No. 645,654. Patented Mar. 20, 1900.

W. A. P. WILLARD, Jr.

THIRD RAIL FOR ELECTRIC RAILWAYS.

(Application filed July 13, 1899.)

(No Model.) 2 Sheets—Sheet 1.

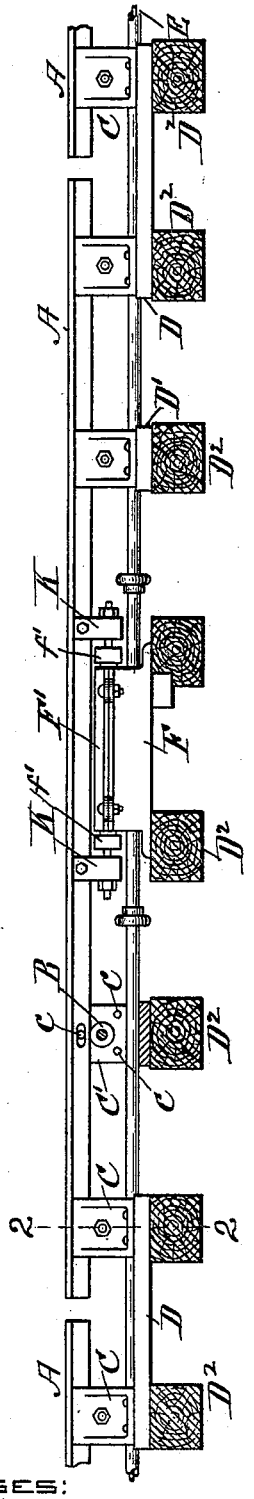

Fig. 1.

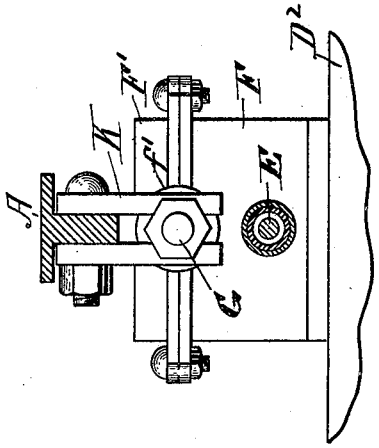

Fig. 3.

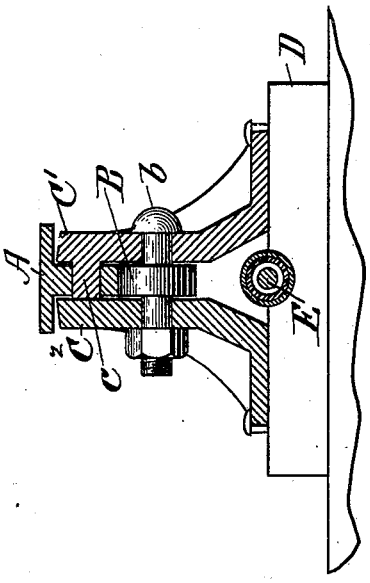

Fig. 2.

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L. A. Walsh

INVENTOR:
Wm. A. P. Willard Jr.
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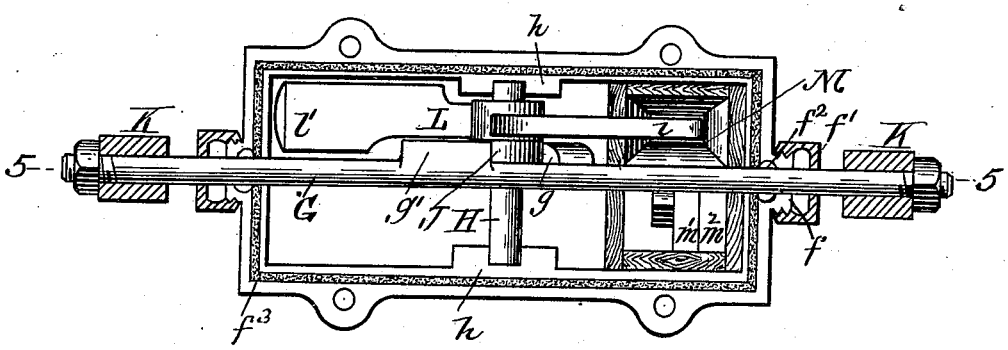

Fig. 4.

