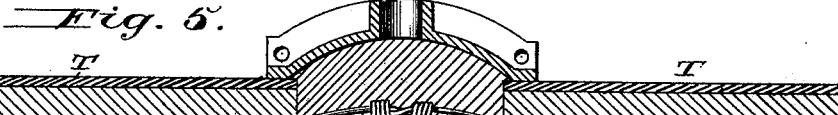


Patented May 13, 1879.

Fig. 1.

Fig. 3. A perspective view of a cylindrical device. The left end face is labeled 'I' and features a central circular area with a grid of small dots. A vertical line passes through the center of this face. The cylindrical body is labeled 'II' and has a section with a hatched pattern. A rectangular base is labeled 'B'.

Fig. 5.



Attest:
H. D. Pennington

Inventor.
Robt. P. Manly.

Twentor.
Robt P. Manly.
By Fred M. Royce
Att'y.

UNITED STATES PATENT OFFICE.

ROBERT P. MANLY, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN APPARATUS FOR INSULATING TELEGRAPHIC CONDUCTORS.

Specification forming part of Letters Patent No. **215,231**, dated May 13, 1879; application filed January 20, 1879.

To all whom it may concern:

Be it known that I, ROBERT P. MANLY, of Philadelphia, in the county of same name and State of Pennsylvania, have invented new and useful Improvements in Protected and Insulated Electrical Conductors, of which the following is a specification.

The object of this invention is to secure a perfect insulation of the conducting-wires in that class of insulated and protected telegraph-cables composed of one or more wires surrounded by a tube and embedded in a fusible insulating material filling the space not occupied by the wires within the tube.

It has been customary to manufacture these cables by arranging the wire or wires within the tube, and at a proper distance from the inner surface thereof, and then to pour in the insulating material in a molten state, leaving the whole to cool and contract freely after expansion by the heat of said material. The tube, wires, and insulating material, being of different form, and all usually made of different substances, contract differentially or unevenly, and this difference of contraction has caused the tubes and wires to become bent or twisted, and the wires to be brought in contact with the tube, and their insulation of course destroyed or rendered more or less imperfect. Though the bent tubes could be straightened, the wires could not, after cooling, so that a large proportion of the cables have been worthless for telegraphic purposes.

In overcoming the difficulties and preventing the losses hitherto experienced in the manufacture of cables of this class, my invention consists, first, in maintaining the wire under tension longitudinally and the tube in a straightened position while the molten insulating material surrounding the wire and filling the tube and said wire and tube are cooling, whereby the tube is prevented from bending or twisting, the wire or wires prevented from lateral displacement, and the insulating material permitted to follow its own law of contraction without affecting the relative positions of the other members of the cable; second, in a novel apparatus by means of which the above-described method of manufacture is practiced.

In the accompanying drawings, Figure 1 is a perspective view of an apparatus for carrying my invention into effect. Fig. 2 is a transverse section of a single-wire cable. Fig. 3 represents a section of cable having a number of wires, and illustrates a portion of the tension devices. Fig. 4 shows the apparatus and devices for the manufacture of a cable having a plurality of wires. Fig. 5 illustrates the mode of connecting the ends of two sections of cable.

The letter A indicates the base portion of a clamping device for holding a section of tubing in a straight position, B B' designating parallel ridges, between which is formed a trough or receptacle for the tube-section. To the ridge B' is hinged a lid, C, which, when shut down, completely covers said gutter, and is provided with a suitable latch. The ridges B and B' do not extend the entire length of the base A; but at each end of the ridges and gutter is a platform or table, *a*, at about the center of which is arranged a vertical spindle, D or D', adapted to be turned by a suitable wrench. Through the lower portion of the base A are longitudinal passages E, through which may be passed hot air, steam, or other suitable medium, for communicating heat to the base and a section of tubing within the gutter or trough, said base being preferably constructed of a good conductor of heat.

In using this apparatus in the manufacture of cables according to my invention, I lay the section of tubing, as at T, which has been first straightened by any suitable means, in the trough or receptacle between the ridges B B', and then pass through said tube-section a section of wire, *w*, with its ends projecting sufficiently for attachment to the spindles D D'. Previously to attaching the wire to the spindles, however, I pass over each of its ends a centrally-perforated plug, (designated by *f*), and having such a diameter as to fit closely within the ends of the tube; and when inserted therein, as shown at Fig. 1, these plugs hold the wire in a central position in said tube. The plugs being inserted, I then secure the ends of the wire to the spindles D and D', respectively, and turn the spindles, or one of them, until the wire is wound taut. I then

form a hole, *h*, in the top surface of the tube, near one end, for the purpose of pouring into the tube the molten insulating material, of which any of those fusible substances or compounds in ordinary use may be selected. I also usually form in the end of the tube opposite the pouring-hole a small vent for the escape of air. The various parts being thus arranged, I pass through the passages *E* hot air or steam, by means of any of the ordinary hot-air blowers or pipes leading from a suitable steam-generator, and raise the temperature of the base *A* to approximately the melting-point of the insulating material to be used, this being done in order to secure the free flow of said material in the tube. I then pour the molten insulating material into the tube, filling it completely, after tightening the wire to take up all expansion from the heating of the base. After filling the tube I again tighten the wire, if I find it to have further expanded, and then shut down and latch the lid *C*, remove the hot-air or steam connections from the passages *E*, and permit cold air to flow therethrough to cool off the whole. The wire, being under tension, cannot contract as it cools, or become bent or twisted, nor can the tube become bent or twisted, as it is firmly clamped in a straight position.

The insulating material may follow its own law of contraction without affecting either the wire or tube. The tube being thus kept straight, and the wire maintained in a central position, so that it will be evenly surrounded by the insulator, the insulation of the section will be perfect.

The devices shown in Figs. 3 and 4 are used in the manufacture of cables having a plurality of wires. The ends of the tube are closed

by perforated plates, as shown at *G*, the perforations being suitably arranged to hold the wires in proper position within the tube. The ends of the wires are firmly connected to the perforated plates *I*, which are connected to the spindles by wires *m n*.

In joining the ends of two cable-sections I splice the wires in the usual manner, then cover the joint with an expanded sleeve, *S*, composed of two halves, in each of which is formed one-half of a pouring-passage, *p*. When the two halves are secured together by the screws or bolts the pouring-passage is completed, and through it I then fill the sleeve with the insulating material, and the joint is complete.

Having now described my invention, I claim—

1. The herein-described improvement in processes for manufacturing insulated and protected telegraph-cables, the same consisting in maintaining the wire or wires under tension and the inclosing-tube in a straightened position while the molten insulating material with which the tube has been filled and said wire and tube are cooling, substantially as set forth.

2. The improved apparatus consisting of the base *A*, having a trough formed in its surface, the lid for covering said trough, and the spindles, one or more, for giving tension to the wire, substantially as described.

3. The base *A*, having the passages *E*, and the trough, in combination with the lid and one or more spindles for tightening the wire or wires, substantially as described.

ROBERT P. MANLY.

Witnesses:

P. W. MANLY,
CHAS. T. PACKER.