(No Model.) 3 Sheets—Sheet 1.

# R. M. HUNTER.

## ELECTRIC RAILWAY.

No. 457,736. Patented Aug. 11, 1891.

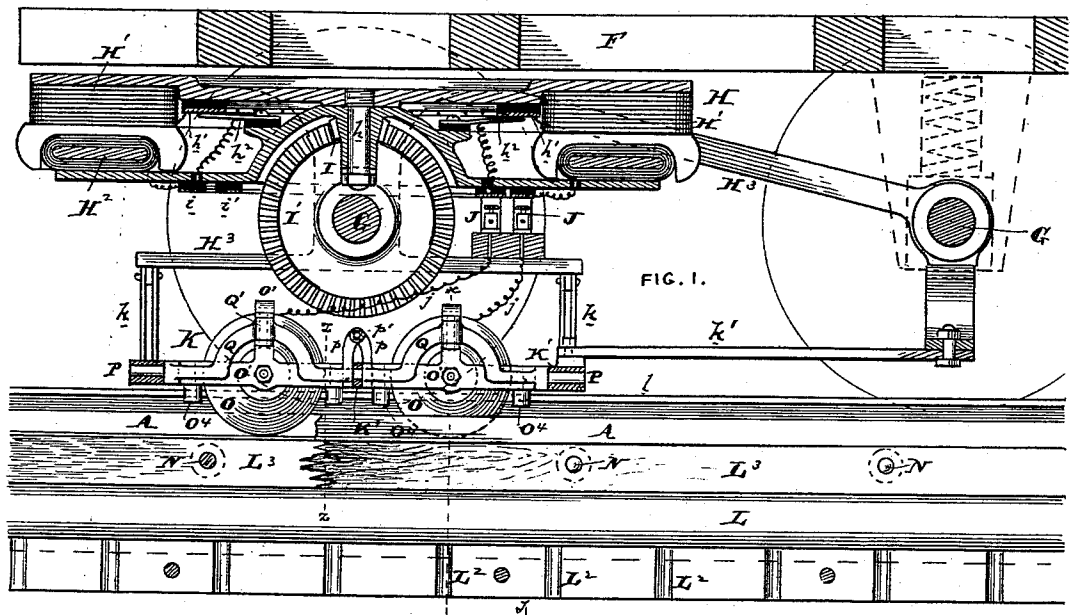


FIG. 1.

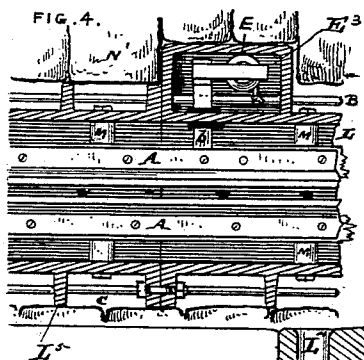
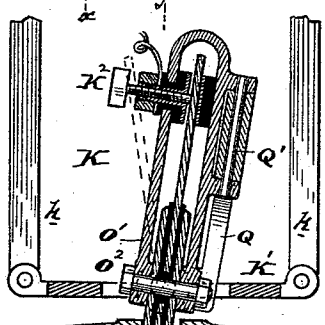


FIG. 4.



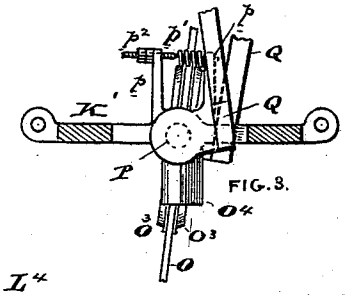


FIG. 3.

