(No Model.)

L. F. REQUA.

COVERED OR INSULATED WIRE OR CONDUCTOR.

No. 375,952. Patented Jan. 3, 1888.

Fig. 1.

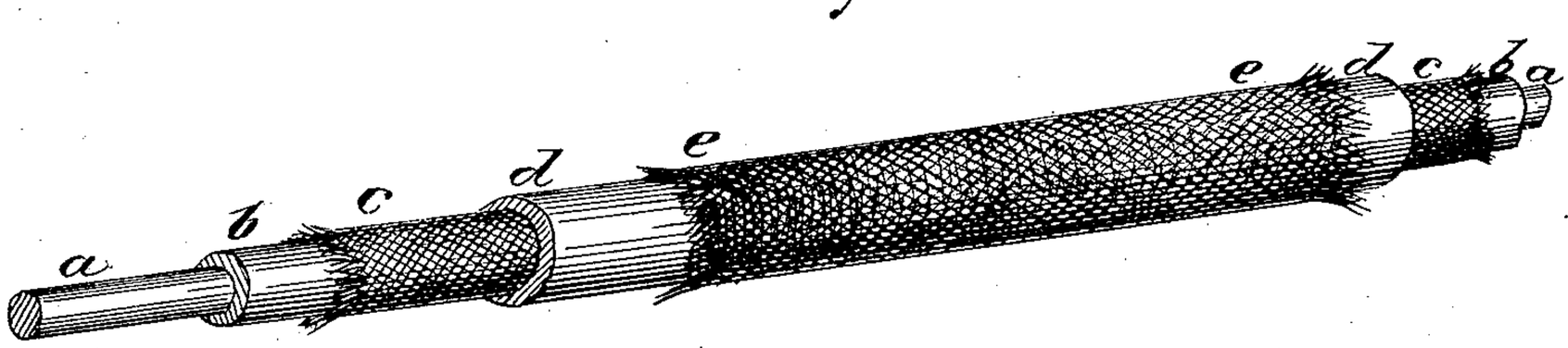


Fig. 2.

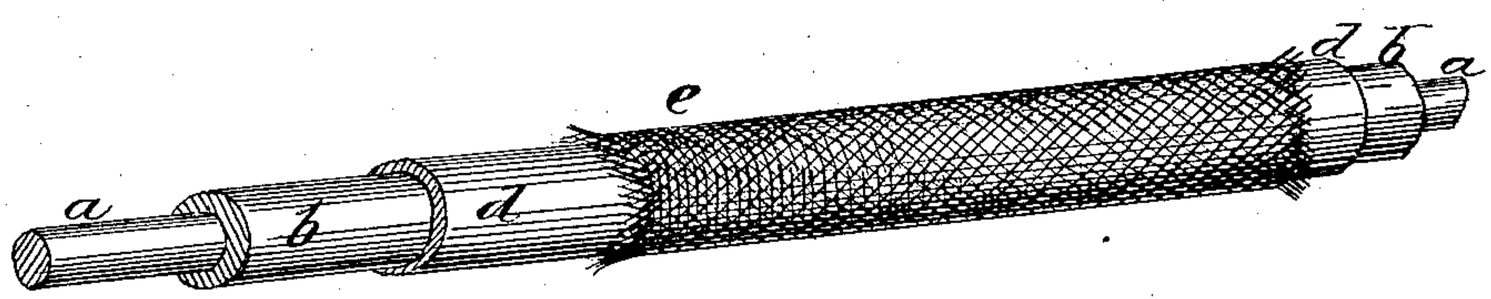
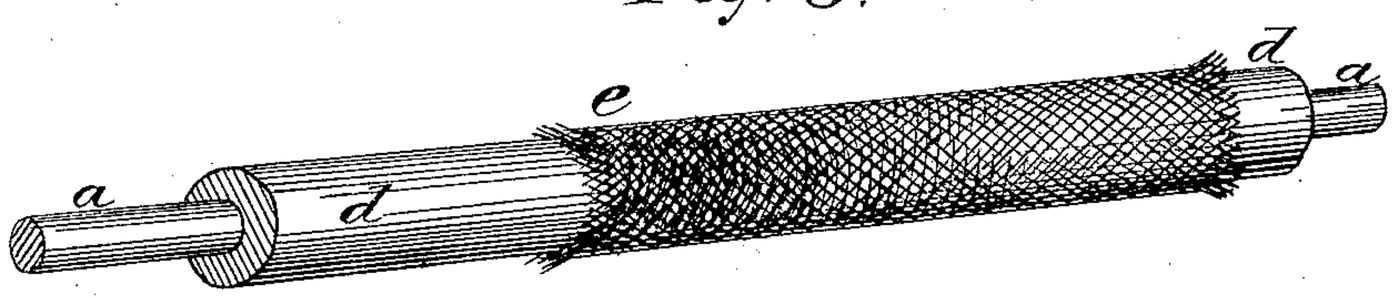


