

(No Model.)

D. N. HURLBUT.

UNDERGROUND LINE.

No. 276,415.

Patented Apr. 24, 1883.

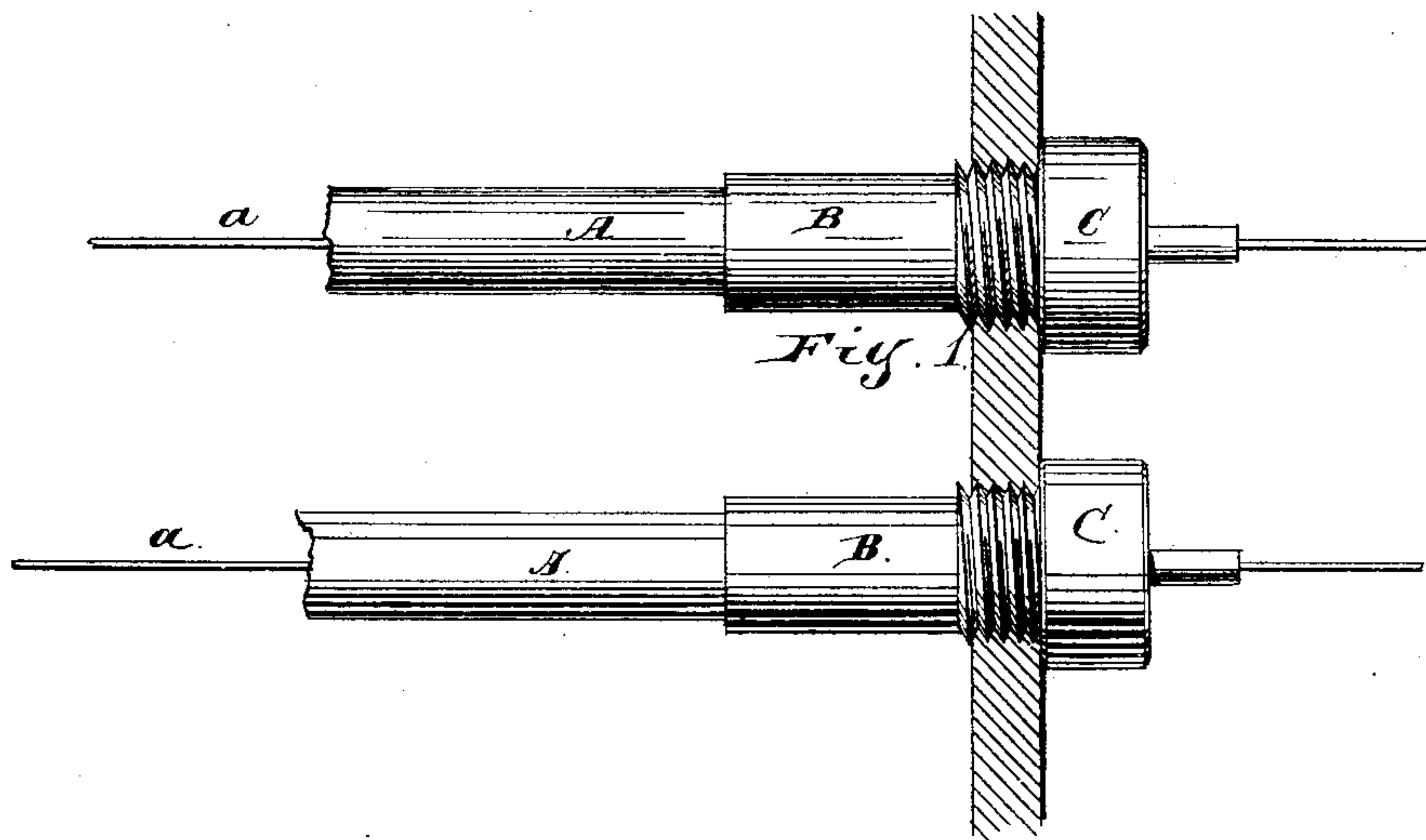


Fig. 3.

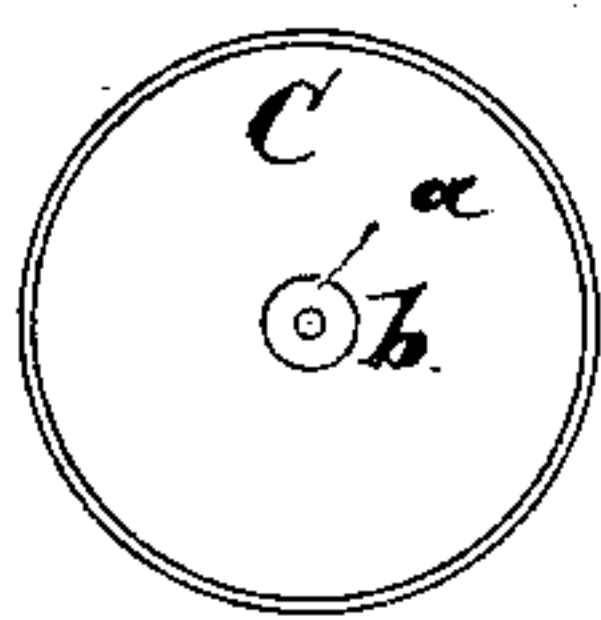


Fig. 2.