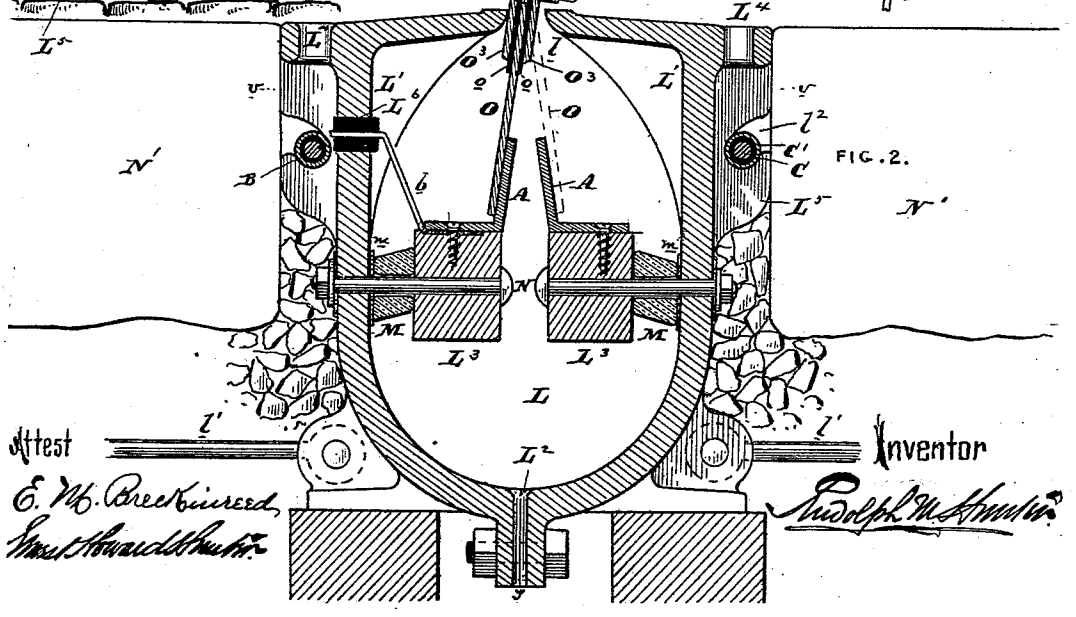


FIG. 2.

Attest

E. M. Breckinridge,

Inventor

Rudolph M. Hunter.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.)

3 Sheets—Sheet 2.

# R. M. HUNTER.

## ELECTRIC RAILWAY.

No. 457,736. Patented Aug. 11, 1891.

