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Patented Nov. 11, 1902.

A. M. LOUGEE.
ELECTRIC CONDUIT.

(Application filed Dec. 2, 1901.)

(No Model.)

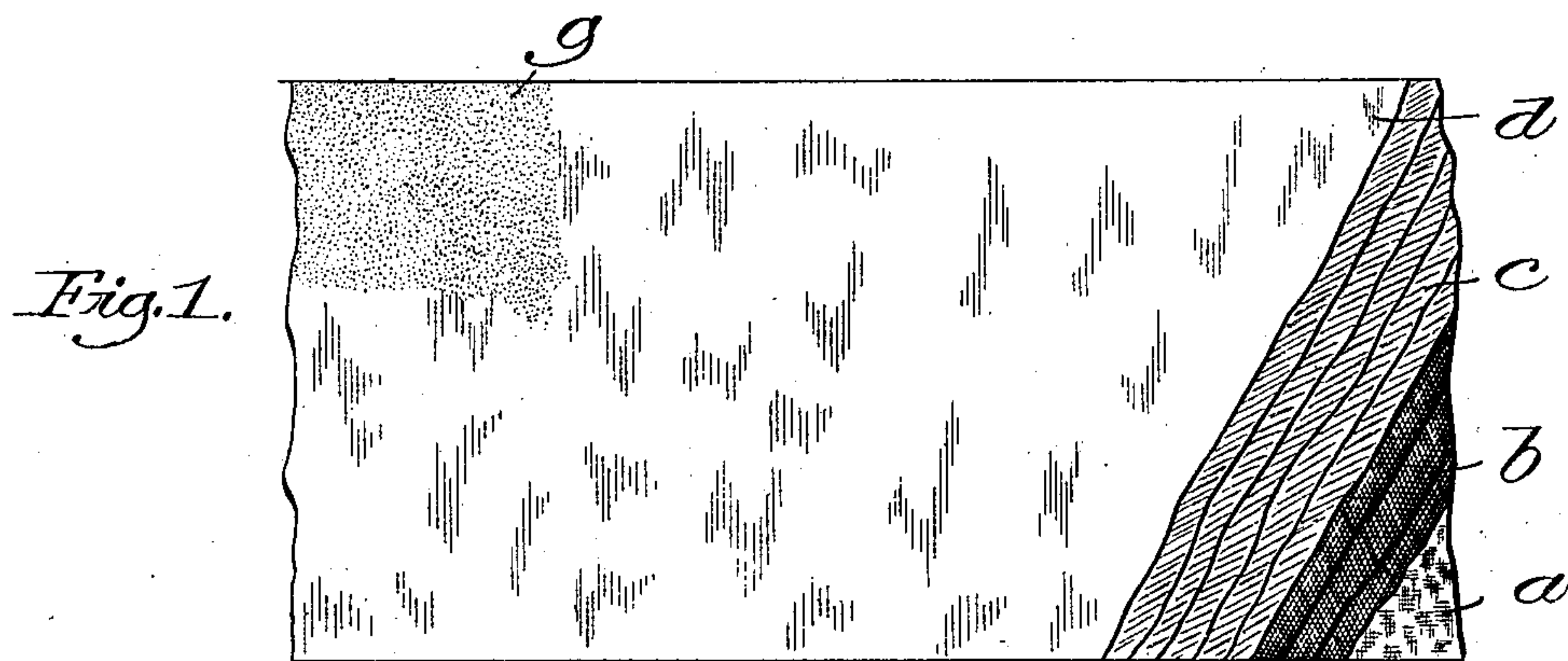


Fig. 2.