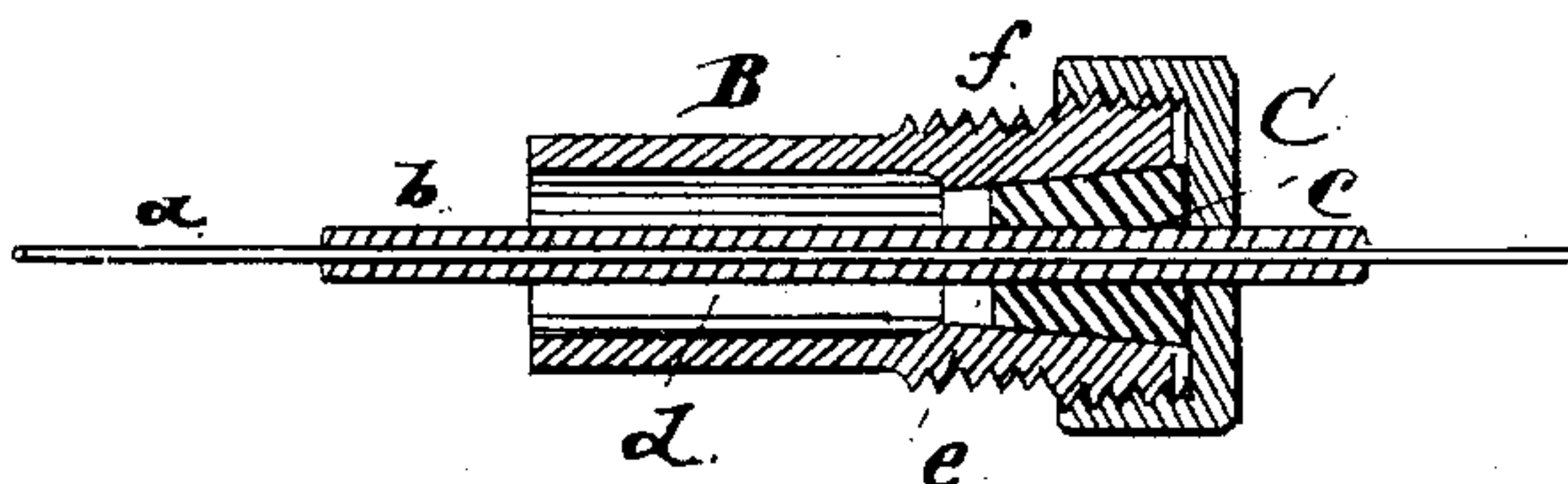
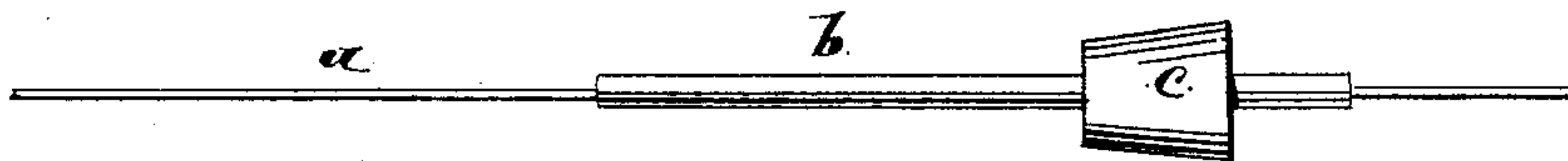


Fig. 4.



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UNDERGROUND LINE.

SPECIFICATION forming part of Letters Patent No.-276,415, dated April 24, 1883.

Application filed December 18, 1882. (No model.)

To all whom it may concern:

Be it known that I, DANIEL N. HURLBUT, residing at Chicago, in the county of Cook and State of Illinois, and a citizen of the United States, have invented new and useful Improvements in Insulating Underground Wires, of which the following is a full description, reference being had to the accompanying drawings, in which—

Figure 1 is a longitudinal elevation, showing a section of a tube with the naked wire and the terminal end by which the insulation of the wire is effected; Fig. 2, a vertical longitudinal section of the terminal end, showing the wire and devices by which it is insulated; Fig. 3, an end view of the cap or nut; Fig. 4, a detail showing the wire with insulating material around it and the plug or stopper by which the end of the tube is closed to make the tube moisture-proof.

