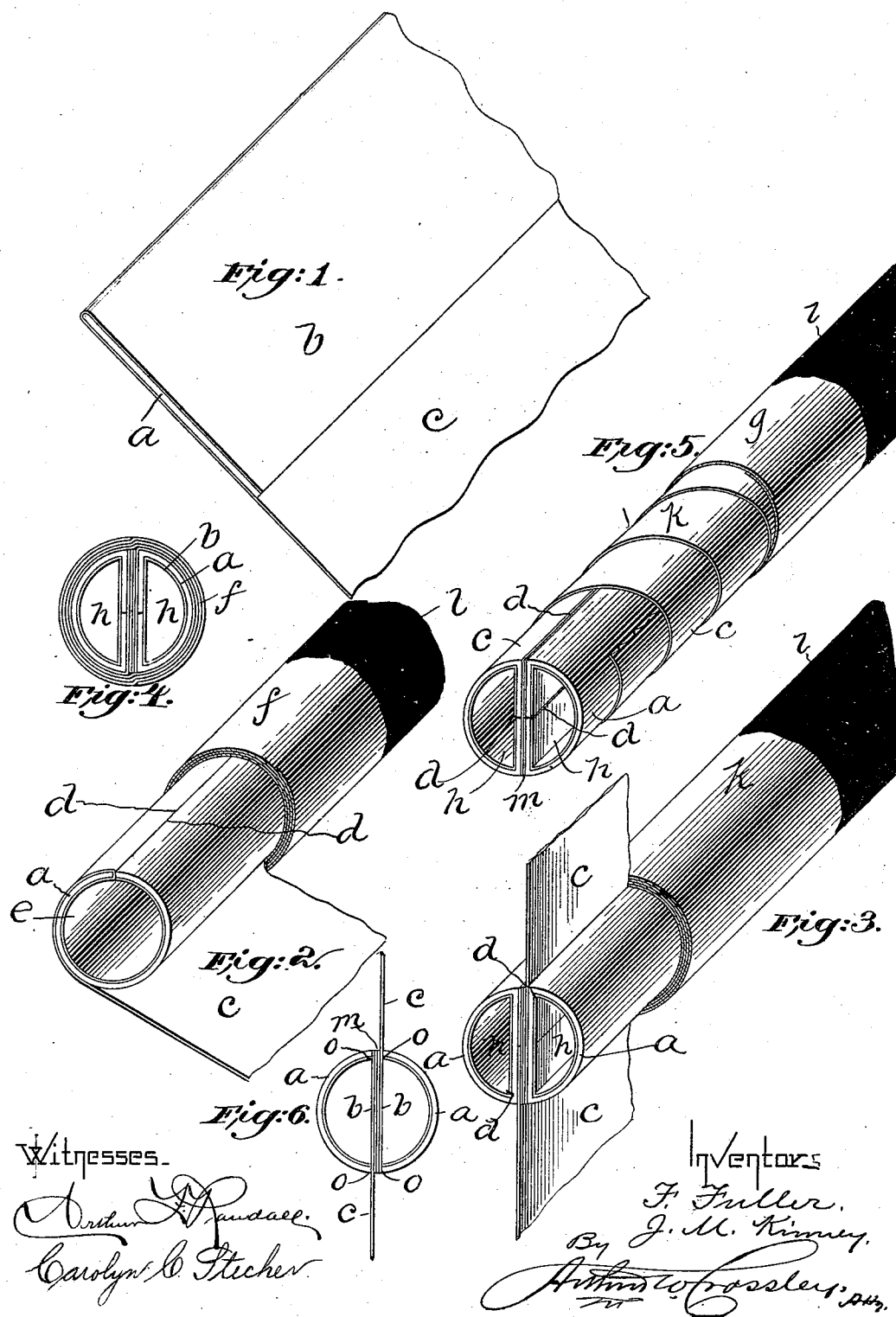


(No Model.)

F. FULLER & J. M. KINNEY.  
CONDUIT FOR ELECTRIC CONDUCTORS.

No. 554,631.

Patented Feb. 11, 1896.



# UNITED STATES PATENT OFFICE.

FRANK FULLER AND JOHN M. KINNEY, OF BOSTON, MASSACHUSETTS.

