

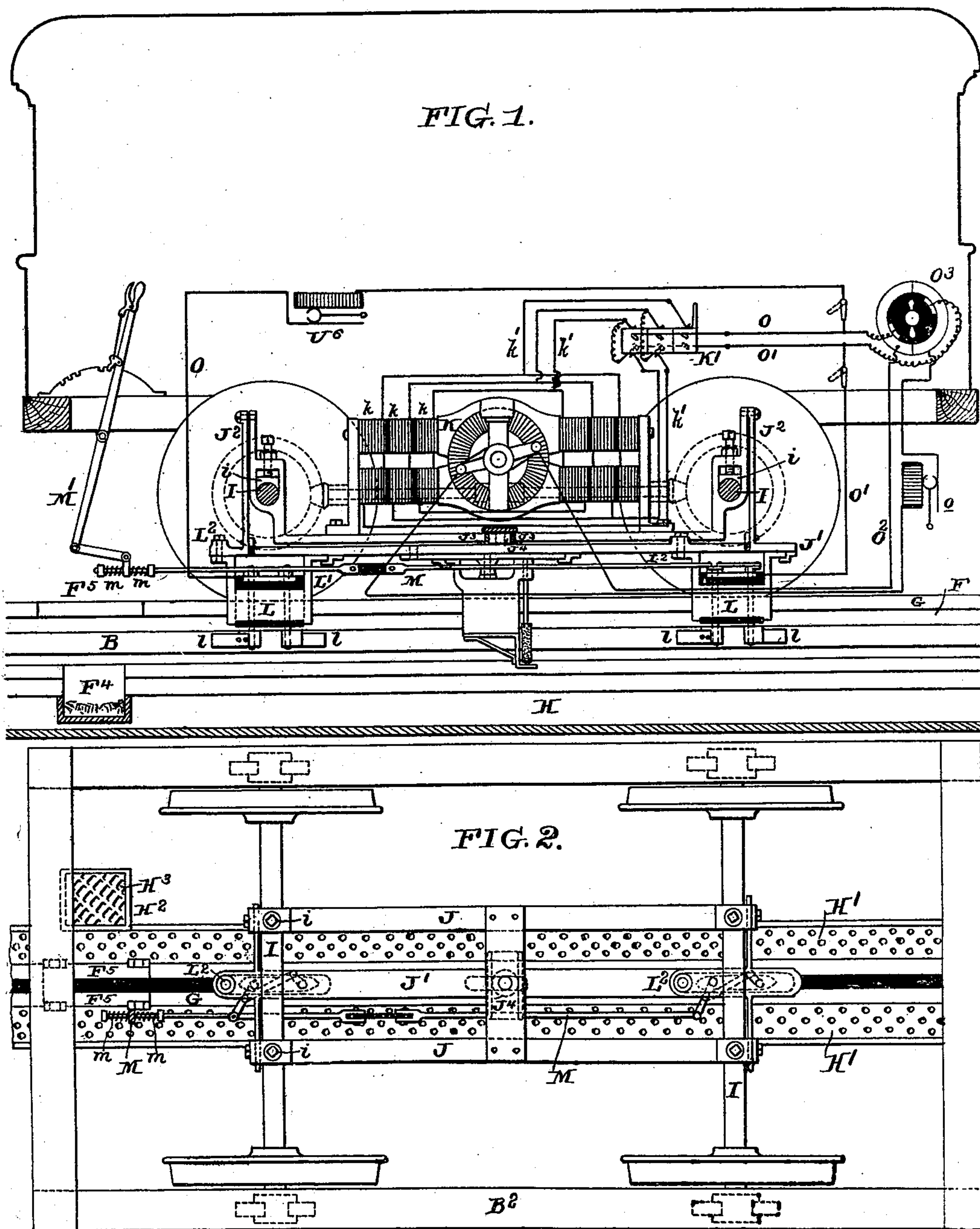
(No Model.)

2 Sheets—Sheet 1.

R. M. HUNTER.  
ELECTRIC RAILWAY.

No. 556,322.

Patented Mar. 10, 1896.



Witnesses.

*Henry D. May*  
*Wm. L. Beaus*

Inventor.

*R. M. Hunter*

(No Model.)

