

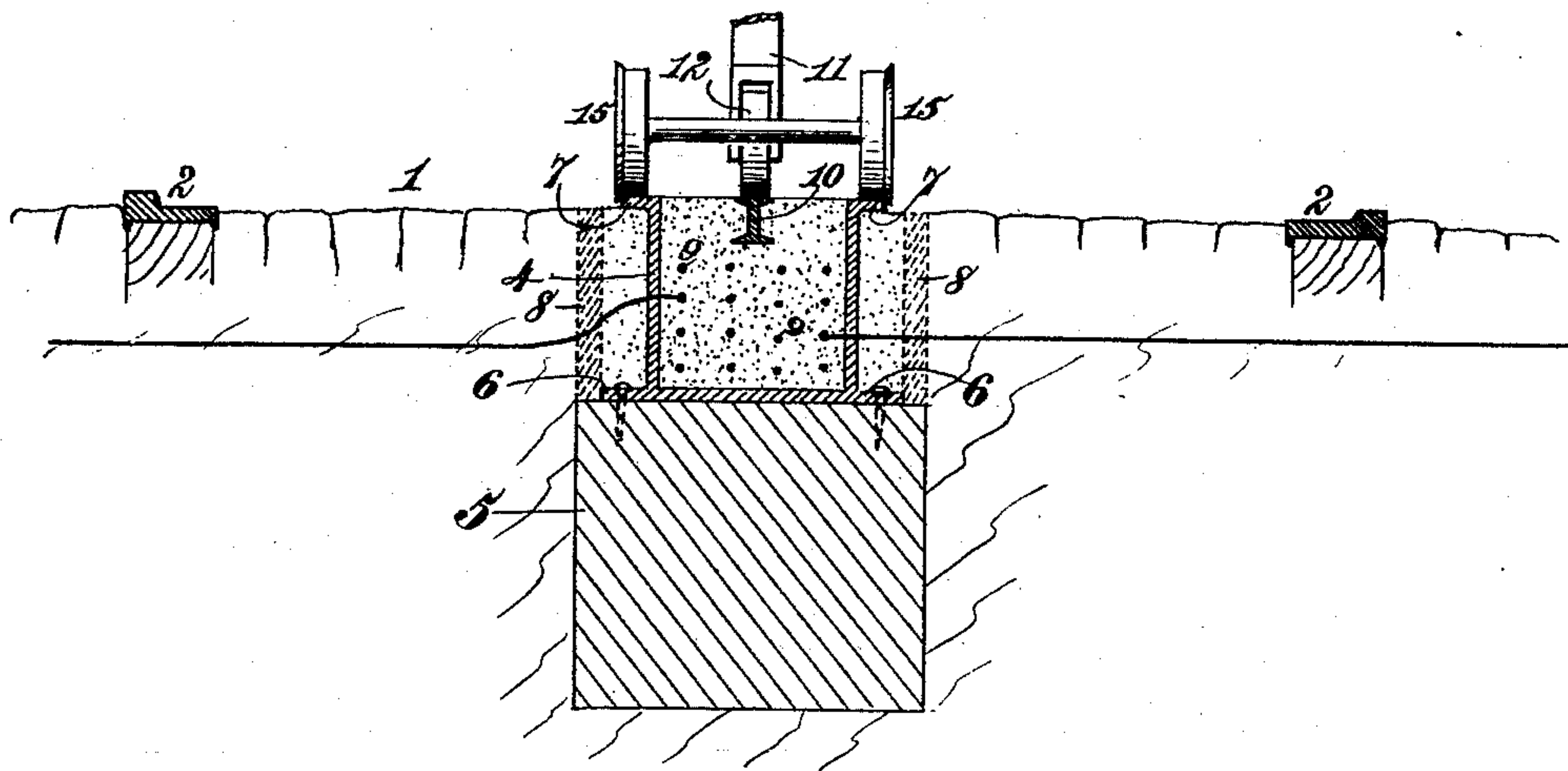
(No Model.)

