C. J. BEAVER & E. A. CLAREMONT.

MANUFACTURE OF ELECTRIC CABLES.

APPLICATION FILED APR. 4, 1918.

1,298,644.

Patented Apr. 1, 1919.

4 SHEETS—SHEET 1.

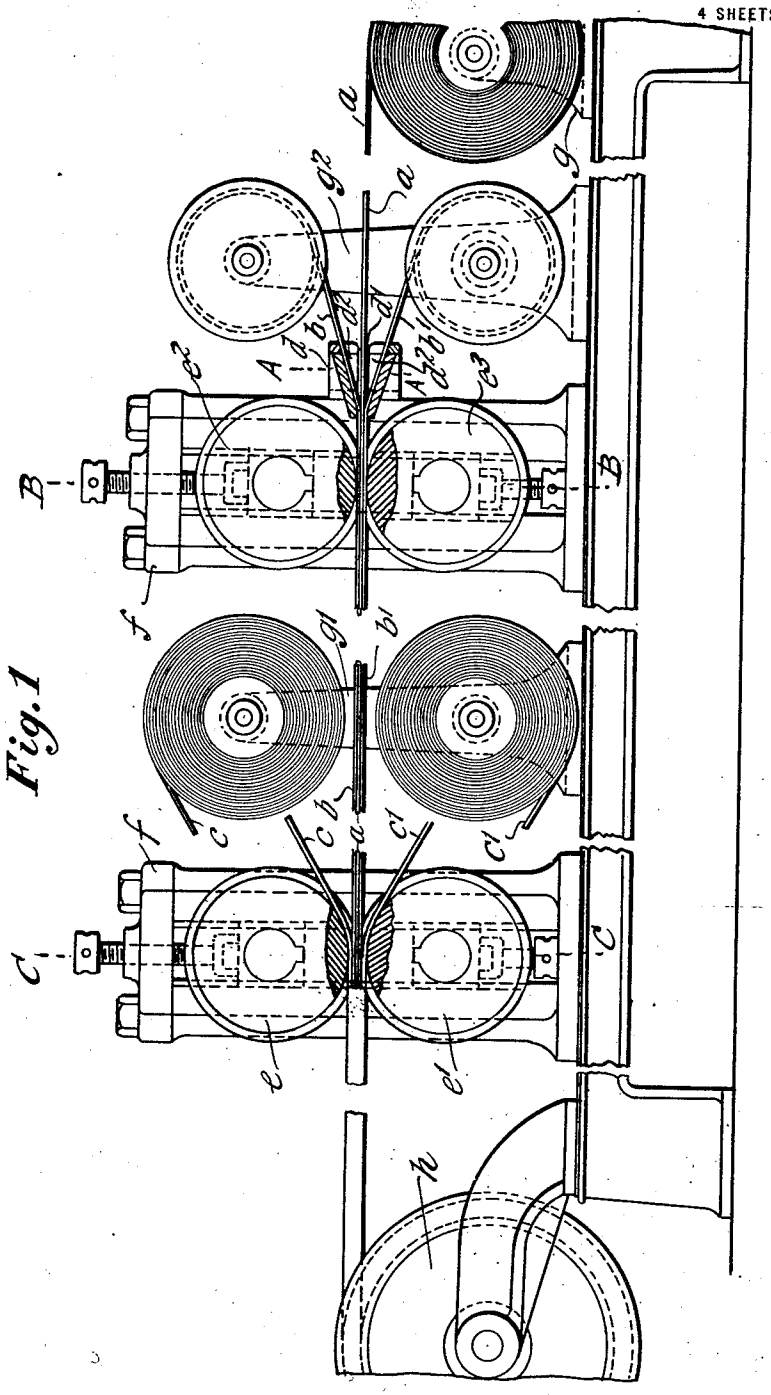


Fig. 1

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4 SHEETS—SHEET 2.

