

(No Model.)

W. H. KNIGHT.  
ELECTRIC RAILWAY.

No. 455,341.

Patented July 7, 1891.

FIG 1

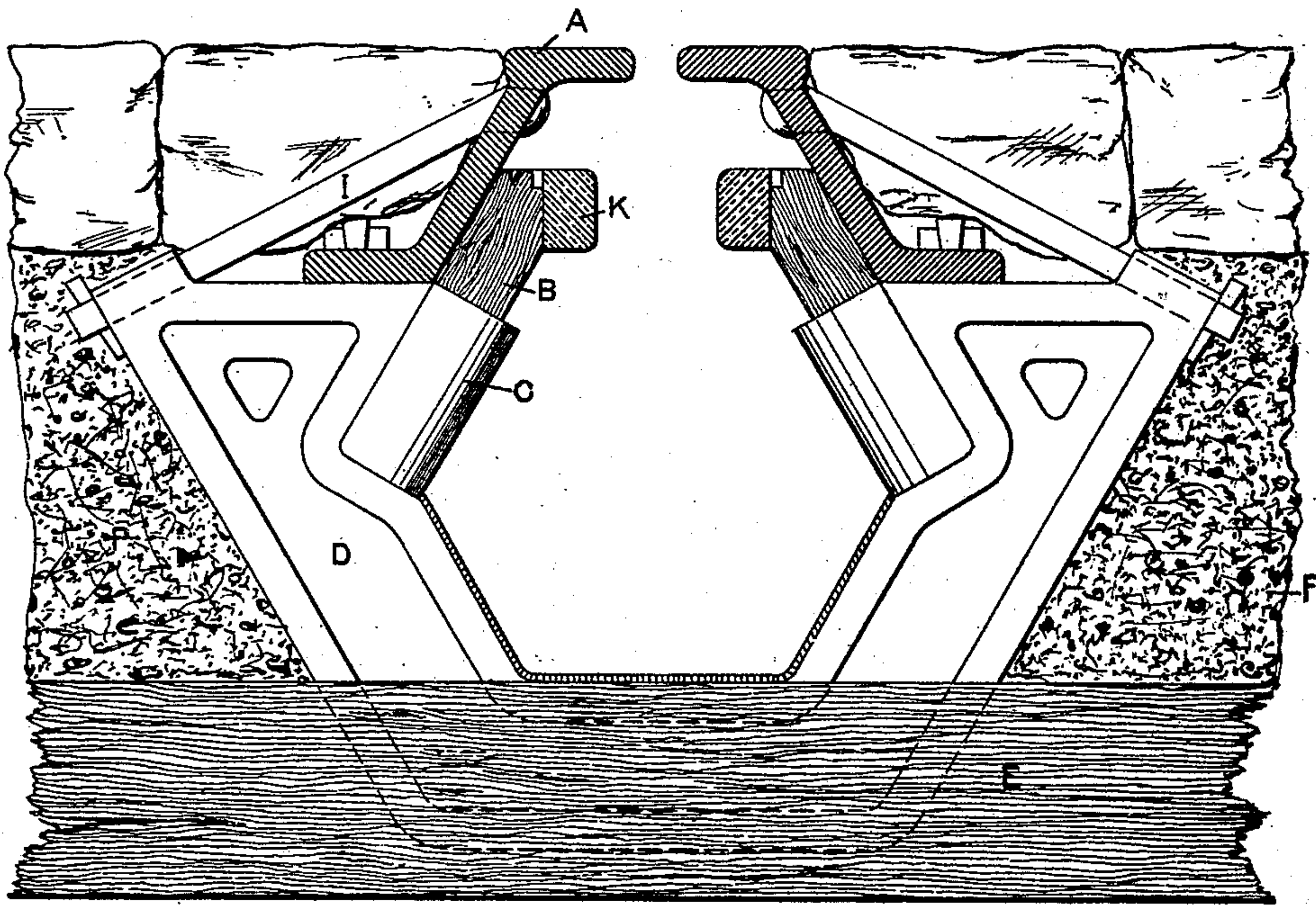
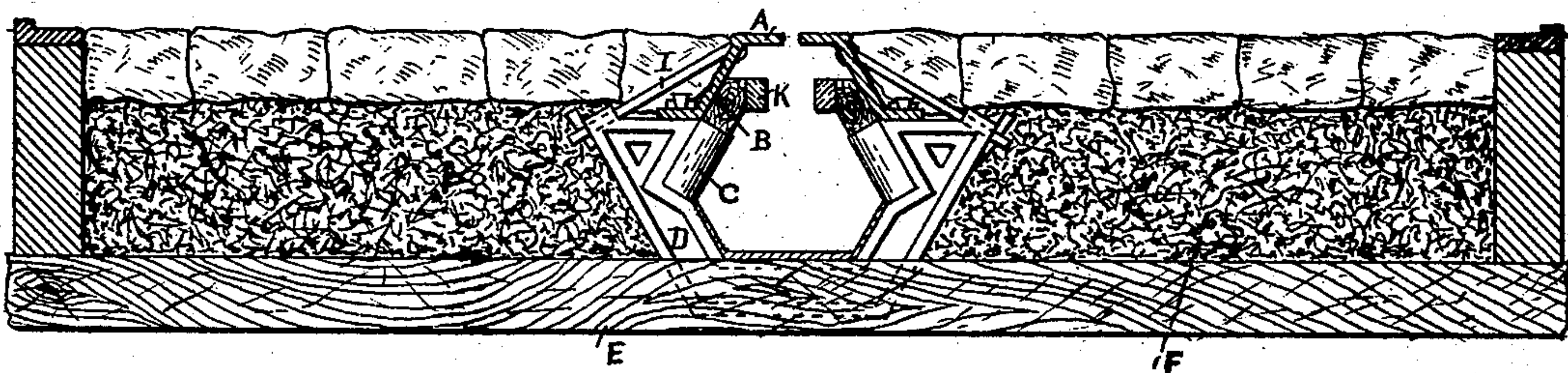