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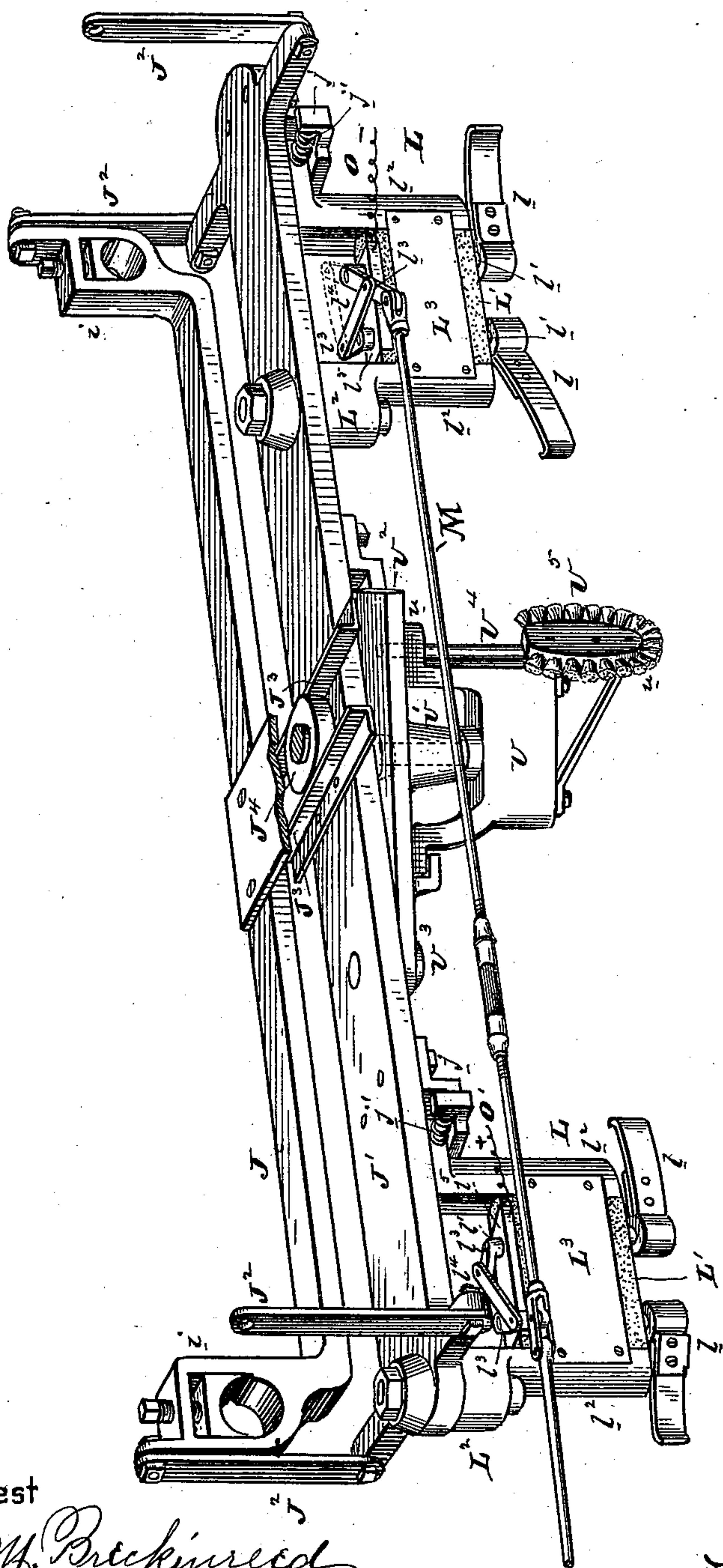


Fig. 3.

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E. M. Dermott.

Inventor

Rudolph M. Hunkeler



# UNITED STATES PATENT OFFICE.

RUDOLPH M. HUNTER, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO  
THE ELECTRIC CAR COMPANY OF AMERICA, OF SAME PLACE.

## ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 556,322, dated March 10, 1896.

Application filed July 19, 1886. Serial No. 208,418. (No model.)

*To all whom it may concern:*

Be it known that I, RUDOLPH M. HUNTER, of the city and county of Philadelphia and State of Pennsylvania, have invented an Improvement in Electric Railways, of which the following is a specification.