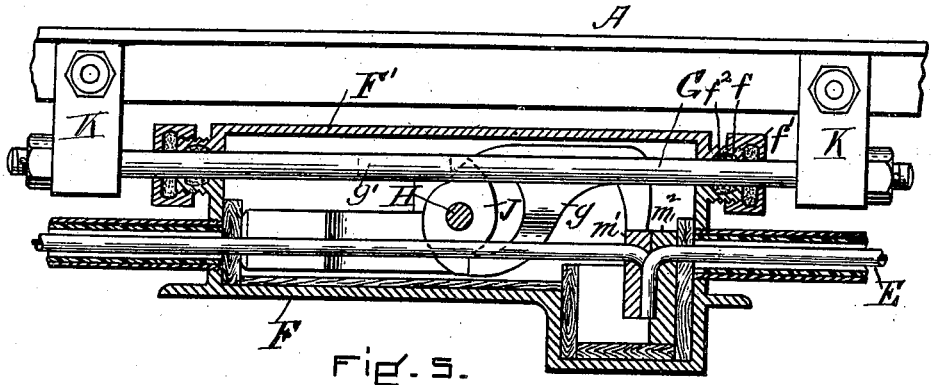

Fig. 5.

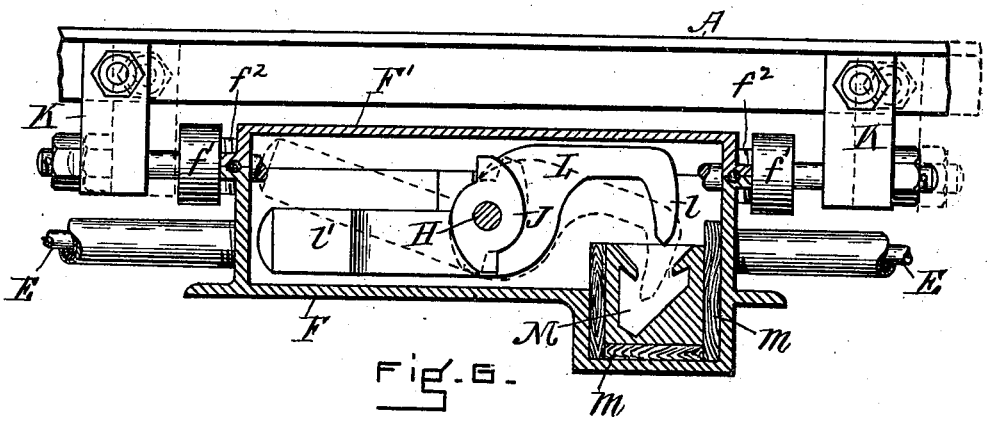

Fig. 6.

WITNESSES

E. A. Guild

L. A. Walsh.

INVENTOR

Wm. A. P. Willard Jr.

by Geo. P. G. Lowe

his atty

UNITED STATES PATENT OFFICE.

WILLIAM A. P. WILLARD, JR., OF HULL, MASSACHUSETTS.

THIRD RAIL FOR ELECTRIC RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 645,654, dated March 20, 1900.

Application filed July 13, 1899. Serial No. 723,649. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. P. WILLARD, Jr., of Hull, in the county of Plymouth and State of Massachusetts, have invented a new and useful Improvement in Third Rails for Electric Railways, of which the following is a specification.

My invention relates to that class of third rails in which a horizontal movement is given to the contact-rail to make electrical connection between it and the source of electricity, the rail being out of circuit except when in its forward or rear position.

My invention consists, mainly, in an improved switch-box adapted to be operated by such a rail and also in certain details of construction which will be described below.

