(No Model.)

2 Sheets—Sheet 1.

H. ROOT.

TUBE STRUCTURE FOR CABLE RAILWAYS.

No. 309,982. Patented Dec. 30, 1884.

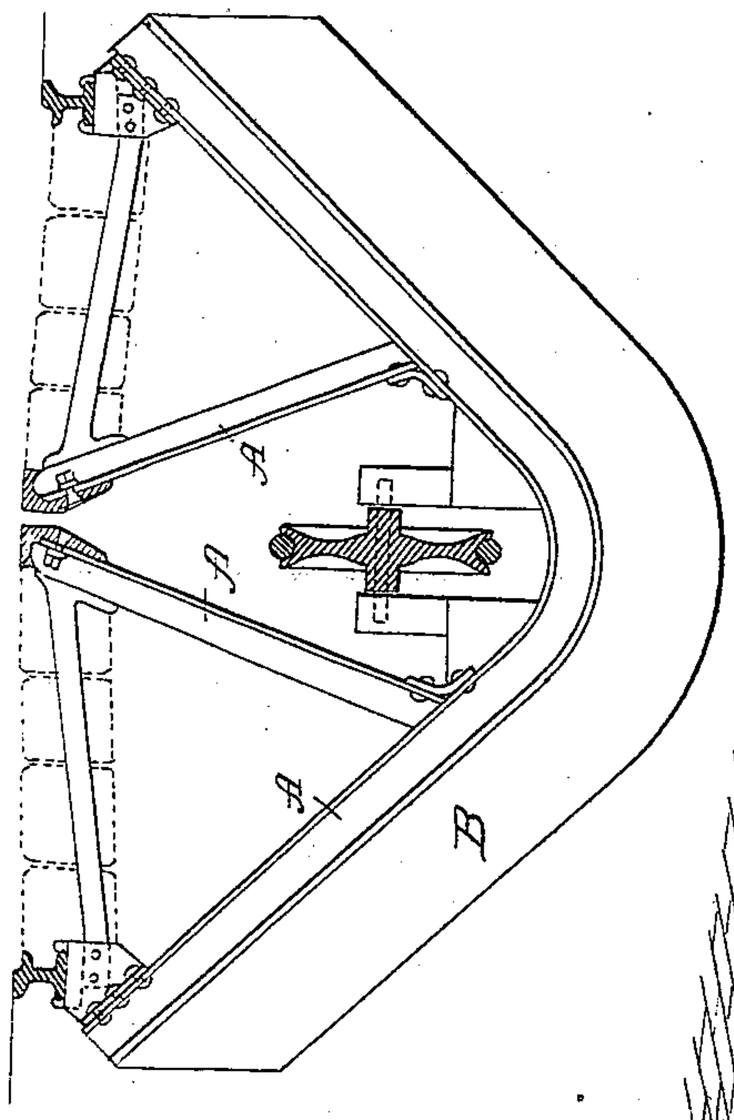


Fig. 2.