W. W. AVERELL.  
INSULATING CONDUIT.

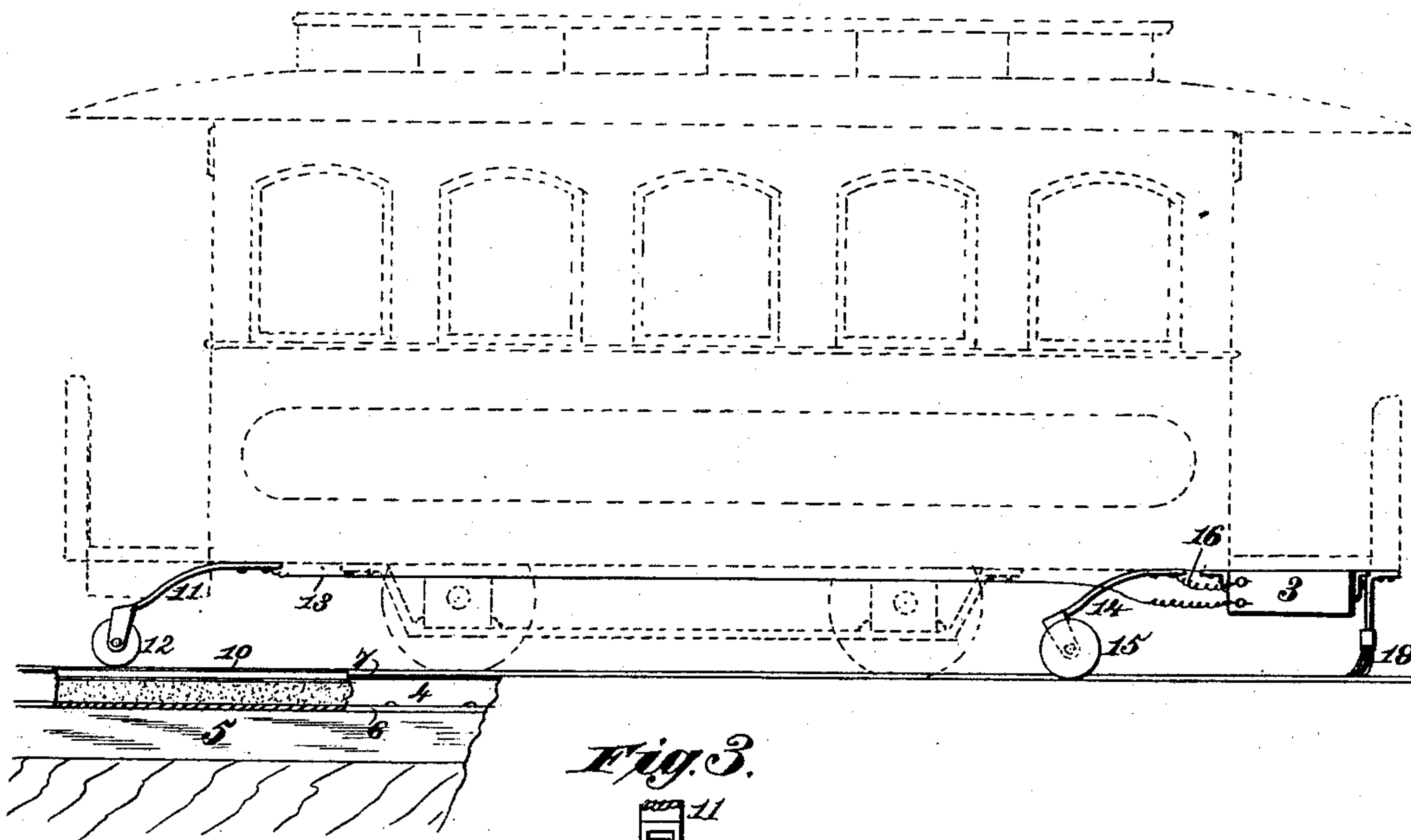
No. 348,880.

Patented Sept. 7, 1886.