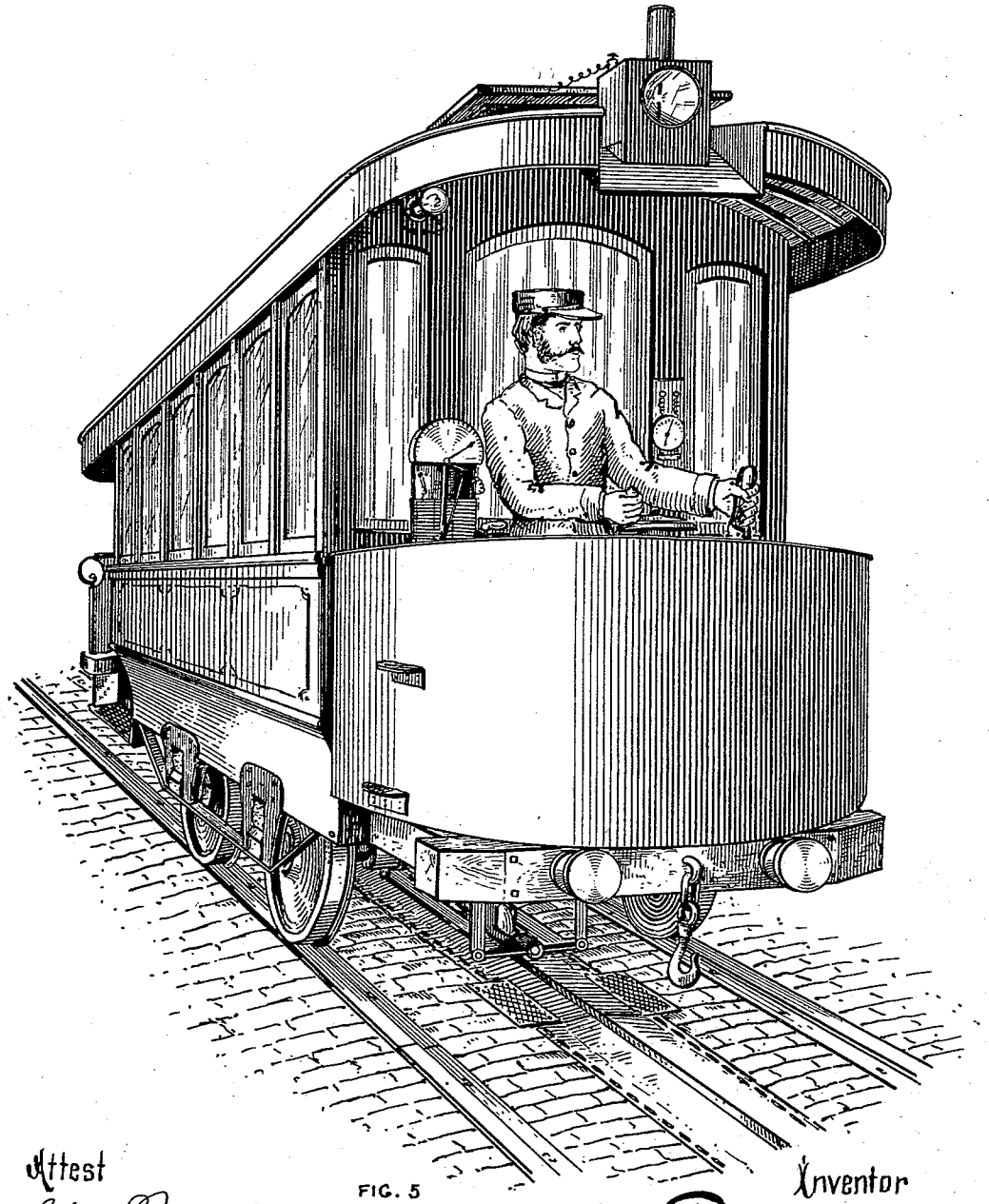


FIG. 5

Attest

E. M. Breckinridge

Inventor

Rudolph L. M. Hunter

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.)

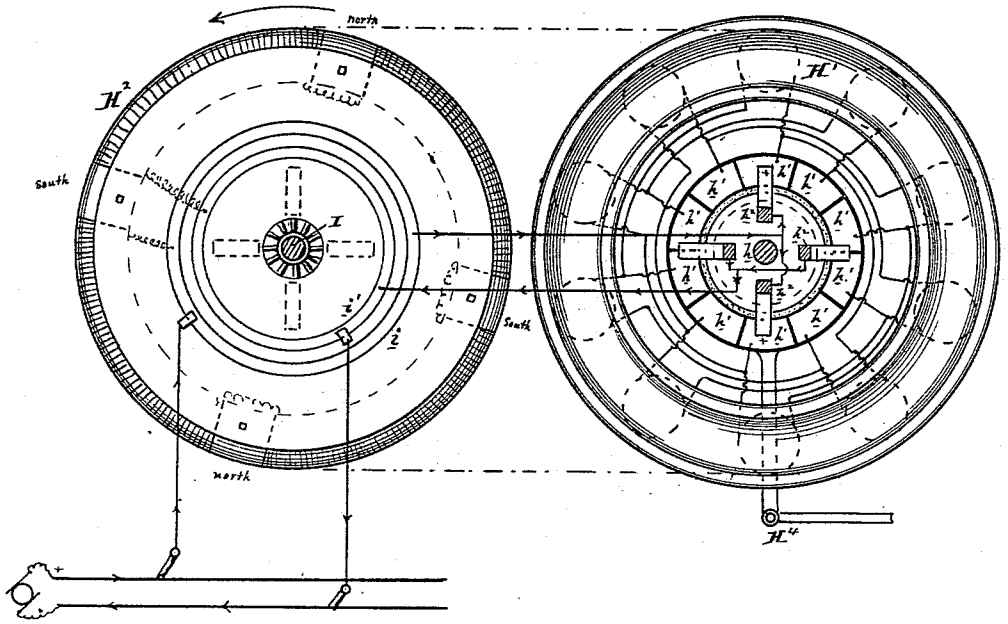
3 Sheets—Sheet 3.

# R. M. HUNTER.

## ELECTRIC RAILWAY.

No. 457,736. Patented Aug. 11, 1891.

FIG. 6.



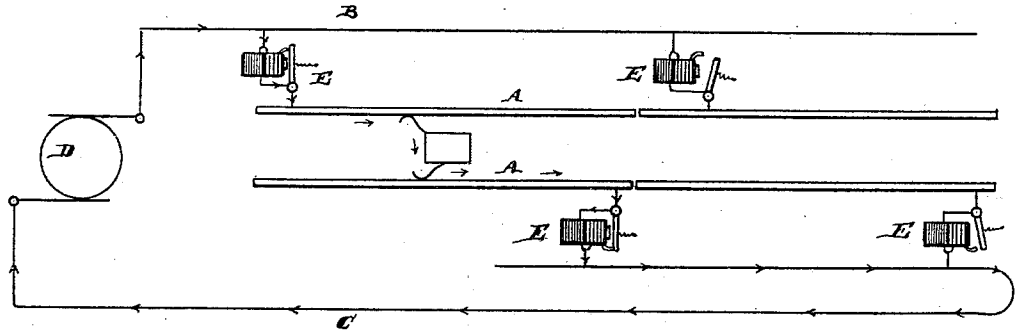




FIG. 7.

