2 Sheets—Sheet 1.

C. LINFORD.

Underground Telegraph.

No. 220,765. Patented Oct. 21, 1879.

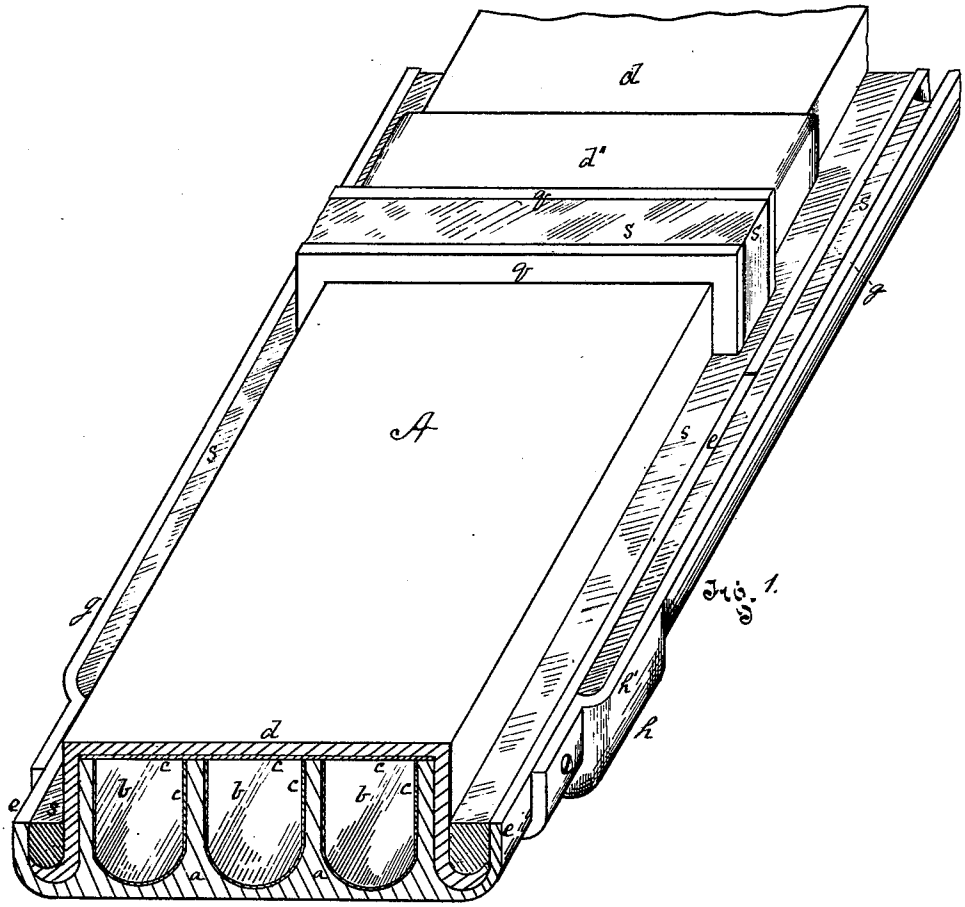


Fig. 1.

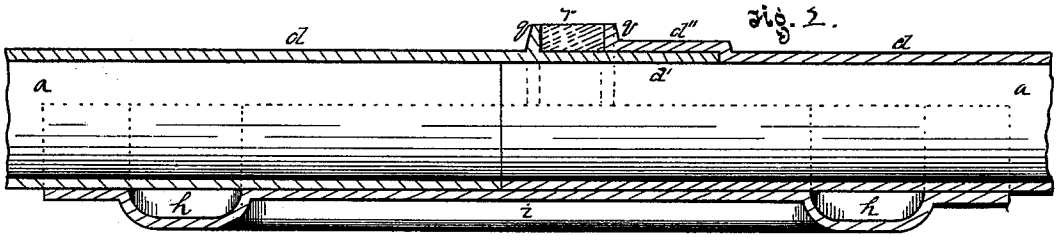


Fig. 2.

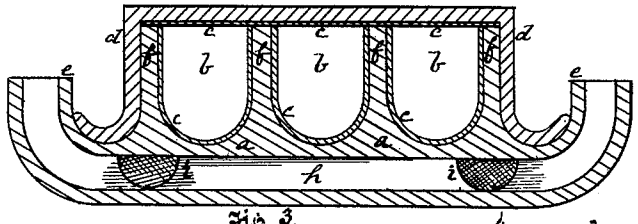


Fig. 3.

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2 Sheets—Sheet 2.

C. LINFORD.

Underground Telegraph.

No. 220,765. Patented Oct. 21, 1879.