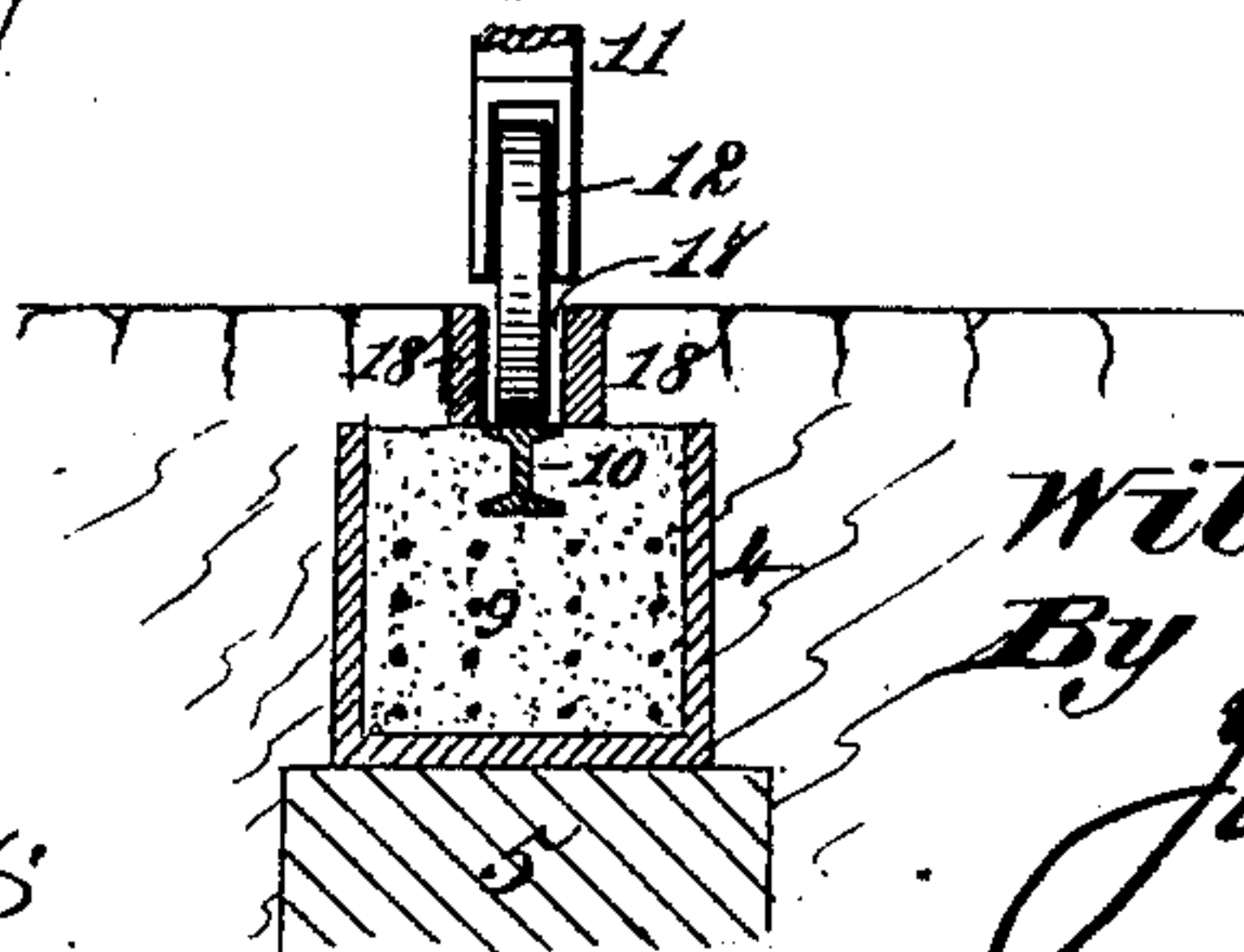
*Fig. 1.*



*Fig. 2.*



*Fig. 3.*



Witnesses,  
*Robert Everett.*

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# UNITED STATES PATENT OFFICE.