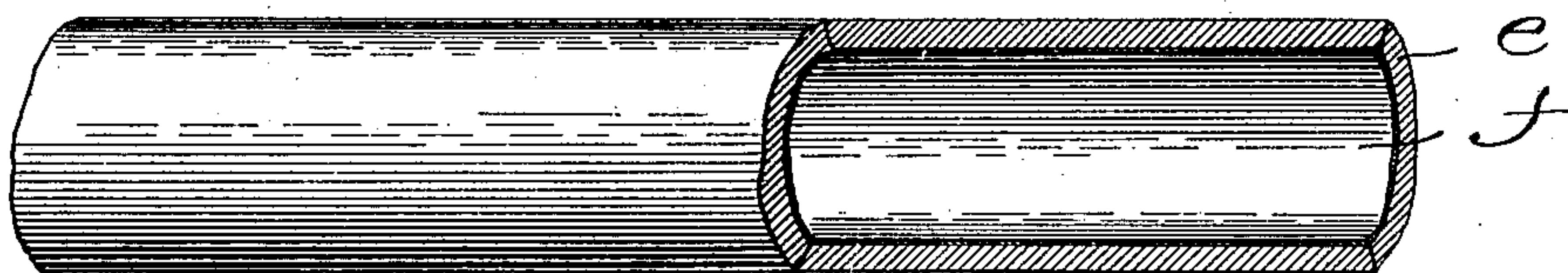
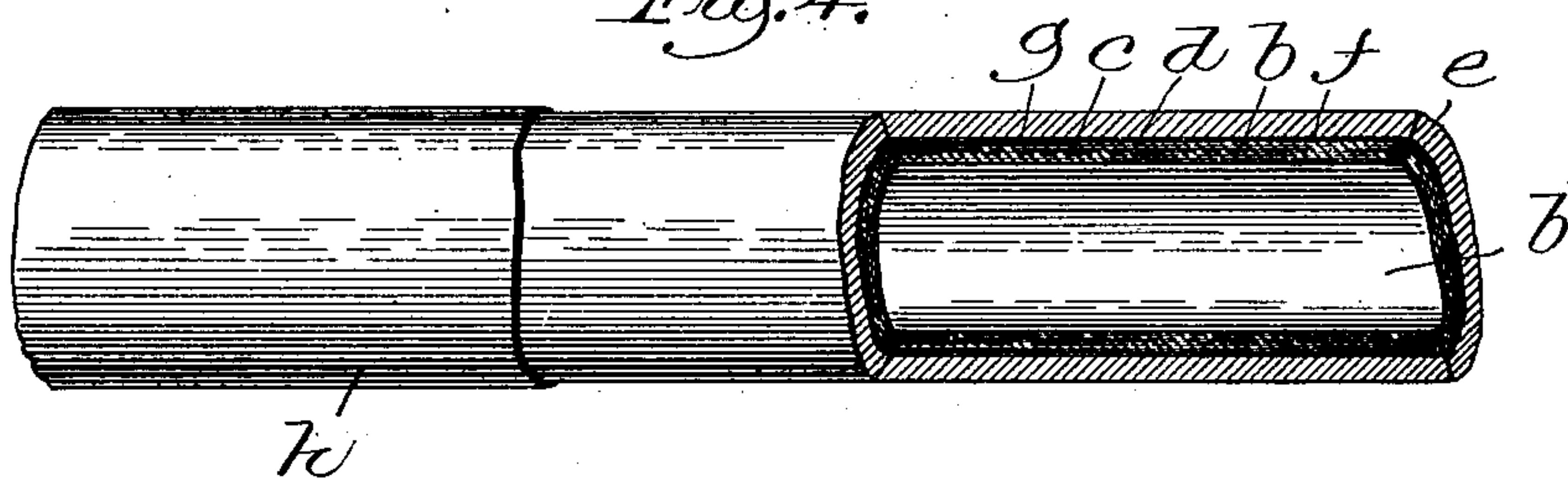


Fig. 3.



Fig. 4.



Witnesses:

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UNITED STATES PATENT OFFICE.

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ELECTRIC CONDUIT.

SPECIFICATION forming part of Letters Patent No. 713,123, dated November 11, 1902.

Application filed December 2, 1901. Serial No. 84,345. (No model.)