Attest

E. W. Breckinridge,

H. A. Cerr.

Inventor

R. M. Hunter.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

# 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. 457,736, dated August 11, 1891.

Application filed June 21, 1886. Serial No. 205,770. (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 electric railways; and it consists in certain improvements, all of which are fully set forth in the following specification, and shown in the accompanying drawings, which form part thereof.

My invention has particular reference to the arrangement of the conductors with reference to the track and electrically-propelled vehicle, and also the construction and operation of the current-collecting devices for supplying current from the conductor to the motor. The conductors are preferably arranged within a conduit, through the slot of which the collector projects. The motor may be supported upon a frame carried by the axle-box of the car, or, if desired, may be supported by the car-body or truck-frame. The conduit shown is provided with longitudinal stringers of insulating material, upon which oblique conductors are supported, and collectors project obliquely through the slot of the conduit to form contact with said conductors, substantially as set out in my application filed April 28, 1886, Serial No. 200,400, but with many specific differences of construction. These collectors are preferably made circular and are capable of adjustment, so as to bring new portions into working contact as old portions become worn, and said collectors are supported upon longitudinal and vertical axes, whereby they follow variations or curvatures in the slot. These collectors are independently supported upon a collector-frame suspended from the motor and preferably from the axles, and capable of lateral movement, substantially as set forth in my application filed July 14, 1885, Serial No. 171,625, to follow variations in the slot of the conduit, but sustained against longitudinal movement by a drag bar or link, substantially as set out in my application filed April 28, 1886, Serial No. 200,400. The conduit is preferably formed of metal and has its upper part flanged on the outside to form drainage holes, whereby any water may run down upon the outside of the conduit to the sewer or ground without reaching the slot of the conduit. The sides of the conduit are provided with a series of preferably vertical ribs, against which the Belgian blocks or stones of the roadway rest to retain them in position and form vertical drainage-passages for the water between the said stones and the conduit. If desired, the supply-conductors may be supported in notches formed in these vertical ribs, and said supply-conductors are connected with the switch device located in tight compartments upon the sides of the conduit, and which switches are connected to the working conductors within the conduit by conductors passing through a perforation in the conduit-walls, which are tightly sealed with insulating material.

The foregoing gives a general outline of the invention set out in this application, and which is clearly shown in the drawings, and specifically described hereinafter in referring thereto.

In the drawings, Figure 1 is a sectional elevation on line *y y* through a conduit and a motor on same. Fig. 2 is a cross-section through the conductor and collectors on line *x x*. Fig. 3 is a cross-section through a portion of the collector apparatus on line *z z*. Fig. 4 is a sectional plan view through the conduit on line *v v*, and Fig. 5 is a perspective view illustrating my electric railway. Fig. 6 is a plan diagrammatic view showing the details of construction of the motor, the revolving field-magnets being separated from the stationary armature for clearness; and Fig. 7 is a diagram showing one form of circuit adapted for use with the conduit shown.

A represents the working conductors, which are formed in sections in part or in whole, and may be either the rails or separate working conductors above the surface of the ground or arranged in a conduit. These sections are connected to supply-conductors B and C by branch connections *b*, in which the switches or circuit-breakers E are located.

D is the generator and supplies electricity to the conductors B and C.

F is the car or truck of the vehicle to be propelled, and may be supported upon its axles G in any manner desired.

H is the electric motor, and is preferably supported on the motor-frame $H^3$, sustained by the axles and advisably independent of the car. The motor is made with a vertical shaft $h$, which is secured to revolving field-magnets $H^2$ of large diameter, said field-magnets revolving before the fixed horizontal armature ring H'.

$h'$ are the commutator-sections for the armature, and $h^2$ are the two brushes carried by the field-magnets in their rotation. The field-magnets receive current by two annular rings $i\,i$ and contact-brushes J J, the latter receiving current from the working-conductors. This form of motor is clearly set out in my application filed June 9, 1886, and serially numbered 204,583. In place of the field-magnets revolving the armature may be made to revolve, the essential point in the motor being its horizontal arrangement, whereby it may be placed close to the body of the car, if desired, above the wheels, and by which a large diameter and consequent leverage is obtained.