## CONDUIT FOR ELECTRIC CONDUCTORS.

SPECIFICATION forming part of Letters Patent No. 554,631, dated February 11, 1896.

Application filed May 24, 1895. Serial No. 550,581. (No model.)

*To all whom it may concern:*

Be it known that we, FRANK FULLER and JOHN M. KINNEY, of Boston, in the county of Suffolk and State of Massachusetts, have  
5 invented certain new and useful Improvements in Conduits for Electric Conductors, of which the following is a specification.

This invention has relation to insulating conduits or tubes for electric conductors of  
10 the class in which the tube or conduit is not only perfectly insulatory in character but is armored or provided with a layer or member of steel or equivalent substance rendered fireproof and waterproof both inside and out-  
15 side, and it has reference also to the art of producing such conduits or tubes.

It is well known at the present time that in order to prevent the breaking or cutting of the tubes by blows or by the driving of nails  
20 or screws, as also to render them fireproof and proof against attacks by rodents and insects, the said tubes must be equipped with a metallic or equivalent armor of sufficient strength to resist such blows or abrasions  
25 and attacks; but at the same time unless the metallic armor be separated from the inclosed conductors by insulating material of some nature the tube or conduit will be rendered extremely dangerous, owing to the liability  
30 of the electric current being short-circuited in case the conductor comes into contact with the armor; and, again, to prevent the presence of moisture in the tube and the consequent corrosion or oxidization of the armor,  
35 it is necessary to cover the interior as well as the exterior surface of the tube with waterproof material. For the prevention of the spread of fire the tube or conduit must furthermore be treated with a non-combustible  
40 substance, so as to prevent its own destruction or damage by fire. In addition to these things it is also frequently desirable that the conduit should be equipped with two or more insulated tubes or compartments to receive  
45 the separate conductors which go to constitute the electric circuit, or to receive a plurality of conductors of independent circuits.

To these ends the invention consists of an electric conduit embodying in its construction  
50 a tube composed of sheet metal or other suitable substance bent to proper form and having a sheet of properly-treated paper secured upon its inner side and wrapped about

its outer side in the novel manner herein-  
after fully set forth.

Our invention further consists of a tube or  
55 conduit comprising in its construction a metallic tube of steel to form the armor and having its interior surface covered with insulating fireproof material coated or treated  
60 with such substances as will render it waterproof, and its outer surface inclosed in a wrapping of paper suitably treated.

It also consists of such a tube covered on its exterior surface with a layer of paper or  
65 other suitable material coated with an insulating fireproof substance and coated with any suitable waterproof material.

It further consists of such a tube formed in two compartments suitably insulated from  
70 each other, each of which is adapted to receive one of the conductors forming an electric circuit; and the invention also consists of the art of producing conductors of the kind  
75 above described, and in the features of construction which are hereinafter pointed out with more particularity and set forth in the appended claims.

Reference is to be had to the annexed drawings and to the letters marked thereon, forming a part of this specification, the same letters designating the same parts or features,  
80 as the case may be, wherever they occur.

In the drawings, Figure 1 is a perspective view showing the first step which may be per-  
85 formed in the process of making our improved electric conductors. Fig. 2 is a perspective view of a piece of our improved electric conductor, showing it completed and in  
90 different stages of its formation. Fig. 3 is a view similar to Fig. 2, showing the invention as embodied in a structure containing two tubes or conduits. Fig. 4 is a cross-section  
95 of the tube shown in Fig. 3. Fig. 5 is a perspective view of a modified form of the invention illustrated in Fig. 3. Fig. 6 illustrates diagrammatically a modification.

In carrying out our invention in the form illustrated in Figs. 1 and 2 we take a strip *a*  
100 of sheet-steel or other equivalent material of desired width and cover or coat the same with a compound or mixture of silicate of soda and mica, or treat it in an equivalent manner. We then take a sheet or strip of paper  
105 *b*, wider than the metallic strip *a*, which has been previously treated with the same com-

