, approximately corresponds in shape with that which the insulating-strip *a a' a''* is desired to assume, and may, for example, be S-shaped, C-shaped, or W-shaped. On opposite sides of the forming-tool *A* two ears *d d* are provided, which serve to force the wires *b b* in the proper direction. The insulating-strip *a* on leaving the forming-tool *A* enters and passes through a die

or folding instrument B, Figs. 9, 10, and 11, the walls of which force it to assume the shape desired for the finished product, while the wires *b b* respectively traverse the centers of the two compartments C C' into which the die is divided. The forming-tool A and die or folding instrument B may be connected by any suitable means, a sufficient interval being left between the two parts to allow the insulating-strip in its passage from the one part to the other to assume the required form for entering the folding instrument without difficulty, whereby the progress of the operations in both the forming-tool and the die are carried on uninterruptedly. The die B tapers toward the exit end, where each of the compartments C C' assumes a form corresponding with that desired for each member of the double-barreled insulating-tube. When in operation, the forming-tool and the die are caused to rotate in unison, each on its center as an axis, and thereby to impart a twist to the entire product. The air spaces or passages *e e*, each inclosing one of the wires *b b*, thus acquire a spiral form.

A machine adapted for producing the improved insulated conductors and having a forming-tool, such as A, and a die, such as B, arranged in operative position is illustrated in Fig. 14. The machine, speaking generally, is of the ordinary character. The insulating-strip *a* on leaving the reel P passes through the hollow axis of the pulley D and thence to the forming-tool A, the wires *b b* being meanwhile led off the reels W W, and the metallic strip *c* (when required) off its reel M. The insulating material *a* passes through the forming-tool A, while the wires *b b* pass along the outer surface of that tool and through the cars *d d*. The insulating material, the wires, and the metallic strip (if the latter be used) then enter the die or folding instrument B, issuing therefrom (for example) in the condition shown in section in Fig. 5. Owing to the rotation of the forming-tool and die the entire product F in passing from the die B to the guide-drum G becomes twisted, as shown in Fig. 13.

The improved conductors insulated as herein described may be provided with an outer protective sheathing or several such conductors may be assembled to form a cable.

The insulating-strip *a* may be folded about the wires *b b* by means other than those described, provided its edges be bent so as to lie in the interior of the duplex or double-barreled tube. Referring to Fig. 12, for instance, one edge of the strip *a* might be laid about both wires or conductors *b b*, so as to

cover them, and with the other edge be then forced between them, so that both edges occupy a central position in the interior of the completed product.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In an electric cable, a duplex tube, produced from a single strip, of non-conducting material, the edges of the strip being turned inward and constituting or forming part of a central partition dividing the tube into two compartments; the tube being, moreover, twisted about its axis so as to form spiral air-spaces within which the conductors are inclosed, substantially as herein described.

2. An electric cable comprising two naked conductors inclosed in the two compartments of a duplex tube produced from a single strip of non-conducting material, portions of the strip forming a wall to separate the two conductors; the whole being twisted about its common axis so as to convert the compartments within which the conductors are inclosed into spiral air-spaces, substantially as herein described.

3. An electric cable comprising two naked conductors inclosed in the two compartments of a duplex tube produced from a single strip of non-conducting material, portions of the strip in conjunction with a metallic strip forming a wall to separate the two conductors, and at the same time serving to insulate the metallic strip which is inserted in the thickness of the said wall; the whole being twisted about its common axis so as to convert the compartments within which the conductors are inclosed into spiral air-spaces, substantially as herein described.

4. The combination with two naked electric conductors of a twisted duplex inclosing tube produced from a single strip of non-conducting material, the edges of the strip being turned inward to form a wall to separate the two conductors, substantially as set forth.

5. For use in the manufacture of air-space cables, such as herein referred to, a forming-tool having a straight slot at its entering end which gradually assumes an S shape, a C shape or a W shape, and provided on opposite sides with cars for guiding the conductors; in combination with a finishing-tool having two circular compartments C C', which gradually contract and assume a triangular or other form corresponding with that required for the finished product.

THEODORE GUILLEAUME.

Witnesses:

MARIA NAGEL,

WILLIAM H. MADDEN.