Fig. 4

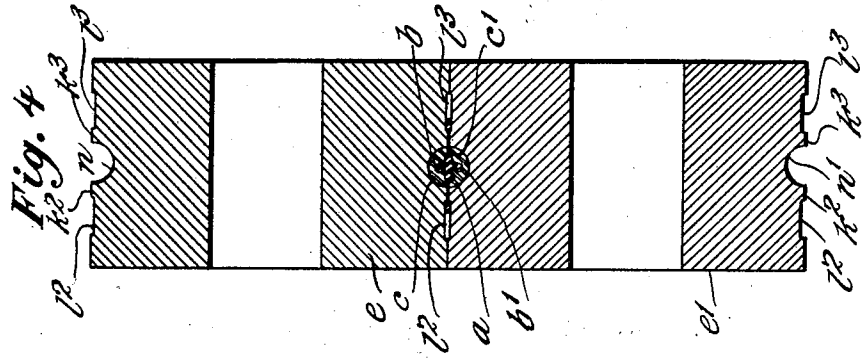


Fig. 3

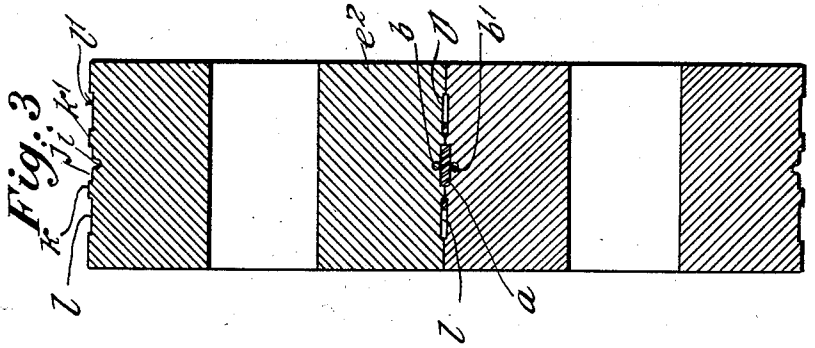
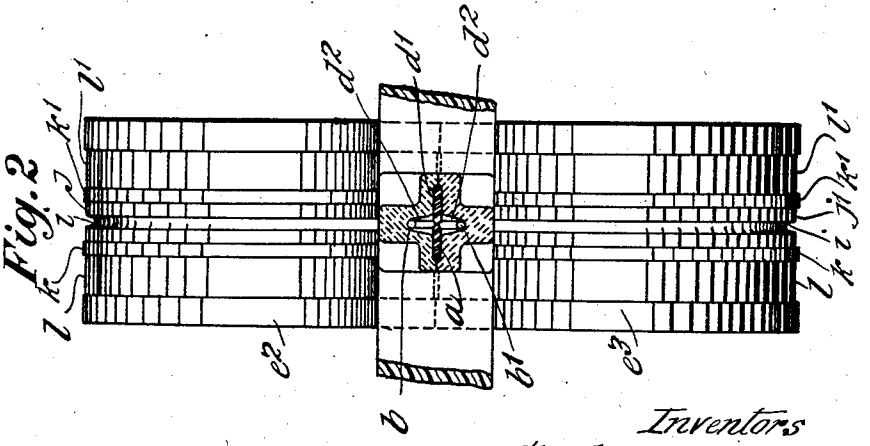