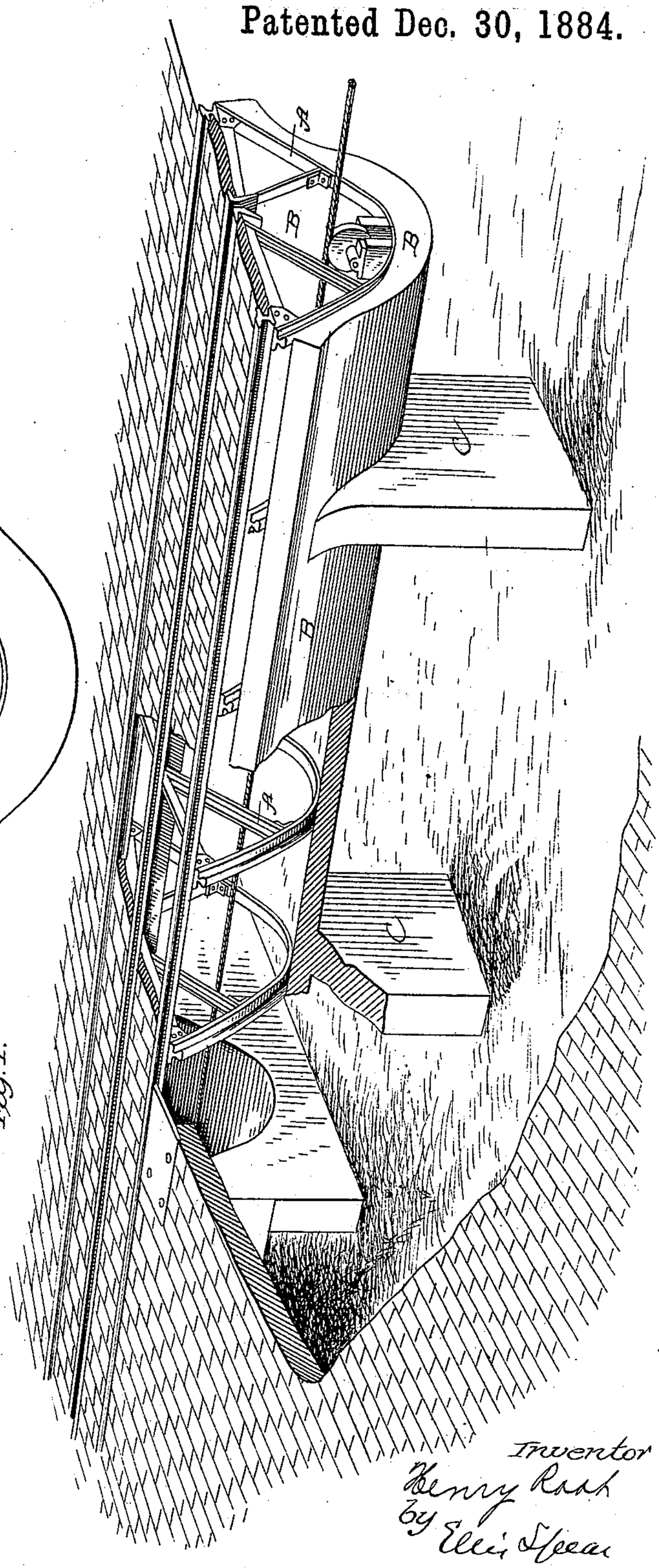


Fig. 1.

Attest.
F. L. Middleton
Walter Keene

Inventor
Henry Root
by Ellis Spear
Atty's.

(No Model.)

2 Sheets—Sheet 2.

H. ROOT.

TUBE STRUCTURE FOR CABLE RAILWAYS.

No. 309,982. Patented Dec. 30, 1884.

Fig. 3.