FIG II



WITNESSES

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# UNITED STATES PATENT OFFICE.

WALTER H. KNIGHT, OF NEW YORK, N. Y.

## ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 455,341, dated July 7, 1891.

Application filed April 29, 1887. Serial No. 236,548. (No model.)

*To all whom it may concern:*

Be it known that I, WALTER H. KNIGHT, a citizen of the United States, residing at New York, in the county of New York, State of New York, have invented certain new and useful Improvements in Electric Railways, of which the following is a specification.

The invention is illustrated in the accompanying drawings.

10 I have found it a matter of great importance in the practical construction of conduits for electric railways that there should be but a narrow surface of iron exposed on the street or roadway in which the railway is operated, and that the overhanging edge of the slot should be very narrow to avoid great thickness of material. It is also of importance that the conductor or conductors should be supported as far as possible above the bottom of the conduit, so as to avoid a large and expensive structure of sufficient depth to prevent accumulation of dirt or snow extending up to the conductors and interfering with the operation of the road. To successfully meet these requirements I have devised a conduit having inclined vertical sides in its upper part and having one or more conductors supported in this upper part, as will be hereinafter described.

30 Referring to the accompanying drawings, Figure I is a transverse section of the conduit, and Fig. II the same, with a section of the road-bed added.

A represents two slot-pieces of iron or steel having horizontal flanges at their upper and lower edges, which flanges are upon opposite sides of the central inclined web. The function of this web is to give vertical stiffness to the rail and at the same time form a metallic backing for the pavement, and, as it has been found necessary in most cases to extend the conduit below the pavement, the web should go substantially through it.

45 For some of the features of conduit construction hereinafter claimed this web may be more or less inclined and even exactly vertical or curved. For this reason I have given it the general definition of "upright." These slot-pieces are supported on a series of transverse metallic yokes D, placed every four feet or so along the line. Between these yokes the body of the conduit is made up of con-

crete, asphalt, or similar material laid around a former, which is withdrawn as the concrete sets. A thin layer of concrete is also laid over the inside of the yokes to prevent corrosion and to aid in the insulation. In the yokes D are cast sockets C, in which are set insulating-pins B, upon which are carried conductors K. I have found that although better insulation may be had by supporting the conductors from the insulating-walls of the conduit, yet they are held more firmly and reliably by supporting them from the metallic part of the structure, and are more readily put in place. The pins B extend upwardly, so as to bring part at least of conductor K into the upper part of the conduit above the lower edge of slot-pieces. The foundation part or substructure which is thus made for the slot-rails A is hollowed to form the lower part of the conduit. It is strengthened by the yokes D, which form metallic ribs, securing alignment of the rails, while the intermediate filling of concrete F composes the side walls and the bottom.