WILLIAM W. AVERELL, OF WASHINGTON, DISTRICT OF COLUMBIA.

## INSULATING-CONDUIT.

SPECIFICATION forming part of Letters Patent No. 348,380, dated September 7, 1886.

Application filed June 26, 1885. Serial No. 169,857. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM W. AVERELL, a citizen of the United States, residing at Washington, in the District of Columbia, have invented new and useful Improvements in Insulating-Conduits, of which the following is a specification.

My invention relates to improvements in insulating-conduits for the purpose of transmitting electrical energy to a motor by which a public conveyance is propelled, or for underground wires, or both; and it is the purpose of my invention to provide simple and efficient means for accomplishing such results without loss of energy, except by friction, from the point of its generation to place or places where it is applied.

It is also the purpose of my invention to provide a simple and efficient return-circuit, and to prevent the current from being "short-circuited" by accident.

Referring to the drawings, Figure 1 is a transverse vertical section of a road-bed, illustrating one method of applying my invention. Fig. 2 is a side elevation of the same with part of the road-bed removed. Fig. 3 is a vertical cross-section showing a modification.

In the said drawings, the reference-numeral 1 designates the streetway or that portion of it containing the road-bed of a street-railway. The numeral 2 denotes the rails, laid in the usual manner, and in Fig. 2 I have represented a car running upon said rails and driven by an electric motor, 3, which may be of any known or suitable construction.

In order to utilize the electrical energy for propelling cars it is necessary to expose the surface of one side of an electric conductor to the touch of a wheel or brush having good conductivity, in order to take up the requisite current for actuating the motor which may be attached to the car, as shown, or mounted upon a separate truck. When the conductor is used upon a street of a city or large town, it is necessary that its insulating-bed should be composed of material suitable for a pavement which will withstand the wear and tear of travel. To obtain practical results from such a system it is also necessary that the electrical energy, after passing through the motor, should be returned to its source through

a metallic circuit or to the earth. This return may be made through the rails of the road, or in the manner hereinafter described.

In carrying my invention into operation, I provide a continuous box or open trough, 4, which is placed upon its bottom upon a wooden stringer, 5, buried in the ground at such depth as to leave the edges of the box flush with the surface of the street or pavement. This box or trough is preferably made of channel-iron, wrought into shape and having suitable flanges, 6, projecting laterally from its bottom, whereby it may be spiked or bolted to the wooden stringer 5. It is also provided with outwardly-projecting flanges 7 upon its upper edges for a purpose presently to be described.

In order to give a perfect insulation to the box, vertical wooden planks 8 are placed upon the stringer 5 near its edges and just outside the flanges 6. These planks are flush with the roadway or pavement, and the space between them is filled in with the same insulating material used within the trough, and more fully described hereinafter.

Within the box or conduit 4 may be arranged any suitable number of separate conductors, 9—such as electric-motor, electric-light, and telephone wires, &c.—leading out at different points to houses, stores, or hotels. These wires are laid or embedded in the same insulating material, consisting of an asphaltic concrete, composed, substantially, of asphaltic cement and silica, and possessing those qualities requisite for an insulating underground conduit. When the box 4 is being filled with the asphaltic concrete, an I-rail, 10, is laid centrally therein, with its upper surface exposed and flush with the surface of the compressed concrete. This rail forms the conductor for the electrical energy.

Upon one end of the car is centrally mounted a spring-arm, 11, on the end of which is journaled a roll, 12, both the arm and the roll having good conductivity. The elasticity of the former is such as to preserve complete contact between the roller and the I-rail, and the current is carried to the motor by a wire, 13, held to the arm 11 by a binding-post.