Fig. 2



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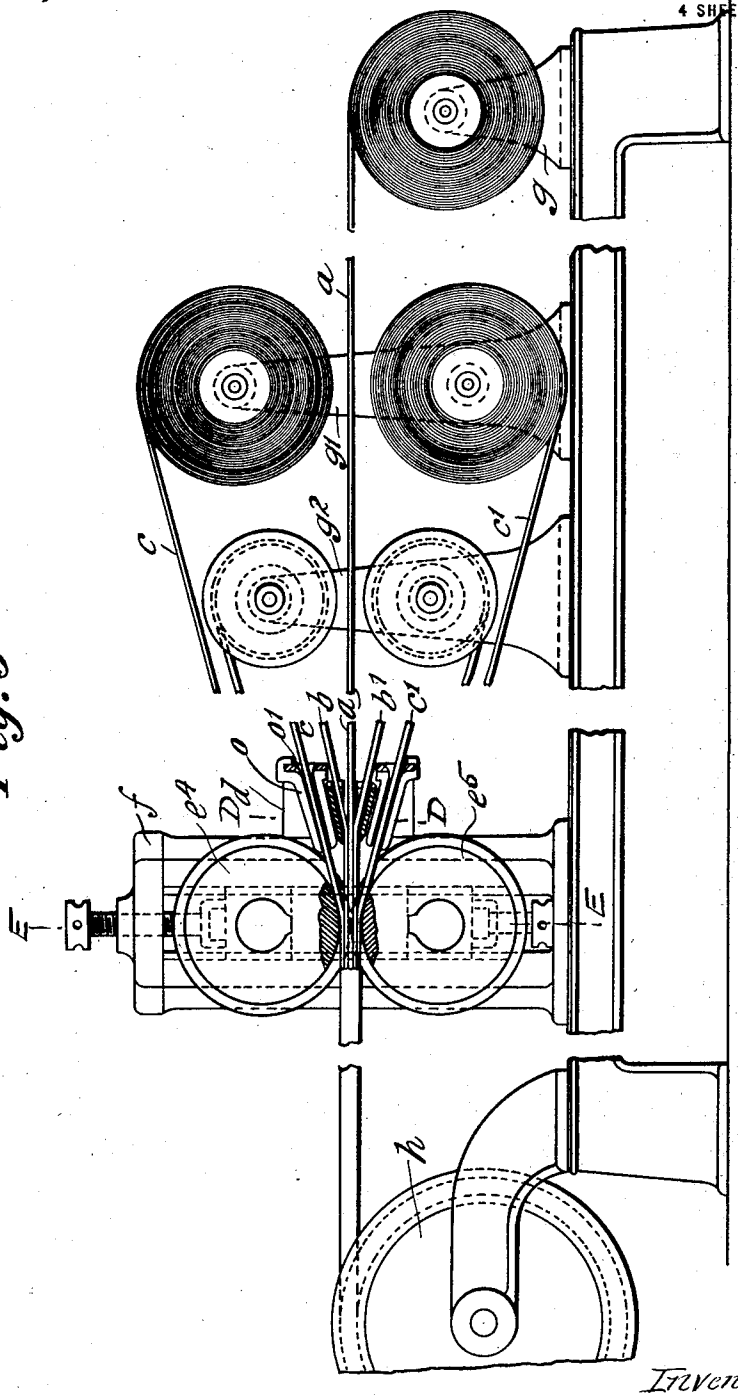
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4 SHEETS—SHEET 3.

Fig. 5



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4 SHEETS—SHEET 4.