Referring to Fig. 6, it will be observed that the motor is made with the four-pole revolving field-magnets $H^2$, the pole-pieces being marked thereon, the magnets being essentially similar to a Gramme ring. The circuit through all of the coils of the field is continuous, and the terminals are connected with the rings $i\,i'$, which receive current from the stationary brushes J J, connected with the line or source of electrical energy. The armature H' is made stationary and is divided into a number of coils, which is not a multiple of the poles in the field-magnets to induce a successive action of attraction and overcome dead-points. The connections of armature-coils with the commutator-sections and with each other is shown, the sections $h'$ being equal in number to the coils of the armature. The brushes $h^2$ are four in number, and the two diametrically opposite are electrically connected together and to the respective rings $i\,i'$, so that the two opposite brushes supply current of one polarity. The commutator-ring may be shifted to obtain the necessary lead for reversing by the lever $H^4$. Of course it is evident that if the field-magnets $H^2$ had only two poles the armature connection could be somewhat simplified and only two brushes $h^2$ would be required.

The motor is provided with a bevel-pinion I, which meshes with a large bevel-wheel I' on the shaft G of the vehicle or car; but I do not limit myself to any particular mechanical connection between the motor and car-axle.

The motor-frame $H^3$ supports the collector-frame K' of the collector K by links $k$, which admit of lateral movement of the collector to follow variations in the slot or conductors, and said collector-frame is prevented from independent longitudinal movement by drag-bar $k'$.

O are the collectors proper, and are preferably made like disks, and are clamped at their centers by bolts $O^2$ to the frame O', having a vertical hinge Q' in line with the center of the collectors. These collectors O are insulated by layers $o$ of any good insulating material, and said insulation is prevented from abrasion with the sides of the conduit-slot by intervening replaceable protecting metal shields or plates $O^3$, which are supported by bolt $O^2$, and may be adjusted in new positions to compensate for wear. These plates $O^3$ act as shields to the collectors, and may be replaced when worn. The collectors O may be held in any position upon their axes by clamp $K^2$ near their tops and peripheries, the said clamp being carried by the frame O' and being also used to convey the current to the brushes J and motor. This frame O' has surrounding horizontal arms which protect the collector and from which it is insulated, and said arms are provided with guides $O^4$, which extend down into the slot and insure the collectors following the curvatures of the slot—as, for instance, in turning curves. These frames O' are therefore free to swing on a vertical axis and are guided by the conduit-slot, and are carried by the frames Q, hinged at P, in horizontal or longitudinal axes or on a line passing through the center of the collectors. The hinges P are at the ends of the collector-frame K' and at the center thereof. These frames Q are provided with lugs $p$, which are connected by a spring $p'$ and an adjusting-screw $p^2$. By this means they tend to assume a vertical position and are caused to press upon the outer faces of the conductors A in the conduit, substantially as shown in Figs. 1 and 2. The tension of the spring $p'$ may be adjusted to increase or reduce this pressure and cause the collectors to make close and positive contact with the conductors, and the curved edges of the collectors act as knives to shear off any coating of ice or dirt from said conductors which might be formed thereon or adhere thereto.

The collector-disks O might be allowed to rotate freely, if desired; but I prefer to make them rigid.

L is the conduit, and may be formed of wood or metal, and is preferably made in two parts L' L', united at the bottom and having a series of drainage-holes $L^2$, such as set forth in my application filed June 9, 1886. The upper parts of the walls L' form the slot $l$ of the conduit, and the edges of the slot are higher than the main walls of the conduit. These side walls of the conduit at their tops are provided with flanges having perforations, as at $L^4$, upon the outside of the conduit, substantially in principle similar to what is set out in my application last above referred to. This allows the water from the roadway to pass down outside of the conduit. This is facilitated by the vertical ribs $L^5$ upon the outer faces of the conduit, which form supports for the roadway stones or Belgian blocks N' and produce vertical passage-ways leading down to broken stones $l'$. If desired, the supply-conductors may be incased in lead

tubes C′ and be supported in notches $l^2$ in said vertical ribs $L^5$. The working conductors A are made like angle-iron, having their horizontal faces secured to longitudinal wooden stringers $L^3$, which may be impregnated with a substance impervious to moisture, as paraffine, and these stringers are clamped against glass or porcelain or equivalent support M by bolts N, which preferably pass through the stringer, support, and wall of the conduit, and leaden washers *m* may be used between the glass supports M and the iron conduit to prevent breakage and also seal the bolt-hole. By this means a clear space is formed all around the conductor and its supporting-stringer, and any water entering the slot can run down the walls of the conduit without reaching the conductors or their supports. To prevent the water passing over the supports M to the stringers $L^3$, I make the supports like cylinders having oblique bases to cause the water to run toward the conduit-wall and away from the stringer.