Fig. 3.



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UNITED STATES PATENT OFFICE.

LEONARD F. REQUA, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE SAFETY INSULATED WIRE AND CABLE COMPANY.

COVERED OR INSULATED WIRE OR CONDUCTOR.

SPECIFICATION forming part of Letters Patent No. 375,952, dated January 3, 1888.

Application filed April 25, 1887. Serial No. 235,991. (No model.)

To all whom it may concern:

Be it known that I, LEONARD F. REQUA, of New York city, in the State of New York, have invented certain new and useful Improvements in Covered or Insulated Wires or Conductors, of which the following is a specification.

My invention aims to provide electric wires or conductors with an insulating and protecting coating which shall be cheap, strong, impervious, and durable, and particularly adapted for underground or outdoor use. To this end I cover the wire with a tubular coating of a pyroxyline compound strengthened or sustained by a braided or fibrous web, which is preferably cemented and adhered to the pyroxyline. I prefer to use an inner coat of some soft flexible insulating substance next to the wire, over which is placed a thin coat of the pyroxyline. In some cases the strengthening and sustaining fibrous web or braiding may be placed between the inner soft coat and the outer coat of pyroxyline; or the braiding may be on the outside of the pyroxyline only, or both the intervening and the external braidings may be used.

My invention therefore consists, mainly, in the features above outlined, as hereinafter fully set forth.

In the drawings annexed, Figure 1 gives a perspective view of a wire covered, according to my invention, with a compound coating, the different layers of which are exposed. Figs. 2 and 3 are similar views of modifications, showing a less number of layers.

In Fig. 1, *a* indicates the wire or conductor, and *b* indicates an inner coat of some soft flexible insulating substance next to the wire. For this purpose I prefer to use balata mixed with some pigments to give body and consistency, and applied to the wire in any of the usual ways in which balata or other insulators have been heretofore applied, and which is well understood in the art. Over the balata coat *b* is applied a fibrous web or wrapping, *c*, preferably knitted or braided thereon, as illustrated. Outside this braiding *c* is applied a continuous tubular layer or coating, *d*, of a pyroxyline compound or solidified collodion, preferably that known as "zylonite," "celluloid," or their equivalents, and outside of the pyroxyline sheath or tube is a final external fibrous or braided web or sheath, *e*, as clearly illustrated in Fig. 1. The fibrous webs or braidings *c e*, particularly the external web, *e*, should be partly embedded in or adhered or cemented to the pyroxyline, so as to effectually support or sustain the pyroxyline and add to its strength and flexibility and enable the same to bend freely with the wire without breaking or cracking, which would be likely to occur without such support, and which is therefore an important feature of my invention. In order to cause the braided sheath to thus adhere to the pyroxyline, the braiding may be applied while the pyroxyline is soft or plastic, or while its surface is made adhesive by a solvent; but I prefer to accomplish this purpose by finally passing the wire with its several coatings (shown in Fig. 1) through a bath of some solvent for the pyroxyline, so as to saturate the braid and soften the pyroxyline beneath and cause the fibers of the braid to become cemented to and embedded in the surface of the pyroxyline layer, thus binding the braid intimately with or upon the pyroxyline. This solvent may be spirits of camphor, with which may be combined an aniline color or other dye or stain which will color the external braid with any tint desired at the same time that the braid becomes cemented to the pyroxyline.