pound or mixture as the strip *a*, and lay it upon or cement it to the strip *a* so that one edge will match one edge of the said strip *a*, and so that the other edge will overlap the said strip *a*, as is clearly shown in Fig. 1, in which the overlapping portion of the paper strip is lettered *c*. The strip *a* so prepared is then bent so as to bring its longitudinal edges *d* together and form a tube of suitable shape, with the paper-covered face inside of the tube, all as is represented at *e* in Fig. 2. The overlapping portion *c* may now be wrapped several times about the tube, as indicated at *f*, and cemented or otherwise secured in place so as to keep it from unwinding, and so as to hold the edges of the strip *a* together. The structure may then be coated or otherwise treated with a suitable waterproof compound, as indicated at *l*, in solid black. Under this mode of construction it will be seen that the overlapping part *c* of the paper strip or sheet *b*, when the strip *a* is bent so as to form a tube, will project from the inner to the out side between the meeting edges *d*, from which line or point it may be wrapped around the tube, as has already been described; but the functions of the invention will not be changed or the invention altered to a material extent if the inner lining were composed of a separate strip and the outer covering made independent thereof, and for some uses the waterproof coating *l* may be dispensed with.

In case it is desired to form the conduit with two tubes two sheets *a* may be employed and each bent into a half-round form, as represented at *h*, so that the meeting edges *d* will be opposite the one to the other when the tubes are brought together, and so that the overlapping portion *c* of the sheet *b* will extend in opposite directions from said meeting edges and between the two tubes. Then by wrapping the overlapping part *c* around the two tubes from opposite lines or points the double-tube structure will be formed as shown in Fig. 4 and as represented at *j* in Fig. 3.

Instead of wrapping the outside covering *j* upon the tubes, as shown in the last-mentioned figures, strips of properly-prepared paper may be wound spirally upon the tubes, as shown at *k* in Fig. 5, in which case a binding strip or sheet *g* may be wound and cemented on the wrapping-strip *k* to keep the latter from unwinding.

It is preferable, though not essential, in cases where two or a plurality of tubes are embodied in the structure to place strips *m*, of paper, strawboard, or other similar insulatory material, between the outer opposing or adjacent metallic faces of the individual tubes, as well as to place an edge portion *b* of the winding sheet or strip *b* therebetween, as is clearly shown in Figs. 3 and 4.

It is obvious that the form of the individual tubes is not of the essence of our invention, since they may be square, round, half-round, or of other form, and that more than two in-

dividual tubes may be embodied in one conduit. Again, in the formation of the steel tube the longitudinal edges may be brought close together, as is shown in most of the figures of the drawings, or they may be left separated to a greater or less extent, as is represented in Fig. 6, wherein the steel tubes are but half-round in cross-section, as though the two were made from a single-sheet tube split longitudinally and centrally, the edges *o* of each individual tube abutting against the spacing or separating strips *m* and the edge portions *n* of the wrapping or winding sheet or sheets *b*.

In Figs. 3, 4, 5, and 6 the lining of the tubes is shown as separate from the winding-sheet, while in Figs. 1 and 2 the winding-sheet is a continuation of the lining. It is obvious, however, that either method may be employed in all cases or that both may be used as circumstances or convenience may suggest.

Having thus explained the nature of the invention and described a way of constructing and using the same, though without attempting to set forth all of the forms in which it may be made or all of the modes of its use, it is declared that what is claimed is—

1. A conduit for electric conductors, consisting of a sheet of metal bent to form a tube by bringing its longitudinal edges together and having its inner and outer sides treated with an insulating and fireproof substance.

2. A conduit for electric conductors consisting of a sheet of metal bent to form a tube by bringing its longitudinal edges together, and having a sheet of insulating fireproof paper secured upon its inner side and projecting between the said meeting edges and wrapped around its outside.

3. A conduit for electric conductors, consisting of a sheet of metal bent to form a tube by bringing its longitudinal edges together, and having a sheet of insulating fireproof paper secured upon its inner side and projecting between the said meeting edges and wrapped around its outside and the whole treated exteriorly with a waterproof substance.

4. The art of forming electric conduits which consists in cementing to a strip of sheet metal a portion of a sheet of properly-treated insulating-paper or other suitable material, bending the sheet-metal strip into the form of a tube with the portion of the paper strip not cemented thereto extending therefrom, and winding such extended portion of the paper strip about the tube, all as hereinbefore set forth.

In testimony whereof we have signed our names to this specification, in the presence of two subscribing witnesses, this 1st day of May, A. D. 1895.

FRANK FULLER.  
JOHN M. KINNEY.

Witnesses:

ARTHUR W. CROSSLEY,  
C. C. STECHER.