The conductors A have upwardly and obliquely projecting faces, upon which the collectors O press, and the obliquity of said conductors is in opposite directions or so that if extended their faces would meet in a longitudinal line at or slightly above the slot or on a line with the hinge P of the collector. The particular way, however, of making the conductors A or their support is immaterial to my invention.

At intervals along the conduit used at the connections of the sections with the supply-conductors I provide compartments $E^3$, Fig. 4, having no communication with the interior of the conduit, and in this compartment I place the branch circuit switch or breaker E and connect the branch circuit *b* with the conductor A by passing it through a hole $L^6$ in the wall of the conduit and surrounding it with insulating material, which also seals the opening, so that the switch-compartment may be sealed against the deleterious influences of the atmosphere.

It will be understood that the conduit here shown may be used for any other system of conductors, being equally applicable to all, as is also the collectors or motors. The details may be greatly modified to suit the views of the constructors of the railways. Therefore I do not limit myself to the specific construction shown.

Any matters herein set out but not claimed are not dedicated to the public, but form subject-matter of the applications referred to.

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

1. A conduit for an electric railway, provided on its upper portions with lateral flanges formed integral with the sides walls, said flanges being provided with drainage-apertures, in combination with working conductors located within and insulated from said conduit.

2. A conduit for an electric railway, provided on the outside of its side walls with ribs, on its upper portions with lateral flanges formed integral with the side walls, said flanges being provided with drainage-apertures, in combination with working conductors located within and insulated from said conduit.

3. A conduit for an electric railway, provided on the outside of its side walls with ribs notched to support the supply-conductors and on its upper portions with lateral flanges formed integral with the side walls, said flanges being provided with drainage-apertures, in combination with working conductors located within and insulated from said conduit.

4. In an electric railway, a slotted metallic conduit, in combination with longitudinal insulated stringers secured upon the interior of said conduit with a space all around them, and working conductors supported upon said stringers.

5. In an electric railway, a slotted conduit of metal, a longitudinal stringer of wood extending along the conduit and supported therein without contact with the walls of the conduit, a longitudinal metallic conductor supported throughout its length upon said stringer of wood, glass or vitreous blocks interposed at intervals between the wooden stringer and metallic walls of the conduit, and clamping-bolts passing through the stringer and conduit-walls and sustaining the said stringer and glass or vitreous blocks in position within the conduit.

6. In an electric railway, a slotted conduit, in combination with longitudinal stringers of insulating material, and working conductors supported thereon, bolts for securing the stringers to the conduit, glass or other vitreous blocks interposed between the said stringers and conduit having their faces inclined toward the conduit and away from the stringer, so as to cause water entering the conduit to keep away from the stringers.

7. A slotted conduit for an electric railway, consisting of two sections of metal bolted together at the bottom and leaving a slot or aperture along the top, in combination with two conductors arranged within the conduit and insulated from each other, an electrically-propelled vehicle, and two contact devices extending from the vehicle through the slot and respectively pressing upon the outer faces of the two conductors.

8. In an electric railway, the combination of a slotted conduit, conductor-supports secured to the sides thereof, and two working conductors secured to the supports and arranged so as to have a space between and all around them.

9. In an electric railway, the combination of a slotted conduit and two working conductors therein insulated from each other and from the conduit and exposing oblique contact-faces.

10. In an electric railway, the combination of a slotted conduit and two working conductors therein insulated from each other and from the conduit and exposing oblique contact-faces, the obliquity of the two working conductors being in opposite directions from a vertical line.

11. In an electric railway, the combination of a slotted conduit and two working conductors therein insulated from each other and from the conduit and exposing oblique contact-faces, the obliquity of the two conductors being such that planes passed through their faces would cross each other.

12. In an electric railway, the combination of a slotted conduit and two working conductors therein insulated from each other and from the conduit and exposing oblique contact-faces, the obliquity of the two conductors being such that planes passed through their faces would cross each other in a line immediately above the slot and parallel with the conduit.