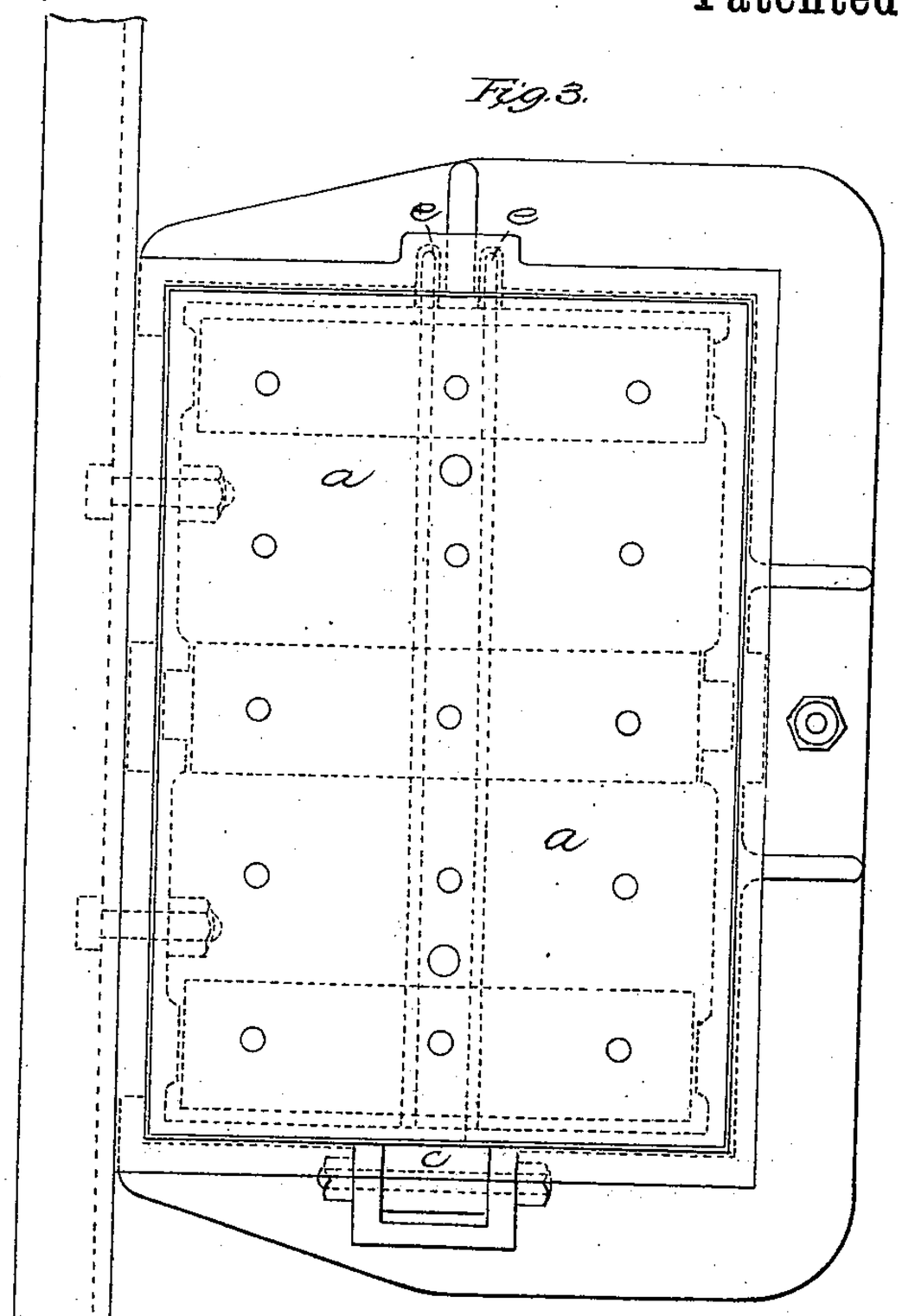


Fig. 4.