My invention has reference to the construction and operation of electric railways; and it consists of certain improvements which are fully set forth in the following specification and shown in the accompanying drawings, which form a part thereof.

My invention comprehends certain improvements fully set out hereinafter, and relate more particularly to the current-collecting devices and means generally for supplying electricity from a conductor within a slotted conduit to the motor on the car.

In the drawings, Figure 1 is a sectional elevation of an electric car or motor and shows the arrangement of the various circuits, &c., on the car. Fig. 2 is a plan view of the truck of same with the motor and all the upper portion removed, and Fig. 3 is a perspective view of my improved collector or apparatus for collecting the electricity from the working conductors and supplying it to the motor on the car.

B<sup>2</sup> represents the car-body, which may be supported upon springs in the usual manner. The wheels are secured to axles I, which are suitably journaled in axle-boxes. Supported upon these axles are the two frames J J, made vertically adjustable thereon by adjustable guides i. The motor K is supported upon these frames and is geared to the axles I in any suitable manner, that method indicated in dotted lines being similar to the construction shown in my application, filed July 14, 1885, Serial No. 171,625. The collector-frame J' is swung upon suspended parallel links J<sup>2</sup>, pivoted to the frame J, whereby the collector-frame may swing laterally, but always remain horizontal. These links being secured to the frames J, the vertical adjustment of said frames will also adjust the collector devices vertically in the slot G of the conduit H, contained therein. The form of the collectors and mode of support is more clearly shown in Sheet 2 of the drawings in the perspective view marked Fig. 3, and is very simi-

lar to the construction set out in my application of July 14, 1885, above referred to, but embodies material improvements upon it.

The frame J' has guides J<sup>3</sup> arranged transversely across its middle, between which a stationary roller J<sup>4</sup> is received, the said roller being supported by the frame J. This roller and guides prevent any longitudinal movement of the collector-frames, but does not in the least interfere with the lateral movement which is necessary for inequalities in the position of the slot or conductors.

Located below each axle and hinged at their ends to the collector-frame J' by vertical pins L<sup>2</sup> are the collector-plates L, to which the collector l is secured and from which they are insulated. The collector-plates L have their free ends supported at j to the frame J and are maintained normally with the slot by springs j'. Their upper portions are notched and the body portions filled with insulating material L', through which vertical rods l' pass to operate the collectors l. The upper parts of these rods l' pass above the connecting and insulated plate l<sup>5</sup> and terminate in cranks l<sup>3</sup>, which are connected by links l<sup>4</sup>. The object of this construction is that when one collector is turned to make contact with the working conductor the other collector of the same collector-plate is turned out of contact or in a longitudinal line and points in the direction of travel of the vehicle. By this means the collectors trail and a different pair of collectors work when running backward than when running forward.

The collectors of a plate may always work in the same direction or may work upon opposite conductors, as shown, in which case the adjustment of the collectors also causes a reversal of current through the motor. The collectors on the two collector-plates are simultaneously operated by the insulated connecting-rod M, the end of which is connected by a slip-joint with the lever M', but is caused to move with the movements of said lever by the spring m, and these springs cause the collectors to press upon the working conductors with more or less elastic pressure. From the construction here set out it will be seen that the collectors may swing on roller J<sup>4</sup> as a pivot and may move laterally at both ends alike.



They may also swing upon pins  $L^2$  as an axis and may move about their own shafts or rods  $l'$  as an axis. The ends  $l^2$  of the collector-plates are made with more or less knife edges and form protections for the insulation, located between the forward and rear ends of said plates, and this insulation may be still further protected by side plates  $L^3$ , which may, if desirable, be made replaceable by repairs in case of wear.

It is immaterial what the specific shape or construction of the parts may be, as it is evident that they may be modified in various ways to suit the various conditions. It is also evident that the two collectors  $l$  may simultaneously receive current from different working conductors, and said current so collected may be supplied to the motor for energizing it.

