C. THIBODEAU.

PROCESS AND APPARATUS FOR INSULATING ELECTRIC CONDUITS.

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1,008,572. Patented Nov. 14, 1911.

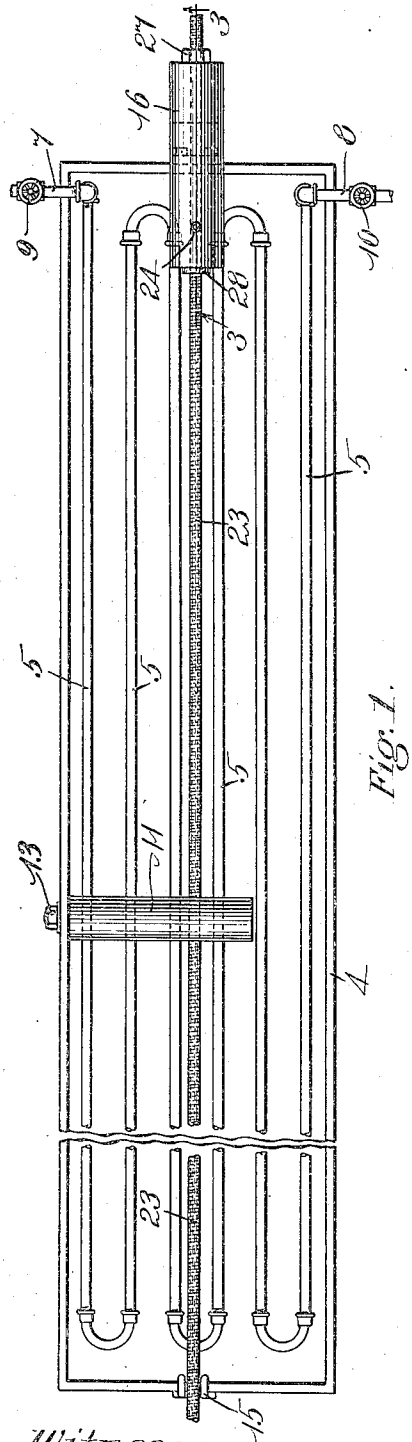

Fig. 1.

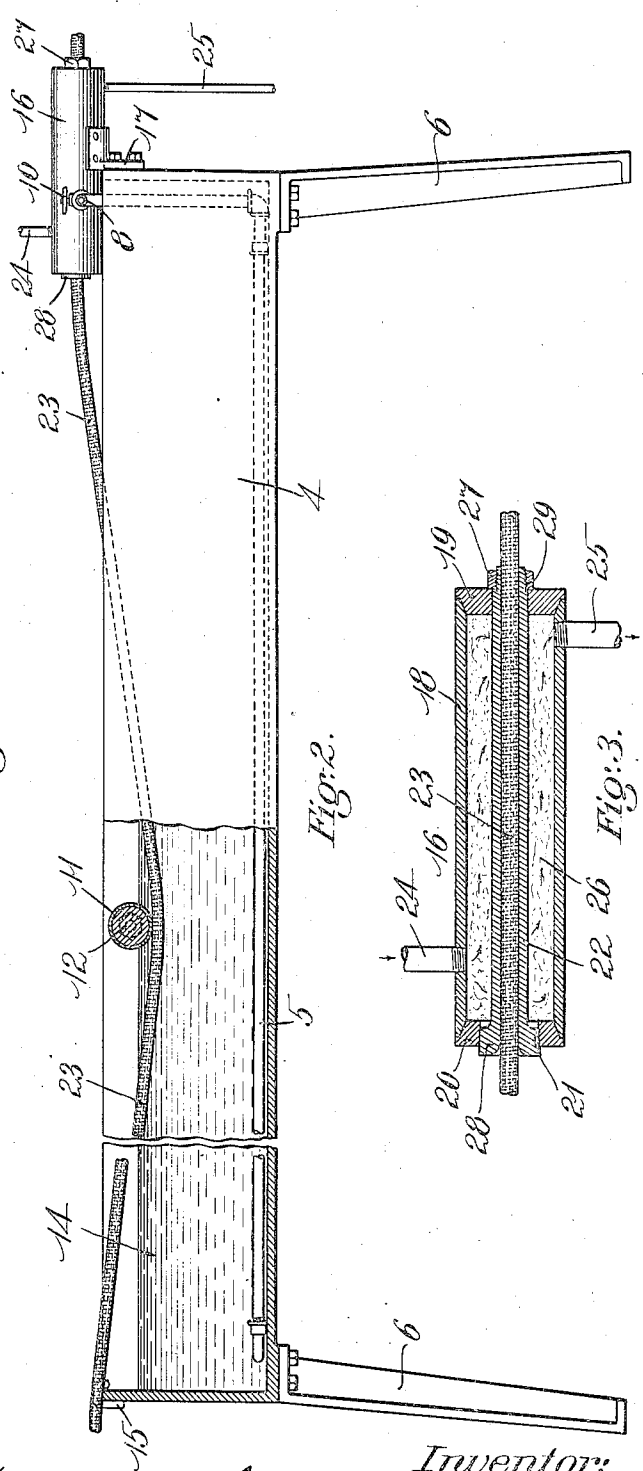

Fig. 2.