Upon the opposite end of the car, or at any suitable point, are mounted two elastic conducting-arms, 14, of similar construction, each



carrying metallic rollers 15, and arranged at such distance apart that said rollers shall rest upon the flanges 7. These rollers are connected by wires 16 with the motor 3 in such manner that they receive the electrical energy after it has passed through the motor and conduct it to the flanges of the box, whereby it is returned to the place of generation. As a modification of this construction, I may sink the trough or box 4 beneath the surface, as seen in Fig. 3, and form an open channel, 17, in the roadway over the I-rail 10, insulation against lateral contact being effected by lining the vertical sides of the channel with wooden strips 18. In such case the wheel 12 will drop into the channel and lie upon the rail, the construction being in other respects the same, except that the return circuit, if desired, be made by means of the rails of the road. In order to keep the exposed surface of the rail 10 free from accumulation of dirt or other foreign matter, a brush, 19, is mounted upon the forward end of the car in such manner as to bear upon the rail and remove such matter from it, leaving it clear for the contact of the wheel 12. I prefer to make the conducting-rail 10 of copper, though other metals may be used, the size in cross-section being proportioned to the desired power and to the conductivity of the metal used. The asphaltic concrete in which the rail is embedded should be laid at a temperature not less than 200° Fahrenheit, and should be perfectly compressed. The box 4 may, as shown, be laid centrally with relation to the rails, or it may be laid beside one of them. The I-rail may be duplicated for the return-circuit, and brushes may be used, instead of rolls, to take up and return the electrical energy.

In Letters Patent No. 293,214, granted to me the 12th day of February, 1884, for an improvement in asphaltic concrete conduits the manner of preparing and laying the insulating material in which the I rail is embedded is fully described.

As I have already mentioned, the insulating material in which the conducting-rail and other electrical conductors are embedded must be of a character to withstand the severe wear to which it is subjected by the traffic of large cities. The comparatively indestructible character of the asphaltic concrete I employ for this purpose is clearly shown by the fact that substantially the same material patented to me the 14th day of January, 1878, has been in constant use upon the principal thoroughfares of Washington city for eight years past without material deterioration.

It will be seen that my invention contemplates a twofold purpose—viz., the mechanical anchoring of the conducting-rail in such manner that it shall not be displaced and the insulation of the same. I effect both of these

objects by laying the rail in soft cement, which is then allowed to set, whereby it is held in place with great strength and firmness, and at the same time fully insulated. I do not, therefore, limit my present invention to any especial composition of cement, provided only that it is of proper insulating character and possesses such a degree of strength and durability as to render it capable of use for the purpose.

Heretofore a conducting-rail has been laid in a street-railway and partly embedded therein, the head of the rail projecting above the surface. In this construction, however, the rail is described as being "fairly" insulated only, and the material in which it is laid is not an asphaltic non-conducting cement. Moreover, with a rail having the head raised above the surface there is some obstruction of the roadway as far as relates to the passage of teams. In my invention the conducting-rail is wholly embedded and covered, save as to its tread, in a non-conducting cement, which not only insulates it, but serves as a smooth, hard, and comparatively indestructible roadway, which affords complete insulation, together with convenience of travel.

What I claim is—

1. The combination, with a body of cement, of a conducting-rail insulated thereby and wholly embedded therein, save as to its upper surface, which is exposed, substantially as described.

2. An electric conductor for motors for railway-cars, consisting of a conducting-rail, a non-conducting body of asphaltic concrete in which said rail is buried, and an insulated metallic box containing said concrete and serving for the return-circuit, substantially as described.

3. An electric conductor for motors for railway-cars, consisting of a rail embedded in a non-conducting body of asphaltic cement, an insulated iron box containing said concrete, a wheel mounted on the car and running on the conducting-rail, and wheels also carried by the car and running on the flanged edges of the insulated box, said wheels being connected with the motor to take up the energy from the rail and return it through the box, substantially as described.

4. The combination, with a body of asphaltic cement, of a conducting-rail embedded therein save as to its upper surface, and a conducting wheel or brush moving upon said exposed surface, substantially as described.

In testimony whereof I have affixed my signature in presence of two witnesses.

WM. W. AVERELL.

Witnesses:

JAMES L. NORRIS,  
J. A. RUTHERFORD.