E is the ordinary cross-tie of the railway carrying the bearing-rails, as seen in Fig. II. It is preferably made to sustain the yokes D, which are here shown set into it. To supplement the lateral stiffness given to the slot-rail by the flanges on the web, a bolt or rod  $d$  is attached near its upper edge, and extends thence to a lug on the corner of the yoke, where it is adjustably secured by a tapered key. The paving-blocks do not form any part of the conduit, so that it is free from the disturbance and leakage to which the pavement is subject.

In the form of conduit which I have described there are, in addition to the mechanical features set forth, the following other advantages, principally electrical. It has been found essential in practice to protect the conductor and insulator both from mechanical injury and also from mud, slush, and water. In the present construction the slot-rails forming the upper part of the conduit go substantially through the pavement, so that no breaks in the pavement can admit sand, mud, or slush behind the conductor to affect the insulation, and since the conductor is supported from the substructure the jars and shock from the traffic above are not communicated



to the insulators. This is of special importance when glass or porcelain insulators are used, which are likely to become broken by the shock. It is also of great importance in practical construction that the conductors should be put in place and all joints and supports carefully inspected before the slot-rails are put down. To inclose them permanently for this purpose the conductors should be supported from the substructure, and in order to make room for working, as well as a sufficient insulation distance between the conductor and the metal of the conduit, the substructure should be beneath the pavement, as it is impracticable to secure this space when the whole structure is compressed into the pavement-depth. It must also be borne in mind that the conduit contains a stationary permanent conductor, with which a traveling contact device makes a constant connection. To take advantage of the opportunities afforded by this arrangement, it is essential to have a construction much finer than that contemplated by any other electric conduit or by the ordinary cable construction, a perfect horizontal alignment must be secured, and room must be had behind the conductor to support it and connect the sections, so as to leave the contact-surface smooth. The contact device can then work within much finer limits and be less liable to strike in its passage the joints of the conductor-sections, the insulators, or the sides of the conduit, while the conductors must have a support sufficiently firm to withstand considerable force from a broken contact device or other accident. To perfect this it is highly desirable that the conductors be supported firmly on the solid yokes and that those yokes have a wide neck, such as can only be secured by placing them beneath the pavement, where they have opportunity for sufficient transverse extension, while the slot-rails above them can have converging sides, which bring the structure to a practicable width on the surface.

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

1. In an electric street-railway, a conduit inclosing a line conductor and constructed of two parts: first, a substructure beneath the pavement, consisting of yokes placed at intervals with intermediate filling and supporting the conductor by projecting insulators hold-

ing it free from the side walls, and, second, slot-rails extending through the pavement forming the upper part of the conduit, the said insulators being so placed that the slot-rails serve as a water-shed, guarding them from matter entering behind the said rails.

2. In an electric street-railway, a conduit inclosing the line conductor and constructed in two parts: first, a substructure beneath the pavement, consisting of yokes and intermediate filling with insulators projecting from the yokes and holding the line conductor free from the side walls, and, second, an angular slot-rail above the insulators extending from the said substructure through the pavement, so as to shelter the insulators, while forming both a backing for the pavement and a metallic slot-edge upon the street-surface.

3. The combination of the yokes formed with sockets therein and the slot-rails extending through the pavement to form the upper part of the conduit, with the insulators seated in the sockets and a conductor attached thereto, as described.

4. The combination, in an electric railway, of a slotted conduit consisting of the upright side or slot pieces forming the upper part of the conduit and attached to an underlying foundation part, and an insulated supply-conductor therein supported from the said foundation part at a point above the lower edge of the said side or slot pieces.

5. The combination, in an electric railway, of a slotted conduit composed of slot-pieces attached to an underlying foundation part and a supply-conductor inclosed therein and supported from the said foundation part of the structure on an upwardly-projecting insulating-piece.

6. In an electric-railway conduit, the combination, with an inclosed supply-conductor, of an upright slot-rail, a substructure therefor having transverse yokes, a transverse brace from said yokes to said rail, and cross-ties for the bearing-rails separate from said yokes.

In witness whereof I hereunto set my hand this 19th day of April, 1887.

WALTER H. KNIGHT.

Witnesses:

ROBERT W. BLACKWELL,  
JOSIAH LOW BLACKWELL.