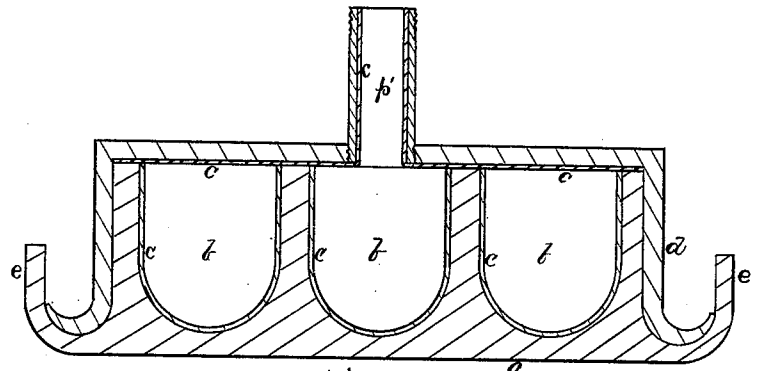


Fig. 4.

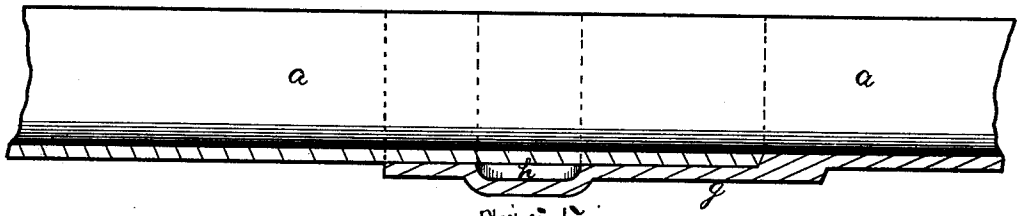


Fig. 5.

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UNITED STATES PATENT OFFICE.

CHARLES LINFORD, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN UNDERGROUND TELEGRAPHS.

Specification forming part of Letters Patent No. **220,765**, dated October 21, 1879; application filed August 13, 1879.

To all whom it may concern:

Be it known that I, CHARLES LINFORD, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Improvement in Devices for Protecting Underground-Telegraph Wires; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming part of this specification, in which—

Figures 1, 2, and 3 are, respectively, perspective, longitudinal, and cross-sectional views of my invention. Fig. 4 is a sectional view of the conduit-box, provided with means for leading the wires up to the surface of the ground for connection with stations, batteries, &c. Fig. 5 is a sectional view of a section of the insulating-box, with the coupling cast therewith.

Like letters of reference indicate like parts wherever they occur.

There have been many efforts made to secure a suitable and practicable conduit or conductor for laying telegraphic wires under ground; but they have been at best only partially successful. Among the chief reasons for want of success have been, first, the failure to secure a perfect exclusion of moisture from the interior of the conductor; and, second, the inaccessibility of the wires when once put down, which, in many instances, has rendered it necessary to take up the whole line of conductor in order to make the most simple repairs, thus making the same cost as that of originally putting it down.

Another cause of failure has been the lack of durability of either the material of which the conductor is composed or by which it is coated to exclude the moisture.

The conductors mentioned as inaccessible are tubes of various forms, in the bore of which the wires are laid. If a break occurs it is impossible to get at it or to relay the wire without uncoupling and taking up the whole string of pipe.

The object of my invention is to overcome these difficulties; and to this end I have made a conductor which is practically indestructible, impervious to moisture, and capable of being opened easily and quickly at any desired point without removal from its bed, so that the wires are accessible at all times.

To enable others skilled in the art to make and use my invention, I will now proceed to describe it.

A indicates the conduit, having a box or bed, *a*, which may be cast-iron, wrought-iron, or other suitable material, and preferably protected from rust by tinning, galvanizing, or otherwise coating its exterior. Its interior is fluted or grooved, as indicated at *b*, to form receptacles for the wire, and the whole interior surface is coated with porcelain enamel, as at *c*. This coating unites so firmly to the iron that it will not separate, scale, or break off; and it is unaffected by the expansion and contraction of the metallic box or conduit. The method of applying it is well known in the arts.

I make use of it to prevent the passage of moisture to the interior of the conduit by the sweating of the metal or from other cause, and thereby prevent the rusting of the iron, and to prevent contact between the wires and the metal of which the conduit is made.

Upon the box or bed *a* is a cover, *d*, adapted to fit within the flanges *e* and rest upon the shoulders *f*. The exterior of the cover *d* may be tinned or otherwise coated, as described for the box *a*, and its interior or under surface must be coated with porcelain enamel, as described for the interior of the box. Thus I make a practically indestructible metallic conduit for underground wires, having an impermeable irrefragable interior lining. I have obtained this result by the discovery of the peculiar utility of porcelain cement for this purpose. It is evident that this conductor may be of any desired shape.