Located between the collector-plates  $L$  is the brush  $U^5$  for cleaning the conduit-walls and sweeping the refuse into the wells  $F^4$  of the conduit  $H$ . This brush is pivoted at  $U'$  on a vertical axis to a laterally-movable or hinged frame  $U^2$  pivoted at one end  $U^3$  to the frame  $J$  of the collectors. By this means the brush may rotate upon its vertical pivot  $U'$  and may bodily swing laterally to follow all variations in the slot or conduit due to irregularities or in passing around curves. The brush is secured to a vertical rod  $U^4$ , having a bearing  $u$  at the top and bottom. The upper end of the rod  $U^4$  passes through the upper bearing and rests against the plate  $U^2$ , and if said plate be moved to one side the rod may be pushed up to disengage the lower part from its bearing and the brush may be removed from the conduit, being sufficiently thin for that purpose. The shank of the brush or its frame  $U$  is made long and narrow or flat to run properly between the slot-walls. It is evident that the particular location of this brush and its appendages may be varied. It is also evident that the brush should be so constructed that parts brushing the conductors of opposite polarity may be insulated from each other to prevent short-circuiting of the currents.

$O$  and  $O'$  are the two main conductors on the car which receive the current from the collectors and supply it to the motor, and hence may be considered the motor-circuit. This circuit is provided with a resistance-changer  $U^6$  located therein.

$O^2$  is an armature-circuit, and may be provided with a resistance-changer  $o$  and have its current reversed by reversing-switch  $O^3$  of any suitable construction.

The motor  $K$  is shown as having its field-magnets divided into sections  $k$ , which may be coupled up in various ways by the commutator-switch  $K'$ , which commutates the current from the conductors  $O O'$  by coupling them up in different ways with the motor-conductors  $k'$  connecting with the sections  $k$  of the motor-magnets. I do not limit myself

to the details of this commutator, as the same principle might be carried out on modified constructions of what is here shown.

The current passes from one of the collectors by circuit  $O$  through resistance-changer  $U^6$ , thence to the field-magnets by a commutating device  $K'$ , returning by circuit  $O'$  to the other collector. The armature is not in series relation with the field-coils, but is included in a circuit  $O^2$ , leading from the motor-circuits  $O O'$ , and includes a current-reversing switch  $O^3$  and a resistance-changer  $o$ .

I do not confine myself to the details herein set out, as they may be modified in various ways without departing from my invention.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an electric railway, a slotted conduit, a bared working conductor contained therein, an electrically-propelled vehicle, an electric motor on said vehicle to propel it, a collector-frame suspended from the axles of the vehicle and adapted to have lateral movement, transverse guides to prevent said frame from having longitudinal movement, a collector suspended from said frame passing through the slot and making contact with the working conductor, and a conductor extending from the collector to the motor.

2. In an electric railway, a slotted conduit, a bared working conductor contained therein, an electrically-propelled vehicle, an electric motor on said vehicle to propel it, a collector-frame suspended from the axles of the vehicle and adapted to have lateral movement, transverse guides to prevent said frame from having longitudinal movement, a collector suspended from said frame passing through the slot and making contact with the working conductor, a conductor extending from the collector to the motor, and a hand-operated regulator for controlling the current passing through the motor.

3. In an electric railway, a slotted conduit containing bared working conductors, an electrically-propelled vehicle, a motor on said vehicle receiving electricity from said conductors, a collector-frame suspended from the axles of the vehicle and adapted to have lateral movement, transverse guides to prevent the said frame from having longitudinal movement, and collectors suspended from said frame passing through the slot and making contact with the working conductors.

4. In an electric railway, a slotted conduit containing bared working conductors, an electrically-propelled vehicle, a motor on said vehicle receiving electricity from said conductors, a collector-frame suspended at its ends from the axles of the vehicle and adapted to have lateral movement, transverse guides at or near its middle to prevent the said frame from having longitudinal movement but allow of lateral and horizontal oscillatory movements, and collectors sus-



pended from said frame near its ends passing through the slot and making contact with the working conductors.

5. In an electric railway, a slotted conduit containing bared working conductors, an electrically-propelled vehicle, a motor on said vehicle receiving electricity from said conductors, a collector-frame suspended from the axles of the vehicle and adapted to have lateral movement, transverse guides to prevent the said frame from having longitudinal movement, collectors suspended from said frame passing through the slot making contact with the working conductors, and adjusting devices to adjust said collector-frame vertically.