It will be seen that by having a soft insulating layer, *b*—such as balata—next to the wire, but a very thin sheath of pyroxyline is needed, and the soft internal layer, which may be quite thick, will give great insulating power with flexibility, while the pyroxyline layer will render the conductor impervious to almost all substances or influences to which it is liable to be exposed, and being made thin, will not be expensive, and this thin layer being sustained by the web or braid cemented thereto, will be very strong and tough and not subject to crack or break in bending, as would be likely to occur if the pyroxyline layer were thick or if it were not protected by a fibrous layer. It will be therefore noted that wire coated in this manner will be very flexible, much less expensive than other coatings, particularly rubber and gutta-percha, the insulation will be most effective, and the pyroxyline layer being insoluble in all substances to

which conductors are exposed underground—such as water, coal or water gases, naphtha, acids, and alkalies—will render the insulation superiorly impervious and particularly suited for underground or outdoor uses, and impart, also, peculiar strength and toughness to the coating of the wire.

I do not of course limit myself to balata for the inner coat, *b*, as any other soft flexible insulating substance may be used—for example, gutta-percha, rubber, or wax—if desired; but I do not recommend any coating as preferable to balata.

In some cases the fibrous layer or braid *c* between the balata and the pyroxyline may be omitted, as shown in Fig. 2. Furthermore, for some purposes I prefer to apply the pyroxyline coating directly upon the wire, as seen in Fig. 3, omitting both the layers *b c*, in Figs. 1 and 2. In this case the pyroxyline layer is preferably made proportionately thicker, and it is sheathed, as before, with the fibrous web or braid *e*, which is adhered or cemented thereon, as before described.

In Figs. 1, 2, and 3 the fibrous web or braid might be left tightly wrapped or knitted around the pyroxyline without being actually adhered or cemented thereon; but the pyroxyline would not be so well supported in that case, as the cementation or adhesion of the braid in or on the pyroxyline imparts great strength to the pyroxyline layer and sustains it against tendencies to break or crack.

In the manufacture of the covered wire the balata and pyroxyline coatings are applied in the usual way by tubular covering-machines, to which the balata or pyroxyline are supplied in a plastic state, and from which they are pressed out around the wire, each coating being applied successively in this way, according to the well-known methods in use, which require no detailed specification here. The fibrous coatings *c e* are of course knit around the layers *b d* by passing the wire when covered with said layers through a braiding-machine of the usual kind.

If desired, the outer braid, *e*, may be rendered fire-proof, as is now frequently done.

I prefer to have the fibrous sheaths or coating *c e* braided or knit, as described, and of cotton fiber; but I do not limit myself to this, as any other form of fibrous web or texture may be used—such as a spiral wrapping of tape; but the knit tubular braiding is of course preferable.

It will be noted that another great advantage possessed by a wire covered, as described, with balata, pyroxyline, and cotton braid is that all these materials are very durable and not subject to deterioration by the effects of air or age or to the rotting action which takes place in rubber compounds.

My invention may of course be also applied to cables or bundles of wires as well as to individual wires.

What I claim is—

1. A wire or conductor covered with a layer or tube of pyroxyline compound and a fibrous web or sheath adhered or cemented to or into the substance of the pyroxyline, substantially as herein set forth.

2. A wire or conductor covered with a tube or layer of pyroxyline compound, combined with a knit or braided fibrous sheath cemented thereto, substantially as and for the purpose set forth.

3. Wires or conductors covered with a coat of soft flexible insulating compound, a coat of pyroxyline compound, and a fibrous web in successive tubular layers, the said web being adhered to or into the substance of the pyroxyline, substantially as set forth.

4. A wire or conductor covered with a coat of balata and pyroxyline in successive tubular layers, substantially as set forth.

5. A wire or conductor covered with a coat of balata, a coat of pyroxyline compound, and a fibrous web in successive layers, substantially as herein set forth.

6. In combination with the wire or conductor *a*, the soft insulating-layer *b*, with the pyroxyline layer *d*, intervening web *c*, and outer sheathing, *e*, substantially as shown and described.

7. The combination, with a wire or conductor, of a tubular sheath or covering of pyroxyline enveloping the wire, and a fibrous web or texture embedded or cemented in the pyroxyline by dissolving or softening the pyroxyline next to the said web, whereby the web and pyroxyline become intimately united and bound together, substantially as herein set forth.

LEONARD F. REQUA.

Witnesses:
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