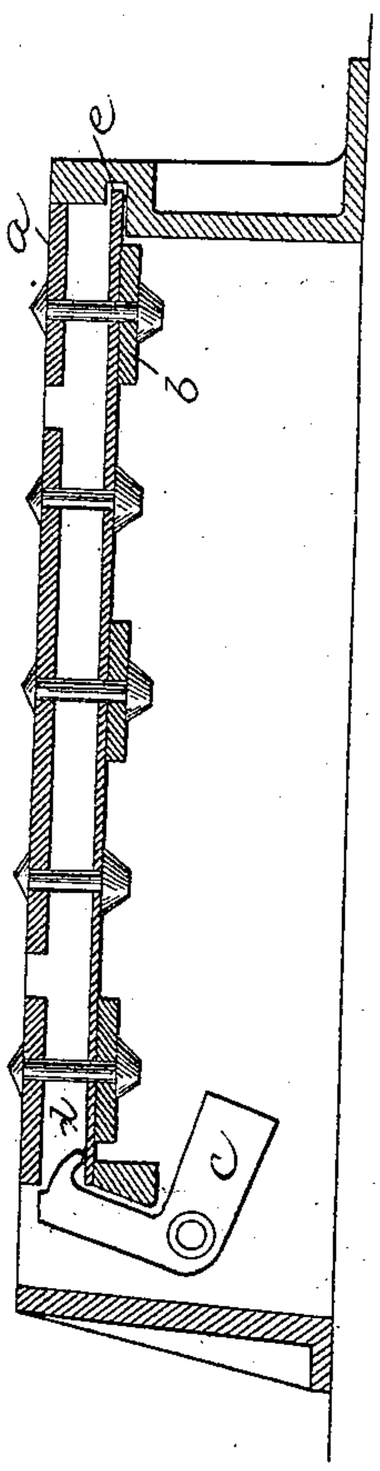
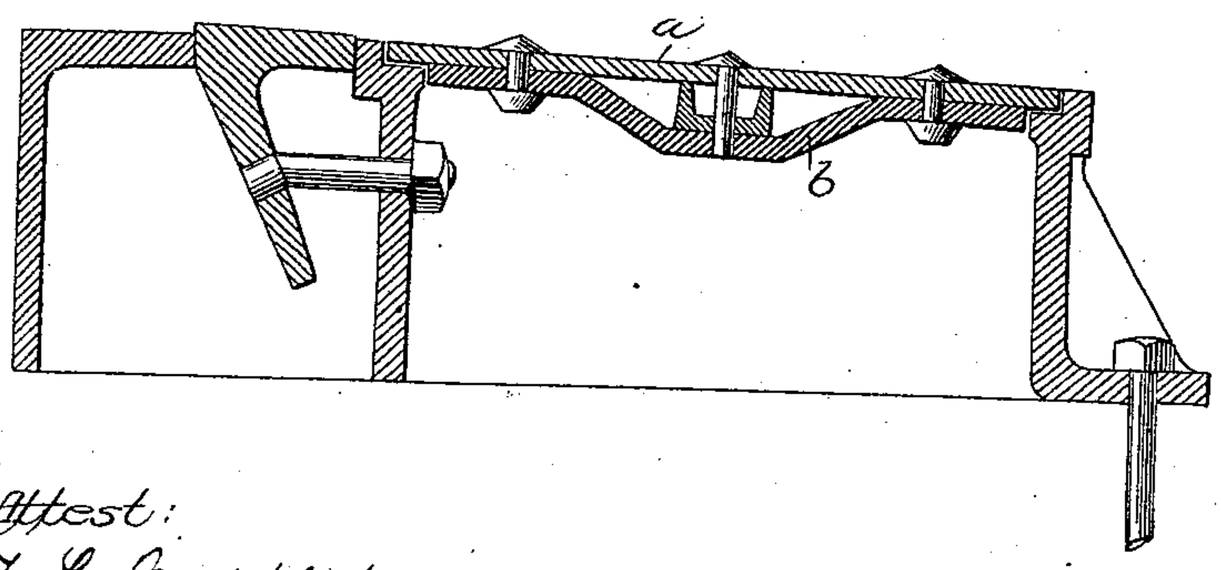


Fig. 5.



Attest:
F. L. Middleton
Walter Keene

Inventor
Henry Root
by Edwin Gear
Attys

UNITED STATES PATENT OFFICE.

HENRY ROOT, OF SAN FRANCISCO, CALIFORNIA.

TUBE STRUCTURE FOR CABLE RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 309,982, dated December 30, 1884.

Application filed July 16, 1884. (No model.)

To all whom it may concern:

Be it known that I, HENRY ROOT, of San Francisco, in the county of San Francisco and State of California, have invented a new and useful Improvement in Tube Structures for Cable Railways; and I do hereby declare that the following is a full, clear, and exact description of the same.

This invention relates to certain improvements in cable railways; and it consists in the construction of the permanent tube with means for closing and locking the same, and in openings by which the interior of the tube is reached along the line.

In the accompanying drawings, Figure 1 is a view of the street, with a part broken away to show the tube frame-work, piers, and cable. Fig. 2 is a transverse section of the tube, showing the position of the cable on the supporting-pulley. Fig. 3 is a top view of the trap or cover. Figs. 4 and 5 are longitudinal and transverse sections of said cover.