My invention will be understood by reference to the drawings, in which—

Figure 1 is a side elevation of a rail-section embodying my invention, a side of one of the chairs being removed to show the construction of the rail. Fig. 2 is a section on line 2 2 of Fig. 1, showing the chair by means of which the contact-rail is supported. Fig. 3 is a cross-section taken in front of one of the switch-boxes and showing the switch-box in elevation. Fig. 4 is a plan of the switch-box, its cover being removed. Fig. 5 is a section on line 5 5 of Fig. 4 with the cover in place, and Fig. 6 is a sectional detail showing the switch mechanism.

A is the contact-rail, which is made of what is commercially known as "T-iron." This rail is supported upon friction-rolls B, mounted in chairs C. Each chair C is made of two parts C′ C². The part C′ has projecting from it lugs, one of which is shown at *c* in Fig. 2, which lugs or projections are slightly longer than the width of the friction-roll B, so as to prevent the sides of the chair from jamming the roller. The sides of the chair are held together by the bolt *b*, which serves as an axle for the roller B. The rail A is slotted and the lug *c* passes through the slot, as is shown in Figs. 1 and 2, the slot being sufficiently long to allow the T-rail to have proper amount of play. Each slot may also serve, with its lug *c*, as a stop to prevent the T-rail from being moved too far in either direction. The chairs C are spiked through the supports D D′ to the sleepers D². It will be noticed that the support D is sufficiently long to connect two sleepers D², thus acting as a fish-plate to prevent the spreading of the adjacent ends of the contact-rails. These supports D D′ are grooved, as shown in Fig. 2, to receive the conductor E, which may be made in any suitable manner, preferably with a central core, which forms the conductor proper, surrounded by a coating of insulation protected upon the outside by a shield of iron pipe or other suitable mechanical protection.

F is the switch-box, provided with a cover F′. This switch-box contains a push-rod G, carrying two arms *g g′*. A rock-shaft H, carrying a double scroll-lever J, is supported in bearings *h* in the sides of the box. The two arms of this lever J engage with the two arms *g g′*, which project from the push-rod G, which arms are suitably shaped to lie normally in contact with the lever-arms and to move the lever in the same direction whichever way the push-rod is moved. I prefer that the push-rod should lie in a semicircular groove in the upper edge of the opposite ends of the box and that the cover F′ of the box should be provided with corresponding grooves to surround and form bearings for the push-rod. Projections are formed around these grooves upon the outside of the box and cover, which when the cover is on the box form on each end of the box a boss *f*, threaded on the outside to receive an annular screw-cap *f′*, this structure forming a stuffing-box, which may have a chamber *f²* to receive a packing or to be filled with grease for purposes not only of lubrication, but to keep dampness from the interior of the box. The ends of the push-rod G are held in hangers K, bolted to the contact-rail A. Its ends are threaded and provided with nuts and cotter-pins, as shown in Fig. 5, so that the push-rod will move in unison with the contact-rail A. Upon the shaft H is also mounted the switch-lever L, which is preferably of the shape shown in Fig. 6. Its end *l* is shaped to engage with the other switch member. Its rear end *l′* is heavily weighted or may be provided with a suitable spring, so as to keep the switch normally in the position shown in Fig. 6. By moving the contact-rail A and push-rod G in either direction the lever J will cause the rock-shaft H to throw the end *l* of the switch into contact with the switch member below it. As indicated above, I prefer for the other member of the switch to use a yielding metallic substance—such, for example, as a perma-

nent liquid metal, which is contained in a metallic cup M. This cup in insulated from the rest of the box by suitable insulating-strips m surrounding it and is preferably made large enough to hold sufficient liquid for the purpose. I prefer to shape the interior of this cup as shown in Fig. 6.