Fig. 3.

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UNITED STATES PATENT OFFICE.

CHARLES THIBODEAU, OF CAMBRIDGE, MASSACHUSETTS, ASSIGNOR TO AMERICAN CIRCULAR LOOM COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MAINE.

PROCESS AND APPARATUS FOR INSULATING ELECTRIC CONDUITS.

1,008,572. Specification of Letters Patent. Patented Nov. 14, 1911.

Application filed March 26, 1910. Serial No. 551,723.

To all whom it may concern:

Be it known that I, CHARLES THIBODEAU, a citizen of the United States, residing at Cambridge, in the county of Middlesex and State of Massachusetts, have invented new and useful Improvements in Processes and Apparatus for Insulating Electric Conduits, of which the following is a specification.

My invention relates to processes and apparatus for rendering electric conduits water-proof and more flexible, and for providing a more effective means of insulation.

My invention consists in first covering a helix or other supporting frame of a flexible conduit, designed for the protection and insulation of electric wires, with one or more layers of porous textile fabric, then passing the same through a molten insulating and waterproofing compound, and finally drawing the tubing into a die which is kept at a temperature sufficiently high to cause the said fabric to be saturated with said compound, and to firmly cement said fabric to the framework of said conduit.

My invention further consists in constructing an elongated trough or vat having at the bottom thereof steam pipes for keeping at the proper temperature the insulating and waterproofing compound introduced therein, a guide roller being provided near the top of the trough and secured to one of the side walls thereof for the purpose of dipping the conduit in said compound, combined with a die kept at a high temperature and arranged to receive said conduit after it has been dipped in said compound.

My invention further consists in constructing an oven consisting of a tubular die of the same diameter as said conduit and provided with a beveled ingress opening, the wall of said die being inclosed by a steam jacket for the purpose of subjecting the exterior of said conduit to a heat of considerable temperature.

My invention further consists in other improvements fully illustrated in the drawing and more specifically hereinafter pointed out and claimed.

Reference is hereby made to the drawing in which similar numerals of designation refer to similar parts throughout the several views.

Figure 1 is a plan view of my improved apparatus showing the trough before the compound has been introduced therein, the steam pipes at the bottom thereof, a portion of the conduit, the roller, and steam jacket. Fig. 2 is a side elevation, partly in section, of the view shown in Fig. 1, the trough, however, being shown filled with the compound used for saturating the porous wrapping of the conduit. Fig. 3 is an enlarged vertical section of the steam jacket and its connections on line 3—3 of Fig. 1, looking in the direction of the arrows.

Referring to the drawing, the trough 4 is shown in the form of an elongated rectangular box supported by the legs 6, and is preferably constructed of metal or other material suitable for the purpose. Within the said trough and preferably resting upon the bottom thereof are coils of pipe 5, steam being introduced therein at the pipe section 7, and escaping therefrom at the pipe section 8, stop cocks 9 and 10, providing a means for regulating the flow of the steam and maintaining the desired temperature. To one side of the trough near the top thereof I secure a rod 12 upon which is mounted the idler roll 11. Preferably one end of the said rod is threaded to engage with an opening in the side of said trough and to be affixed and held in proper position by means of the nut 13. The purpose of said roll is to provide a means of positively dipping the conduit into the compound 14, (see Fig. 2). At the outer end of said trough is the guard or shield 15 to protect the conduit from injury from the rough edge of said trough. Upon the opposite end of the trough 4, is mounted the steam jacket 16, secured to the brackets 17, which are bolted to the upper edge of said trough. The said jacket is composed of the cylinder 18, ends 19 and 20, a die 22 fitting therein, an ingress pipe 24 and an egress pipe 25. The end 20 is formed with an opening 21 tapering toward the interior of said jacket, the better to enable the tapered head 28 of the die 22 to engage therewith and form a steam tight joint,—the opposite end of said die passing through the opening 29 in the head 19 and being threaded to engage with a nut 27, which serves to draw the head 28 tightly within the opening 21, and which also serves to hermetically close the opening 29. Through the use of the tapered opening 21, I am enabled to use different sizes of dies, which though of vary-

ing diameters are formed with heads and ends of uniform shape. I also prefer to bevel the opening within the head 28, to facilitate the introduction of the conduit therein and also scrape off the surplus compound. Steam is introduced into the interior of the jacket through the pipe 24 and passes out through the pipe 25,—stop cocks (not shown) being employed to regulate the flow of said fluid. Preferably the trough 4 is constructed of such length that the conduit 23 passing therethrough shall be deflected as slightly as possible out of the horizontal and straight line of its progress, the purpose being to keep the convolutions of the helical frame of the preferred form of conduit used by the applicant close together in order to prevent the admission of the compound 14 into the interior of the conduit and the consequent obstruction of its bore.