To all whom it may concern:

Be it known that I, AMANDA M. LOUGEE, a citizen of the United States, residing at Boston, county of Suffolk, State of Massachusetts, have invented an Improvement in Electric Conduits, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My present invention is an insulating-conduit for electric conductors, and has for its primary object the provision of a conduit having its insulating-lining joined to the armor practically as one piece and substantially homogeneous throughout the lining body, the inner surface of the lining in the most complete embodiment of my invention being fire-resisting, and hard or not easily injured.

In carrying out my invention I form the insulating-lining of material which is at once flexible or yielding, permitting the conduit to be bent without injury, waterproof or non-absorbent, and preferably having a sleek hard outer finish at the inner surface, said lining being fire-resisting, affording higher insulation than heretofore, and being capable of practical application in thin layers, thereby permitting the reduction in size of the armor or outside protecting-cover and reducing the liability of injury to the lining when the conduit is cut or roughly handled.

Another important feature of my invention resides in vulcanizing the lining directly to the iron of the armor, there being a soft intermediate layer between the hard inner surface and the armor, this intermediate layer being mainly relied upon for flexibility of the conduit.

Various other advantages and the leading constructional details of my invention will be pointed out more fully in the course of the following description, reference being had to the accompanying drawings, in which a preferred embodiment of my invention is illustrated.

In the drawings, Figure 1 is a fragmentary plan view of a sheet properly prepared prior to being formed for insertion in the armor,

said figure illustrating the composition and construction of the insulating-lining. Figs. 2, 3, and 4 are plan views, partly in section, showing an armor in process of manufacture, Fig. 2 showing the cementitious layer or coating, Fig. 3 showing all the parts assembled, and Fig. 4 showing the finished conduit after the foundation layer of the lining-sheet has been removed, it being understood that in Figs. 3 and 4 the relative thickness of the lining is grossly exaggerated in order that the construction may be seen.

For convenience of manufacture the insulating-lining is prepared first in sheet form, as shown in Fig. 1, the lining material proper being spread out on a suitable foundation or support *a*, of cotton fabric or other convenient material, and consisting of a layer *b*, preferably deposited in a plurality of coats, three being herein shown, said layer consisting of fire-resisting material in powdered form, such as asbestos, or asbestos and mica, magnesium, lime, slate, talc, infusorial earth, or any earthy substance, or any prepared mass or mixture of fireproof material mixed with suitable vulcanizable material, such as rubber or equivalent oxidized oils, as commonly practiced in the rubber art, together with a drier and vulcanizing agent—as, for example, litharge and sulfur. On the layer *b* are also placed, preferably in successive coats, a layer *c* of relatively soft material, such as rubber. Preferably the coatings from the bottommost coating next the foundation *a* to the last coating applied contain sulfur or other well-known vulcanizing agent in diminishing quantities, so that when the entire sheet or lining is vulcanized the mica-containing layer will have a backing of relatively soft or more pliable waterproof and resilient material between it and the armor. On top of the said intermediate and softer layer *c* I preferably apply a coat *d* of cementitious substance, preferably a vulcanizable naphtha solution of rubber, and dust over this coating a layer of dry antimony or other vulcanizing-powder *g*. I also coat the inside of the armor *e* with a layer *f* of a like cementitious solution, preferably adding to such common solvent of rubber, as naphtha,

a quantity of bisulfid of carbon, which I have found to be superior, because of its ability to dissolve rubber, sulfur, and partly the litharge and hold the same in a freely-flowing state capable of being spread thinly and evenly over a surface and run freely through any pipe, however small. Bisulfid of carbon is advantageous principally because of its complete disintegration of the rubber and being capable of holding a vulcanizing amount of sulfur in solution.

The parts having been assembled as shown in Fig. 3, the whole is vulcanized, thereby melting the layer *g*, so that it no longer appears as such and at the same time directly vulcanizing the lining and uniting it to the iron.

Of course it will be understood that I prefer to employ all the details of construction thus far explained, although I do not limit myself to a conduit embodying invariably all these features, as useful and advantageous results are obtained when a part only thereof are employed, whether alone or in connection with features now known in the art.