The conductor E is led through the box F, as shown in Fig. 5, and is connected with the metal cup by a suitable clamp m' m^2, (see Figs. 4 and 5,) between which the two ends of adjacent sections of the conductor are held. When the end of the switch-lever L is thrown down into the cup, the current finds a path from the conductor E, through m^2, to the liquid contained in the cup M, thence to the switch, and from it through the various parts electrically connected to it to the push-rod G, clamps K, and contact-rail A, and from it to the motor on the car and to the traffic rails or other return by which the circuit is completed. At other times the current remains in the conductor. An insulating-block e is provided at the farther end of the switch-box to insulate the conductor E where it enters the box from that side.

The switch-box should be water-tight, and for this purpose is grooved, as at f^3, to receive a suitable packing, and it and its cover are provided with eyes to receive screws or bolts to hold them together. In practice where the outer coating of the conduit-pipe for the conductor is metallic I insert on each side of the box an insulating-joint, so that at the time when the box becomes charged the current will not leak either way, but will be driven through the various parts to the conduit-rail.

The operation of this device is as follows: The shoe being electrically connected with the motor is led down from the under surface of the car and pushed to move the contact-rail A. This rail throws the switch-lever L by means of the push-rod G and scroll-lever J, so as to cause the end l of the switch to engage with the other switch member M, thus bringing the shoe and motor into electrical connection with the conductor E, the current then passing through the motor and completing the circuit through the track or in some other way. When the shoe has passed beyond the particular section of contact-rail referred to, the weight of the rear end l' of the switch-lever falls, breaking the electrical contact of the two switch members and throwing the push-rod and the rail into their normal position.

Because of the peculiar construction of the scroll-lever J and the arms g g' of the push-rod G the switch will be thrown whichever way the contact-rail is pushed.

If thought best, springs may be applied to the contact-rail or lever-rod to return it to its normal position after it has been moved by the shoe.

I prefer to make the contact-rail in sections of, say, thirty feet long and provide one switch-box for each section; but this is a matter of convenience merely. The whole structure is comparatively inexpensive and exceedingly simple, and, as with other rails of this class, it prevents danger, which arises from the use of live third rails or that class of third rail in which downward pressure alone causes contact to be made.

What I claim as my invention is—

1. In a third-rail system, a contact-rail, a switch-box carrying a push-rod suitably connected thereto, in combination with a stationary switch member, a conductor connected thereto, a switch-lever and means substantially as described connecting said push-rod with said switch-lever, whereby a reciprocation of the push-rod in either direction will bring said switch member into electrical engagement, as set forth.

2. In a third-rail system, a contact-rail, a switch-box, a push-rod passing through said switch-box and connected to said contact-rail, a switch consisting of two members, one of which is movable, and means connecting said movable switch member with said push-rod, whereby the reciprocation of said contact-rail and said push-rod in either direction will cause electrical contact between said switch-lever and the other member of the switch, as set forth.

3. A switch-box adapted for use in third-rail systems having a freely-movable switch member and a stationary switch member and a horizontally-movable rod connected to said movable switch member and adapted to be connected to a movable third rail, and means for electrical connection between said stationary switch member and a source of electricity, as set forth.

4. In a switch-box, a switch-lever mounted on a horizontal shaft, a double scroll-lever connected thereto and a push-rod having two arms each capable of engagement with one of the arms of said scroll-lever, whereby the movement of the push-rod in either direction will cause the oscillation of the switch-lever in the one direction, in combination with a stationary switch member, all as set forth.

5. A third-rail-supporting chair consisting of two sides, one provided with lugs adapted to engage with the face of the other, and said chair carrying a friction-roll mounted thereon, as set forth.

6. In a third-rail system having a horizontally-movable contact-rail, in combination, a slotted contact-rail and two or more supporting-chairs each having a friction-roll upon which said rail rests, and a lug adapted to pass through a slot in said rail and limit its movement, as set forth.

In testimony whereof I have hereunto set my name this 5th day of May, 1899.

WM. A. P. WILLARD, JR.

Witnesses:
FLORENCE DRAPER,
GEORGE O. G. COALE.