6. In an electric railway, a slotted conduit containing bared working conductors, an electrically-propelled vehicle, a motor on said vehicle receiving electricity from said conductors, a collector-frame suspended from the axles of the vehicle and adapted to have lateral movement, transverse guides to prevent the said frame from having longitudinal movement, and pivoted collectors suspended from said frame passing through the slot and making contact with the working conductors.

7. In an electrical railway, a slotted conduit containing bared working conductors, an electrically-propelled vehicle, a motor on said vehicle receiving electricity from said conductors, a collector-frame suspended from the axles of the vehicle adapted to have lateral movement, transverse guides to prevent the said frame from having longitudinal movement, and pivoted collector plows or plates extending down through the slot, and pivoted collectors carried thereby and insulated therefrom to make contact with the working conductors.

8. In an electric railway, stationary bared working conductors, in combination with an electrically-propelled vehicle, a motor on said vehicle, two independently laterally movable collecting devices carried by the vehicle working in contact with said bared conductors, and a connection between said collecting devices to prevent their independent longitudinal movement, suspended from the axles independent of the vehicle-body.

9. In an electric railway, stationary bared working conductors, in combination with an electrically-propelled vehicle, a motor on said vehicle, two independently laterally movable collecting devices carried by the vehicle working in contact with said bared conductor, a connection between said collecting devices to prevent their independent longitudinal movement, and adjustable supports for the collecting devices to adjust them vertically, upon the vehicle relatively to the conductors.

10. In an electric railway, stationary bared working conductors, in combination with an electrically-propelled vehicle, a motor on said vehicle, two independently laterally movable collecting devices carried by the axles of the vehicle independently of the vehicle-body

and working in contact with said bared conductors, a connection between said collecting devices to prevent their independent longitudinal movement, and a support for said connection sustained by the axles to allow of lateral movement but prevent longitudinal movement.

11. In an electric railway, one or more stationary bared working conductors, in combination with an electrically-propelled vehicle, a horizontal floating collector-frame suspended from the vehicle-axles independently of the vertical movements of the vehicle-body and adapted to lateral movement at either or both ends simultaneously, guides to insure its always remaining horizontal, and one or more collectors suspended from said collector-frame.

12. In an electric railway, stationary bared working conductors, in combination with an electrically-propelled vehicle, a horizontal floating collector-frame suspended from the vehicle-axles independently of the vertical movements of the vehicle-body and adapted to lateral and oscillatory movement at either end, guides to insure the frame always remaining horizontal, and one or more collectors suspended from said collector-frame.

13. An electrically-propelled vehicle, stationary bared working conductors arranged along the path of the vehicle, two independent pivoted collectors working in contact with said conductors and carried by said vehicle, an operating-lever for moving said collectors into or out of contact with said conductors, and elastic connections between the lever and said collectors.

14. In an electric railway, a stationary bared working conductor, an electrically-propelled vehicle, two collectors pointing in opposite directions, and connecting devices to throw either collector into contact with the working conductor but not both at the same time.

15. In an electric railway, the combination of a slotted conduit containing a bared conductor extending along the railway, an electrically-propelled vehicle having a motor adapted to rotate its axle, a collector-frame suspended from the axles independently of the vehicle-body with provision for lateral motion, a current-collecting device pivoted to said laterally-movable frame with provision for motion about a vertical axis and having a contact pressing against the bared conductor in the conduit, a circuit leading from the collector for supplying current to the motor, and a regulator for controlling the current passing to the motor.

16. In an electric railway, the combination of a slotted conduit containing a bared conductor extending along the railway, an electrically-propelled vehicle having a body supported upon the axles by springs, a motor adapted to rotate its axles, a collector-frame suspended from the axles of the vehicle with provision for lateral motion independent of the car-body, a current-collecting device piv-



oted to said laterally-movable frame with provision for motion about a vertical axis and having a contact pressing against the bared conductor in the conduit, a circuit leading  
5 from the collector for supplying current to the motor, a regulator for controlling the current passing to the motor, and a suitable transverse guide to prevent longitudinal movement of the collector-frame and yet permit lateral motion therein.  
10

17. In an electric railway, a slotted conduit containing working conductors, a traveling electric motor or vehicle, a laterally-movable frame suspended from said vehicle over the  
15 slot, and a cleaning-brush pivoted thereto on a vertical axis.