Fig. 9

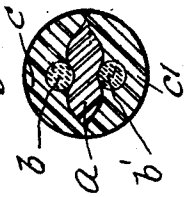


Fig. 8

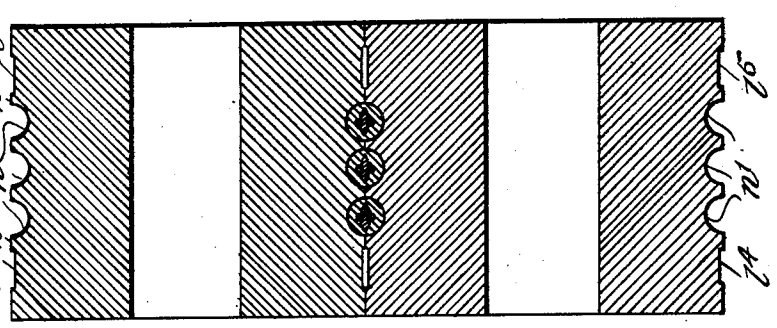


Fig. 7

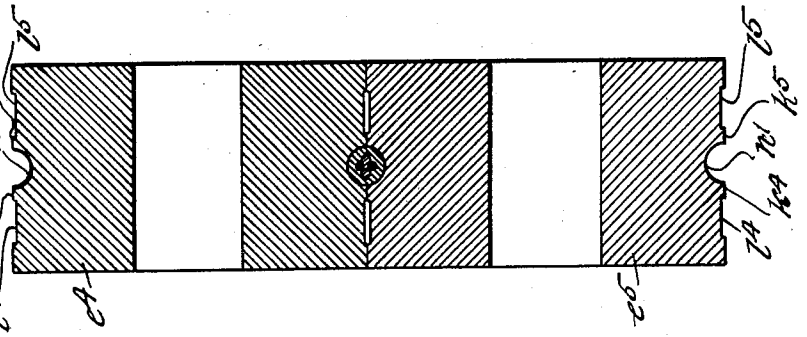
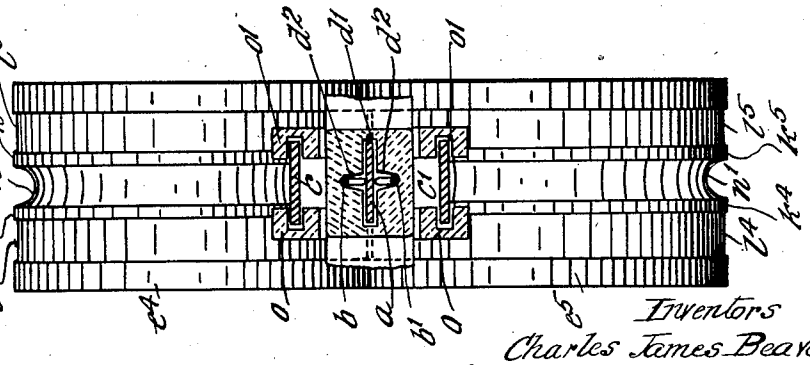


Fig. 6



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UNITED STATES PATENT OFFICE.

CHARLES JAMES BEAVER AND ERNEST ALEXANDER CLAREMONT, OF CHESTER, ENGLAND.

MANUFACTURE OF ELECTRIC CABLES.

1,298,644. Specification of Letters Patent. Patented Apr. 1, 1919.

Application filed April 4, 1918. Serial No. 226,729.

To all whom it may concern:

Be it known that we, CHARLES JAMES BEAVER and ERNEST ALEXANDER CLAREMONT, electrical engineers, of Chester, England, have invented certain new and useful Improvements in and in the Manufacture of Electric Cables, of which the following is a specification.

This invention relates to twin wire electric cables. For many purposes, such as telegraph, telephone and electric light conductors it is desirable to employ twin wires efficiently insulated from one another and from earth and to inclose them within the smallest compass compatible with such efficient insulation.

According to our invention three strips of rubber or other suitable flexible insulating material not of plastic form or condition and the two conductors are laid together, one strip of rubber or other material (not thicker than necessary for efficiently insulating the same) being between the conductors and one strip on the outer side of each conductor, the whole being pressed together to cause the strips of rubber or other insulating material to infold the two conductors (at the same time keeping them apart) and the edges of all three strips on each side to adhere and become autogenous, thus forming a circular or approximately circular two-core cable. The cable is then vulcanized. In order to accomplish this we use a longitudinal machine of the ordinary type having two "heads" or pairs of suitably grooved rollers and proceed as follows:— We accurately guide the two conductors with a strip of the rubber or other material between them through the first pair of rollers and thereby compress the conductors into the strip of rubber or other material. The extent to which the conductors are compressed into the strip of rubber or other material is determined by the shape of the rollers, the thickness and compressibility of the strip and the degree of pressure between the rollers. By this means we insure that the conductors are definitely separated from and accurately and symmetrically disposed with relation to each other and to the central strip. We then conduct the two conductors with the strip of rubber or other material and the other two strips of rubber or other material through the second pair of rollers and compress the other two strips of rubber or other material all around the conductors and their separating strip so that the said other two strips are joined together and the whole forms a solid mass of material completely inclosing the separated conductors. We then vulcanize the whole.