13. In an electric railway, the combination of a slotted conduit, two working conductors therein insulated from each other and from the conduit and exposing oblique contact-faces, the obliquity of the two conductors being such that planes passed through their faces would cross each other in a line immediately above the slot and parallel with the conduit, a traveling electric motor, and collectors carried by said motor and projecting obliquely through the slot and working in contact with the working conductors.

14. In an electric railway, the combination of a slotted conduit, two working conductors therein insulated from each other and from the conduit and exposing oblique contact-faces, a traveling electric motor, and collectors carried by said motor and projecting obliquely through the slot and working in contact with the working conductors.

15. In an electric railway, the combination of a slotted conduit, two working conductors therein insulated from each other and from the conduit and exposing oblique contact-faces, a traveling electric motor, collectors carried by said motor projecting obliquely through the slot and working in contact with the working conductors, and a longitudinal axis for said collectors above the slot.

16. In an electric railway, the combination of a slotted conduit, two working conductors therein insulated from each other and from the conduit and exposing oblique contact-faces, a traveling electric motor, collectors carried by the said motor projecting obliquely through the slot and in working contact with the working conductors, a longitudinal axis for said collectors above the slot, and springs to cause said collectors to press upon their respective conductors.

17. In an electric railway, a slotted conduit, two working conductors having obliquely-arranged contact-faces contained therein and arranged one upon each side of a vertical line through the slot, a traveling electric motor or car, a collector-frame carried by the motor or car, depending collectors adapted to travel in contact with the conductors, and hinged connections between said collectors and their frame above the slot, whereby the collectors may swing upon a horizontal axis.

18. In an electric railway, a slotted conduit, two working conductors contained therein and arranged one upon each side of a vertical line through the slot, a traveling electric motor or car, a collector-frame carried by the motor or car, depending collectors adapted to traveling in contact with the conductors, and hinged connections between said collectors and their frame above the slot, whereby the collectors may swing upon a horizontal axis and also upon a vertical axis.

19. In an electric railway, a slotted conduit, two working conductors contained therein and arranged one upon each side of a vertical line through the slot, a traveling electric motor or car, a collector-frame carried by the motor or car, depending collectors adapted to travel in contact with the conductors, and hinged connections between said collectors and their frame above the slot, whereby the collectors may swing upon a horizontal axis and also upon a vertical axis, and guides running in the slot of the conduit to control the movement of the collectors on their vertical axis.

20. In an electric railway, a slotted conduit, two working conductors contained therein and arranged one upon each side of a vertical line through the slot, a traveling electric motor or car, a collector-frame carried by the motor or car, depending collectors adapted to travel in contact with the conductors, and hinged connections between said collectors and their frame above the slot, whereby the collectors may swing upon a horizontal axis, and springs to cause said collectors to move on their horizontal axis and press in contact with the conductors.

21. In an electric railway, a slotted conduit, two working conductors contained therein and arranged one upon each side of a vertical line through the slot, a traveling electric motor or car, a collector-frame carried by the motor or car, depending collectors adapted to travel in contact with the conductors, and hinged connections between said collectors and their frame above the slot, whereby the collectors may swing upon a horizontal axis, guides running in the slot of the conduit to control the movement of the collectors on their vertical axis, and springs to cause said collectors to move on their horizontal axis and press in contact with the conductors.

22. In an electric railway, a stationary bared working conductor, in combination with a traveling electric motor receiving electricity therefrom, a collector-frame carried by the motor, and a collector to work in contact with

the conductor supported upon a transverse axis, and a clamp to secure it in any position upon its transverse axis desired.

23. In an electric railway, a stationary bared working conductor, in combination with a traveling electric motor receiving electricity therefrom, a collector-frame carried by the motor, and a collector to work in contact with the conductor supported upon a transverse axis, a clamp to secure it in any position upon its transverse axis desired, and a longitudinal hinge connection between the collector and its frame.

24. In an electric railway, a stationary bared working conductor, in combination with a traveling electric motor receiving electricity therefrom, a collector-frame carried by the motor, a collector to work in contact with the conductor supported upon a transverse axis, a clamp to secure it in any position upon its transverse axis desired, and a vertical hinge connection between the collector and its frame.