18. In an electric railway, a slotted conduit containing working conductors, a traveling electric motor or vehicle, a laterally-movable  
20 frame suspended from said vehicle over the slot, a cleaning-brush frame pivoted thereto, and a cleaning-brush pivoted to said cleaning-brush frame on a vertical axis.

19. In an electric railway, stationary bared  
25 working conductors, in combination with an electrically-propelled vehicle, a motor on said vehicle, two independently laterally movable collecting devices carried by the vehicle and working in contact with said bared conductor,  
30 a connection between said collecting devices to prevent their independent longitudinal movement, and a cleaning-brush carried by said connection.

20. In an electric railway, stationary bared  
35 working conductors, in combination with an electrically-propelled vehicle, a motor on said vehicle, two independently laterally movable collecting devices carried by the vehicle and working in contact with said bared conductor,  
40 a connection between said collecting devices to prevent their independent longitudinal movement, a cleaning-brush carried by said connection and between the collectors.

21. In an electric railway, the combination of a slotted conduit arranged parallel to the railway, a bared conductor within and insulated from the conduit, an electrically-propelled car, a current collecting or contact  
45 device extending down through the slot of the conduit and making contact with the bared conductor and movable about a vertical axis, a support or frame loosely carried by the car-axles independently of the car-body,  
50 and capable of lateral movement and a vertical pivot connection between the contact or collecting device and the support or frame at a point above the slot of the conduit.  
55

22. In an electrical railway, the combination of two working conductors arranged parallel to the track, slotted conduit inclosing the said conductors, an electrically-propelled car having a body supported on springs, two  
60 current-collectors one for each conductor arranged one in advance of the other and independently movable about a vertical axis, a common carrier above the conduit-slot supported by the axles of the car independently  
65

of the car-body with provision for lateral movement to allow for irregularities in the slot of the conduit and independent connections between said carrier and collectors exterior of the conduit whereby each has an independent lateral motion. 70

23. In an electric railway, a bared fixed conductor arranged parallel with the track, and a slotted conduit in which said conductor is located, in combination with a trailing contact device extending through the slot of the conduit and guided thereby and adapted to move in contact with said conductor and laterally adjustable, a frame located wholly above the conduit and carried by the axles independently of the car-body to which said contact device is suspended, a hinge connection above the conduit between the frame and contact device and springs independent of the frame to press said contact device laterally into contact with said conductor. 75 80 85

24. In an electrically-propelled vehicle the combination of a supporting-frame carried upon the axles of the car independently of the car-body, a longitudinal frame sustained by said support with provision for independent lateral motion at each end relatively to the latter, and laterally-movable contact-brushes carried by said longitudinal frame. 90 95

25. The combination of a railway and slotted conduit extending along the railway inclosing two conductors for supplying electricity, an electrically-propelled vehicle, two brush-holders or collecting devices extending through the slot into the conduit and arranged in line and supported from the axles independently of the car-body for making connections with the electrical conductors within said conduit, and an intermediate support located wholly above the conduit having provision for lateral motion and to which the brush-holders or collectors are connected at a point above the conduit, so as to move about vertical axes. 100 105 110

26. The combination of a railway, a slotted conduit therefor, an electric locomotive, two current-collecting devices extending downward below each of the axles of the locomotive, and a common longitudinal bar or frame flexibly supported from the axles independently of the car-body and located above the conduit and to which the two current-collecting devices are movably connected above the slot of the conduit. 115 120

27. The combination of a stationary source of electric supply, the bared working conductors receiving electricity therefrom, a traveling electric motor, two collecting devices suspended from said motor and making contact with said conductors, and a cleaning-brush carried by the motor adapted to sweep said conductors and located between said collectors. 125

28. The combination of a traveling vehicle having a body supported on springs, a slotted conduit over which the vehicle travels, a power-supplying device suspended from the vehicle and passing through the slot into the 130



conduit, parallel links connecting said power-supplying device with the vehicle-axles independently of the vehicle-body or its supporting-springs whereby it shall always maintain  
5 the same vertical position through the slot and also admit of lateral movement to compensate for irregularities in the slot.

In testimony of which invention I hereunto set my hand.

RUDOLPH M. HUNTER.

Witnesses:

RICHD. S. CHILD, Jr.,  
E. M. BRECKINREED.