Separate lengths of the twin conductor so insulated may be laid up together to form a multiple twin cable and be subsequently vulcanized if desired and further covering may be applied to the twin or multiple cable in known manner.

By a modification of the process one pair of longitudinal rollers alone may be used, the conductors being guided into the grooves of the said rollers simultaneously with the three strips of rubber or other material and the edges of all three strips may be made to join together. Further a plurality of pairs of insulated conductors might be simultaneously produced.

In the accompanying drawings is illustrated a form of our invention.

Figure 1 is a side elevation of a machine having two pairs of grooved rollers suitable for applying the intermediate and overall insulating material in two stages.

Fig. 2 is a transverse section through the guides of the conductors and center strip on line A—A of Fig. 1.

Fig. 3 is a section of the first pair of rollers on line B—B of Fig. 1.

Fig. 4 is a section of the second pair of rollers on line C—C of Fig. 1.

Fig. 5 is a side elevation of a machine having only one pair of grooved rollers suitable for applying the intermediate and overall insulating material in one operation.

Fig. 6 is a section on line D—D of Fig. 5 through the guides of the conductors and rubber strips.

Fig. 7 is a section of the grooved rollers on line E—E of Fig. 5.

Fig. 8 is a section similar to Fig. 7 but showing rollers (as an example of the simultaneous production of a plurality of pairs of insulated conductors) for three pairs of conductors.

Fig. 9 is a cross section through a completely insulated twin cable.

Generally in the drawings like letters indicate like parts.

In Figs. 1 to 5 a is the central separating strip of insulating material, b and b^1 are the conductors, c and c^1 are the strips of in-

sulating material forming the overall insulating covering. d is the guide for the accurate disposal of the conductors and the central strip of material preferably mounted on the housing f; e e^1 e^2 and e^3 are the two pairs of grooved rollers in Fig. 1 and e^4 and e^5 the single pair of rollers in Fig. 5 shown in each case partly in section. f are the housings carrying the said rollers in the usual manner, (for the sake of clearness the housings and bearings nearest the observer are not shown). g and g^1 are brackets carrying the rolls of rubber or other insulating material for the central strip and overall strips respectively. g^2 is a bracket carrying the bobbins containing the conductors b and b^1. h is the hauloff wheel by which the cable and its component parts are drawn through the machine. The driving gear for the hauloff and the rollers is not shown.

In the machine illustrated in Fig. 1 all the rollers have similar grooves l, l^1, l^2 and l^3 and the rollers e^2 and e^3 have wide flat grooves j and j^1 which together are of the required cross section, size and shape of the central insulating strip and have semi-circular or quasi semi-circular grooves i and i^1 in the center of the flat grooves j and j^1 and the rollers e and e^1 have semi-circular grooves n and n^1 which together are of the size and shape of the completed cable.

In the machine shown in Fig. 5 the rollers have grooves l^4 and l^5 and also semi-circular grooves n and n^1 of the size and shape of the completed cable.

The guide shown in Fig. 2 has a horizontal passage d^1 to receive the central strip and guide it to its correct central position between the rollers e^2 and e^3, and two vertical converging passages d^2 to receive the two conductors and guide them to the central semi-circular grooves i and i^1 in the rollers e^2 and e^3.

In the machine shown in Fig. 5 in addition to the guide d (which is similar to that in Fig. 1) there are two guides o with passages o^1 horizontal in cross section but converging vertically to receive the overall strips of insulating material and conduct them to the central position of the rollers.

Each of the strips of insulating material is fed into the machine wider than is ultimately required.

In the case of the machine shown in Fig. 1 the edges of the central strip are received and bitten by the shoulders k and k^1 formed by the said grooves of the rollers, the strip is compressed into the space formed between the rollers by the flat grooves j and j^1 and the edges are cut off by the shoulders k and k^1 and are received and disposed of by the grooves l and l^1 and at the same time the two conductors are received by grooves i and i^1 and are pressed into and partially embedded in the central strip of insulation.