For especially high-grade conduit for serving with currents of an extremely high voltage I form the interior of the conduit with a layer of vulcanite thoroughly united with and vulcanized to the interior walls of the pipe, the whole constituting an integral mass, the same as already described, and I wish it understood that I use the term "vulcanite" in its larger meaning, including not only hard-rubber substance, but such materials of a fibrous and celluloid nature as are capable of being treated and mixed according to my invention; also, while it is of advantage to employ the coating *g* for mechanical and chemical purposes, as more fully explained in my concurrent application, Serial No. 84,344, for a patent on the method, I do not limit this present conduit application thereto.

Excepting as required by the claims I do not intend to limit myself as to the binding agent necessary to bring about the homogeneous mass by vulcanization, as described, as this can be accomplished with any of the well-known vulcanizing agencies.

The main purpose of the foundation *a* is merely to hold the lining in place until vulcanized, when it is pulled out in any convenient manner. It will be understood that this sheet material is capable of a great variety of uses because of its peculiar composition, fireproof qualities, durability, flexibility, &c., and I intend the same to be broadly covered by certain of my claims.

The conduit is preferably covered on the outside of the armor with a coating of rubber or other water-resisting substance *h*, which is vulcanized thereto in the same manner as already described in connection with the lining, this exterior cover being for the purpose of resisting the effects of electrolysis. I have found that the latter is the cause of many de-

fects which develop in conduits located in exposed positions, suffering from dampness, changes in the atmosphere, or any of the corroding influences iron is subject to.

One great advantage of my present conduit is that by having the lining proper secured integrally, as it were, directly to the armor without an intermediate layer there is no liability of the lining separating from the armor when bent; but the two are formed practically of one piece, it being understood by those skilled in the art that when the vulcanizing takes place the layer *f* disappears as such and becomes incorporated in the adjacent surfaces, binding them together directly to each other, the rubber coming against rubber, making an integral tube.

Having a hard and smooth interior surface or finish to the lining diminishes the possibility of serious friction between the conduit and wires being hauled through the same, and also said hard surface, being composed of mica and asbestos or similar substances, insures much better fire protection, gives better insulation, and enables me to make a much thinner lining than before, while at the same time the intermediate pliable layer or soft backing of the fire-resisting outer layer gives extreme pliability and strength or absence of tendency to rupture and permits maximum bending without injury.

One great advantage of my invention also resides in the fact that these layers are in no sense distinct from each other, as would be the case were successive sheets stuck or cemented together; but they are integral with each other, being entirely homogeneous, excepting that the degree or extent of vulcanization diminishes from the inner hard surface toward the armor.

By reason of the thorough adhesion or practically unitary nature of the lining and armor and also by reason of the interior integral coating thereof of talc, &c., composition a solidity and firmness are provided which largely obviate the danger of abrasure by the hauling of cables past bends, curves, offsets, &c., which has been especially dangerous heretofore in the larger-sized conduits.

The degree of vulcanization and extent or proportion of other features employed may be varied, as already stated. The different layers of flexible insulating material may be employed separately compounded, each varying from the other either in fire-resisting or insulating and pliability giving qualities. For example, if an extremely high fire-resisting and insulating conduit is desired these features may be imparted to the conduit in a high degree by employing throughout the mass an admixture of the powdered asbestos, mica, and the like, as stated.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. An insulating-conduit comprising an ar-

mor having an insulating-lining provided on its inner surface with a layer composed of comminuted fire-resisting material vulcanized to hardness at its exposed side.

5 2. An insulating-conduit comprising an armor having an insulating-lining provided on its inner surface with a layer having comminuted asbestos embodied in a vulcanized compound.

10 3. An insulating-conduit comprising an armor having an insulating-lining provided on its inner surface with a layer having comminuted asbestos and mica embodied in a vulcanized compound.

15 4. An insulating-conduit comprising an armor having an insulating-lining provided with

an interior hard surface and an intermediate softer layer.

5. An insulating-conduit comprising an armor provided with an insulating-lining consisting of a rubber compound vulcanized directly to the armor, said lining having decreasing degrees of vulcanization from its interior surface toward the armor.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

AMANDA M. LOUGEE.

Witnesses:

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C. J. DONLAN.