The operation of my invention is as follows:—The conduit 23 having one or more outer coverings or layers of textile fabric, preferably porous cotton cloth, and an interior framework supporting the same, is drawn into the waterproofing and insulating compound 14, under the roll 11, the said compound being heated to fluidity by means of the steam pipe 5. The conduit is then slowly introduced into the die 22, inclosed by the steam jacket aforesaid, all surplus compound being removed by the head 28. Preferably a temperature of approximately 300 degrees Fahrenheit is maintained within the said jacket, though the results of my invention may be produced by any temperature great enough to cause the compound completely to saturate the layers of cotton cloth and cause them to adhere to each other and to the framework aforesaid. The speed of the passage of the conduit through the die is preferably timed so that during said passage the said saturation and adhesion will be readily accomplished.

In the preferred form of my conduit, I employ as a basis or frame of the same a flat strip of paper fiber helically wound to form a tube, the convolutions of said strip not being separated when the tube is held in a straight position. Around the said tube I preferably wind a thin tape of porous cotton cloth, the edges of which overlap to a considerable extent, and over the layer of tape I weave or braid a seamless covering of porous textile fabric, the construction of the conduit being of the same general character as that described in Letters Patent No. 456,271 to Herrick, dated July 21st, 1891, for flexible conduits, except that there are preferably no spaces left between the convolutions of the spiral framework. The said cloth and fabric are preferably so porous as to permit the compound when heated by the steam jacket to freely enter into their interstices as far as the fiber frame, the convolutions of which being unseparated will not permit the said compound to enter the interior of said tube, though allowing said compound to work slightly into the line of separation between said convolutions. I am thus enabled to use as a waterproofing layer next to the helical framework a cheap cotton tape, and at the same time to unite and cement all parts together so as to give great strength and resiliency to the structure. While I have described the use of said porous covering or layers in connection with a helical or other framework of a flexible electric conduit, I by no means desire so to limit my invention to the use of the same, since it is obvious that my process and apparatus could be used to advantage in waterproofing or insulating the exterior covering or coverings of any flexible electric conductor, conduit or other tubular structure without departing from the spirit of my invention.

What I claim and desire to secure by Letters Patent is:

1. In an apparatus for waterproofing and insulating flexible electric conduits having a tubular support and a porous outer covering, a receptacle containing waterproofing and insulating compound and means for dipping the said conduit in said compound, combined with a die for scraping the surplus compound from the exterior of said conduit, said die being maintained at a temperature sufficiently high to saturate the said wrapping with said compound and to cause the same to adhere to said tubular support of said conduit.

2. In an apparatus for waterproofing and insulating flexible electric conduits having a supporting tube and a porous outer covering, a receptacle containing waterproofing and insulating compound and means for dipping the said conduit in said compound, combined with an elongated die for scraping off the surplus compound from the exterior of the outer covering of said conduit, said die being inclosed in a steam jacket the temperature whereof is maintained at a degree sufficient to saturate said outer covering with said compound and to cause the same to adhere to the supporting tube of said conduit.

3. In an apparatus for waterproofing and insulating flexible electric conduits having a tubular support and a porous outer covering, a receptacle containing waterproofing and insulating compound and means for diping the said conduit in said compound, combined with an elongated die for scraping off the surplus compound from the exterior of the outer covering of said conduit, said die being inclosed in a steam jacket the temperature whereof is maintained at a degree sufficient to saturate said outer covering with said compound and to cause the same to ad-

here to the said tubular support, and said die being detachably connected to said steam jacket and readily removable therefrom.

4. A steam jacket and die for saturating a porous covering of flexible electric conduits with waterproofing compound, consisting of an elongated metal box, one end whereof is formed with a tapered opening therein, the other end having therein a circular opening, a tubular die having at one end a tapered head shaped to engage with said tapered opening, the other extremity of said die passing through said circular opening and threaded to engage with a nut located on the exterior of said jacket and hermetically sealing the same, combined with means for causing steam to flow into and out of said jacket and to regulate the passage of the same therethrough.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses, this 21st day of March 1910.

CHARLES THIBODEAU.

Witnesses:

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K. M. SULLIVAN.