This invention relates to underground wires for telegraph and other purposes, and has for its objects to enable a naked wire to be used in the tube without danger of being affected by the moisture, and to secure a perfect insulation at the terminal end, and also through the entire length of tube, without the use of a separate insulating material around the wire within the tube; and its nature consists in the devices or means hereinafter described for attaining these results of moisture-tight and perfect insulation, and which are hereinafter pointed out in the claims.

In the drawings, A represents the tube to receive the wire. This tube A may be made of any material which is or can be made a non-conductor of electricity, and for this purpose a tube of paper coated with pitch, asphaltum, or other non-conductor which is also impervious to water may be used; but it is not intended to confine the invention for use with a paper tube.

B is a terminal, made of india-rubber or other non-conducting material, and having an interior opening, *d*, for a portion of its length of a size to receive the end of the tube A, and for the balance of its length an interior opening, *e*, of a tapering form, as shown in Fig. 2. The outer end of this terminal, on its exterior, as shown, is provided with a screw-thread, *f*, for the reception of a cap or cover.

C is a cap or cover, also made of any insulating material, and having an interior screw-thread to receive the screw-thread *f*, and having its outer face solid or closed, except at the center, which is provided with a hole for the passage of the wire and the insulating material around the wire at that point.

a is the wire, which is to be left naked or non-insulated for the main body or length of the tube, but is to be provided with any suitable insulating material—such as gutta-percha—at the end where it passes through the terminal B and cover or cap C, the insulation being of sufficient length to extend both sides of the cover or cap and through the insulating-plug *c*.

c is a plug or stopper, made of soft rubber preferably, but which may be made of any other suitable insulating material which will compress or yield under pressure, so as to fit around the wire *a* and its insulating material *b* and produce a tight joint between the plug and the wire and its insulating material. This plug, as shown, has an exterior slightly tapering to correspond with the taper of the opening *e*, into which opening the plug is to be pressed or forced, and is provided with a central longitudinal opening of sufficient size for the plug to be slipped over the wire and the insulating material *b*.

In practice the naked wire is passed through the length or body of the tube, and at a point where the terminal end is located a covering, *b*, of any suitable insulating material, is provided. The terminal B is slipped onto the end of the tube and held in any suitable manner. The insulating-plug *c* is slipped onto the wire around the insulating material *b* and forced or pressed into the opening *e*; but before this is done the interior surface of the opening *e*, the plug *c*, and the covering of insulating material *b* must each and all be made electrically dry, in order to make a joint that will be moisture-proof. After the parts are made electrically dry and the stopper or plug *c* has been forced or pressed in, the cap or cover C is placed on the outer end of the terminal and screwed down to place, forcing the plug firmly into the opening and compressing it around the insulating material *b* and the wire *a*, insuring a perfectly moisture-tight joint.

The use of a naked wire within a tube has heretofore been impossible, by reason that no means for preventing moisture from entering the tube have been known; but by using a wire having insulating material thereon at the terminal end and passing the terminal end of the wire through an insulating-plug located in a terminal of insulating material which is closed by an insulating cap or cover, and bringing the insulating material of the wire, the plug, and the terminal at the point where the plug is inserted to an electrically dry state, a joint is formed which will effectually prevent the entrance of moisture, thereby enabling a naked wire to be used in the tube without danger of the electric current passing from one wire to another.

By the term "electrically dry" I mean that the surface of the cavity which receives the plug, the plug itself, and the gutta-percha coating of the wire are all to be made entirely free from moisture by absorption, or in any other suitable manner, immediately before sealing, so that when the sealing is done no electric current can flow upon or through the surfaces forming the joint.

A series of the tubes A, with their wires and terminals, plugs, and caps or covers, can be placed in an exterior tube of metal or other suitable material, such exterior tube around the tubes A being filled with paraffine, asphaltum, pitch, or other insulating material.

A removable insulating-plug will be found the most convenient, as it enables easy access and removal for the purpose of repairs, or for other purposes; but it is evident that the same

result of hermetically sealing and a perfect moisture-tight joint for insulating the wires can be attained with non-removable plugs—as, for instance, the plug could be made of asphaltum, pitch, wax, or other material, which could be run into the outer end of the terminal and take the place of the removable plug. With a plug which is to be poured in, the bringing of the parts of the joint to an electrically dry state can be dispensed with, as the heat of the material forming the plug will produce the required state of dryness.

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

1. The terminal tube B, constructed at one end to receive a tube, A, combined with the insulating-plug *c*, located in the other end of the terminal tube, the latter and the plug being made electrically dry, substantially as and for the purpose described.

2. The insulating terminal tube, combined with the insulating-plug *c*, located within one end thereof, and the cap or cover attached to the tube and covering the plug, said plug and tube being made electrically dry, substantially as and for the purpose described.

3. The tube A, naked wire *a*, having insulating material *b* at its terminal end, in combination with the terminal B, insulating-plug *c*, and cap or cover C, substantially as and for the purposes specified.

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