The bed-sections *a* are united by a coupling-box, *g*, of such length that it will lap well over the adjoining ends of each two sections. It is formed, at or near each end, with a transverse groove, *h*, which extends up along the sides of the box, as shown at *h'*, and with longitudinal grooves *i i*, which connect the two transverse grooves.

The form of the coupling-box will be adapted to the exterior shape of the bed *a*, and it may be tinned or galvanized, as before specified, to protect it against rust.

Each cover-section has a tongue, d', and bowl d'', so that when placed together the tongue of one section will fit in the bowl of the next. They also have flanges q, which, when the sections are placed together, form a groove, r, for the cement.

In laying the bed-sections a and coupling them, the ends of two sections, a, are brought together in the coupling-box g, and secured by screws or in other suitable manner. The wires are then properly placed in the grooves or flutes b, and the covers d put on and cemented down, the cement being filled in the groove r and over the cover, and between flanges e, as indicated at s.

The cement poured into the coupling-box g will enter the side grooves, g', and fill the transverse grooves h, whence it will flow or extend into the longitudinal grooves i, completely and effectually sealing the joints and rendering the conduit water and moisture tight.

The conduit A may be provided with one or more grooves, as may be desired, and these grooves may contain one or more wires. The wires I propose to use are insulated wires of any suitable kind. I prefer those covered with a layer of cotton dipped in paraffine.

If the sections a are made of wrought-iron, Bessemer steel, or similar material, they may be rolled in suitably-grooved rolls. In such case they must be joined by separate coupling, g. But by casting them the coupling can be made in one piece with and form part of the section, as shown in Fig. 5. The other end of the section is plain. The sections a and d may be made of any desired length.

Fig. 4 shows the method of carrying the wires from the box to above the surface of the earth. It consists of a glass pipe, p', or a metal pipe lined with porcelain enamel, screwed into or otherwise fastened in an opening in the cover d, at the point where it is desired to lead the wire up out of the box. The pipe p' is long enough to protect the wire to any desired point above the surface of the ground. If desired, another section of pipe may be screwed into the pipe p'.

It will be perceived that my improved conductor is not only a perfect and almost indestructible insulator, but that it possesses the property of perfect accessibility for the purpose of inspecting and repairing the wires. The covers can be removed and replaced with ease and celerity, and there is no obstacle to the complete exposure of the wire at any desired point. It also possesses cheapness, as it can be constructed and laid at a comparatively low cost.

This conduit can be used for the protection of wires laid upon the surface of the ground. The cement used for sealing the joints is preferably such as possesses a slight degree of elasticity, so as to obviate danger of opening at the joints by the expansion and contraction of the metal.

I am aware that metal pumps, pipes, &c., have heretofore been coated with a vitreous enamel for the purpose of protecting the surfaces thereof; and that it has been proposed to employ metallic tubing to protect insulated telegraph-wires from abrasion and injury, and to preserve the tubing by coating the same with a vitreous enamel or other preservative coating, and do not claim the same, for in such cases no provision is made to either obtain access to the wire, or to prevent the access of moisture thereto; nor were the same ever designed or used for the purposes of insulation, as in my invention. Neither do I claim, broadly, sectional insulating-troughs having detachable covers, whether the same have single or multiple wire grooves, for I am aware that the same have been described as made of wood, glass, bituminous materials, slate, &c.; but in all such cases lack of durability, liability to injury, and the difficulty attending in some instances the laying, and in others the formation, of water-tight joints between the sections, &c., render the devices impracticable.

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

1. A longitudinally-divisible (or sectional) metallic conduit, having its interior surface covered with an insulating coating of vitreous material, substantially as and for the purpose specified.

2. A sectional metallic bed or box, having a grooved or fluted interior surface coated with porcelain enamel, and a sectional metallic cover coated with procelain enamel upon its under surface, substantially as and for the purposes described.

3. The coupling-box provided with transverse and longitudinal grooves, substantially as and for the purposes described.

4. The combination, with a bed or box section of a metallic conduit having an interior insulating-lining, of a detachable lid or cover, provided with a surface tube or tubes having an interior insulating-surface, substantially as and for the purpose specified.

5. A sectional channel box or bed, the sections of which are joined together by suitable coupling-boxes, having a sectional cover, and made impervious to moisture by cement placed in suitable grooves surrounding its joints, substantially as described.

In testimony whereof I, the said CHARLES LINFORD, of Philadelphia, State and county aforesaid, have hereunto set my hand.

CHARLES LINFORD.

Witnesses:
FRANK W. SMITH,
JNO. K. SMITH.