On passing through the second pair of rollers the central strip with the two conductors and the two outer strips are received in the grooves n and n^1 the edges of the outer strips being received by and bitten between the shoulders or projections k^2 and k^3 the whole is compressed, and the edges of the overall strips are compressed together their longitudinal joints being sealed, and the overall strips rendered homogeneous, the surplus width of such strips being cut off by the shoulders k^2 and k^3 and received and disposed of by the grooves l^2 and l^3.

In the case of the machine shown in Fig. 5 the three strips and two conductors are all received from the guides by the grooves n and n^1 the edges of all three strips are received by and bitten between the shoulders k^4 and k^5, the whole is compressed in the space formed between the rollers by the grooves n and n^1 the pressure being sufficient to impress the conductors into the central strip, the edges of the overall strips and the central strip are compressed together, the longitudinal joints being sealed and surplus width is cut off by the shoulders k^4 and k^5 and received and disposed of by the grooves l^4 and l^5.

In Fig. 8 the manner of producing simultaneously a plurality of insulated pairs of conductors is illustrated. This only entails multiplication of the number of conductors with an augmentation of guide passages for them, and not of the number of strips of insulating material as will be apparent to anyone versed in the art. It will also be clear that a number of pairs of insulated conductors may be inclosed in one covering forming a multiple cable.

It has been previously proposed to cover conductors with insulation by passing them with two strips of insulating material between suitably shaped rollers and also to make in like manner a two core cable with a wide strip of insulating material between them through which nails might be driven to fix the cable in position and save wood casing or other means of protection but these proposals would not effect the object of our invention which is to make a circular twin core cable of as small a diameter as possible and that quickly and cheaply.

What we claim as our invention and desire to secure by Letters Patent of the United States is:—

1. A circular or approximately circular electric cable consisting of two conductors, insulation between such conductors composed of rubber or other suitable flexible insulating material in the form of a strip not thicker than necessary to efficiently insulate the same, and an exterior insulation composed of rubber or other material aforesaid in the form of two strips respectively folded half around the cable and the edges of the

three strips of rubber or other material caused to adhere and become autogenous by pressure.

2. The method of manufacturing circular or approximately circular electric cables consisting in drawing two conductors and three strips of insulating material from separate sources of supply, one of said strips being not thicker than necessary to insulate said conductors and being positioned between same and the remainder of said strips being positioned to form exterior insulation for the whole, and passing the conductors and insulating strips between shaped pressure members whereby the last mentioned strips are each respectively folded half around the cables and the edges of all three strips are caused to adhere and become autogenous.

3. The method of manufacturing circular or approximately circular electric cables consisting in drawing two conductors and a strip of insulating material from separate sources of supply, the said strip being no thicker than necessary to insulate said conductors and passing the conductors and strip between shaped pressure members whereby the insulating material is positioned between said conductors, then drawing two other strips of insulating material from other sources of supply and passing the whole between other shaped pressure members whereby the last mentioned strips are each respectively folded half around the conductors and the first strip and the edges of all three strips are caused to adhere and become autogenous.

4. The method of manufacturing circular or approximately circular electric cables consisting in drawing a plurality of conductors and a plurality of strips of insulating material from separate sources of supply, positioning one of said strips of a thickness sufficient only to insulate the conductors to lie between the conductors, positioning the remainder of said strips to lie exteriorly of the conductors and first mentioned strips and then subjecting the whole to pressure between shaped pressure members whereby the conductors are compressed into the first mentioned strip and the last mentioned strips are folded around the conductors and first strips and the edges of all said strips are caused to adhere and become autogenous.

In witness whereof we have signed this specification in the presence of two witnesses.

CHARLES JAMES BEAVER.
ERNEST ALEXANDER CLAREMONT.

Witnesses:
E. B. JOULE,
C. A. NEALE.