In the construction of cable railways the permanent subterranean tube in which the cable travels is constructed in various ways, but should have a solid permanent foundation to prevent its setting out of line, and should be connected with the rails and slot-irons, so that all parts may retain their relative positions. In the present case I have shown a body of permanent iron frame-work, A, with a filling of concrete, B, which extends between the iron ribs and forms the continuous inclosed tunnel. In order to make this solid and permanent, piers C are built upon solid foundations at a sufficient depth below the tube, which rests upon and may be formed with the piers. These piers extend down into the ground far enough to provide a permanent foundation; or they may be built upon piles, which are first driven and are placed at intervals of eight or ten feet apart, having a width of about five feet and a thickness of about fifteen inches. In the construction of cable roads having double tracks it is necessary to get a foundation that will not be likely to be disturbed, and as the main sewer to which all house-sewers must connect is in the center of the street all such house-sewers must go under one of the tracks. It is also usual to have but one gas and water main along a street, so that all gas and water service pipes on one side of the street must go under both tracks. The bottom main sewer is usually about ten feet below the surface of the street, and the gas and water mains considerably less, so that if the piers reach a depth of eleven feet below the surface their foundation will be out of the reach of the ordinary disturbances, and leave ample room for all sewers and pipes to be laid under the body of the tube and between the piers without disturbing their foundations, so as not to allow the track to settle and get out of line. The body of the concrete forming the tube will be stiff enough to safely bridge over the distance between the piers without any support from the surrounding earth. I find that these piers can be put in without great cost by the following method. After the ditch in which the tube is to be formed has been finished the four sides of a box are built separately and shod with iron, so as to withstand the blow of a heavy ram. They are then set up in the ditch, forming a box five feet long across the track, fifteen inches wide, and six or seven feet deep, without a bottom. One man gets into the box and casts out the earth from the bottom, another man driving the sides and ends with a heavy ram as they are undermined by the excavation from the inside, until the box is forced down to the depth required for the pier. The box is then filled with concrete in layers and rammed as it is pút in. Within three or four hours the cement will be set enough to allow the sides of the box to be withdrawn separately by means of a chain and lever, suitable means being provided to take up the chain as the box raises. The space left by the removal of the sides is then filled in with earth and well rammed, when the piers are ready for the superstructure. Another box is then set the proper distance ahead, usually about ten feet between centers, and the operation repeated. At short intervals along the tube the cable is supported upon pulleys just below the line of travel of the grip, and as these pulleys must be oiled and looked after at intervals it is necessary to have openings with removable covers on the surface opposite to each pulley. In order to make the covers of sufficient strength,

they are formed of plates of iron, *a*, having a second series, *b*, riveted to them, so as to form a truss below. The rivet-heads project above the top plates, and thus form a roughened surface upon which horses' feet will not slip. In order to lock this cover, so that it will be held in place, a bent lever, *c*, is pivoted by its angle in one side of the frame. The upper arm of the lever has a hook, *d*, formed upon it, with a curved face, and the other arm, which projects inwardly at right angles with it, is made sufficiently heavy to draw the hooked end inward. The cover has projections at *e* on the opposite end from the latch, and these engage in an opening or openings made in the frame for them. The cover has an opening, as shown, between its upper and lower parts, to receive the hook. When the said cover is in position, and in placing it, the projections *e e* thereof are fitted to the openings adapted to receive them, and the opposite end of the cover drops upon the curved surface of the hook *d*, which swings from beneath it, allowing the cover to drop onto its seat, bringing the opening in the said cover in line with the hook *d*, which is drawn forward therein by the reaction of the weighted end of the lever. There is a small opening by the side of the latch, into which a thin-edged bar may be introduced to force the latch back when it is necessary to open the cover. These openings may be filled with a piece of soft material, which will not only collect the street-dust, but will also conceal the spot from unauthorized persons.

Having thus described my invention, what I claim is—

1. A cable railway having piers at intervals extending down into the ground below the bottom of the tube or tunnel, substantially as herein described.

2. A cable-railway tube or tunnel having the trap-opening covers composed of iron plates with truss plates or straps beneath, and bolts passing through and uniting the top and bottom plates, with heads projecting above the surface, substantially as described.

3. A cable-railway tube or tunnel having openings at intervals and covers fitted thereto, with projecting supports or lugs upon one side and an opening upon the opposite side, and an angular weighted latch fulcrumed upon the frame of the opening, so as to engage and hold the cover when closed, substantially as described.

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

HENRY ROOT.

Witnesses:
F. L. MIDDLETON,
L. C. YOUNG.