25. In an electric railway, a stationary bared working conductor, in combination with a traveling electric motor receiving electricity therefrom, a collector-frame carried by the motor, a collector to work in contact with the conductor supported upon a transverse axis, a clamp to secure it in any position upon its transverse axis desired, and vertical and longitudinal hinge connections between the collector and its frame.

26. In an electric railway, a stationary bared working conductor, in combination with a traveling electric motor receiving electricity therefrom, a collector-frame carried by the motor, a collector to work in contact with the conductor formed of a disk of metal supported upon a transverse axis, and a clamp or lock to secure said disk to various positions upon its transverse axis, whereby as one portion of the collector becomes worn another part may be adjusted into operative position.

27. In an electric railway, a slotted conduit, a working conductor within the conduit, a traveling electric motor, a collector-frame carried by the motor, a collector having two or more contact parts and adjustable about a transverse axis to bring different parts into working contact with the conductor, a clamp or lock to secure the collector in the desired position, and insulation upon each side of the collector where it passes through the slot.

28. In an electric railway, a slotted conduit, a working conductor within the conduit, a traveling electric motor, a collector-frame carried by the motor, a collector having two or more contact parts and adjustable about a transverse axis to bring different parts into working contact with the conductor, a clamp or lock to secure the collector in the desired position, and insulation upon each side of the collector where it passes through the slot, and a protecting metal shield between the insulation and slot-walls.

29. In an electric railway, a slotted conduit, a working conductor within the conduit, a traveling electric motor, a collector-frame carried by the motor, a collector having two or more contact parts and adjustable about a transverse axis to bring different parts into working contact with the conductor, a clamp or lock to secure the collector in the desired position, insulation upon each side of the collector where it passes through the slot, and a replaceable protecting metal shield between the insulation and slot-walls.

30. In an electric railway, a slotted conduit, a working conductor within the conduit, a traveling electric motor, a collector-frame carried by the motor, a collector having two or more contact parts and adjustable about a transverse axis to bring different parts into working contact with the conductor, a clamp or lock to secure the collector in the desired position, insulation upon each side of the collector where it passes through the slot, and a protecting metal shield between the insulation and slot-walls and adjustable with the collector.

31. In an electric railway, a slotted conduit, a working conductor within the conduit, a traveling electric motor, a collector-frame carried by the motor, a collector having two or more contact parts adjustable about a transverse axis to bring different parts into working contact with the conductor, a clamp or lock to secure the collector in the desired position, insulation upon each side of the collector where it passes through the slot, a protecting metal shield between the insulation and slot-walls adjustable with the collector, and a clamp to hold the shields in their new positions.

32. The combination of the motor and its collector-frame with the frame Q, hinged to the collector-frame by a longitudinal axis, frame O′, hinged to the frame Q upon a vertical axis, and the collector carried by the frame O′.

33. The combination of the motor and its collector-frame with the frame Q, hinged to the collector-frame by a longitudinal axis, frame O′, hinged to the frame Q upon a vertical axis, the collector O, carried by the frame O′ and adjustable upon a transverse axis, and a clamp to secure the collector rigid with respect to the frame O′.

34. The combination of the motor and its collector-frame with the links *k*, connecting the frame to the motor, the frame Q, hinged to the collector-frame by a longitudinal axis, frame O′, hinged to the frame Q upon a vertical axis, and the collector carried by the frame O′.

35. The combination of the motor and its collector-frame with the links *k*, connecting the frame to the motor, the drag-bar *k*′, the frame Q, hinged to the collector-frame by a longitudinal axis, frame O′, hinged to the frame Q upon a vertical axis, and the collector carried by the frame O′.

36. The combination of the motor and its collector-frame with the frame Q, hinged to

the collector-frame by a longitudinal axis, frame O′, hinged to the frame Q upon a vertical axis having guides O⁴, and the collector carried by the frame O′.

37. The combination of the slotted conduit having two working conductors A, made with bared contact-faces, the traveling motor, a collector-frame carried by the motor, the frames Q, hinged to the collector-frame on horizontal and longitudinal axes, frames O′, hinged to the frames Q on vertical axes, collectors carried by said frames O′, and springs acting upon the frames Q to cause the collectors to press against the conductors.

38. In an electric railway, the combination of a car-body supported on the axles by springs, an electric motor to propel the car, a frame carried by the axle independent of the car-body, a line conductor extending along the railway, a current-collecting device carried by said frame and movable laterally with respect thereto, and a drag-bar connecting the collecting device with the other axle.

39. In an electric railway, a slotted conduit, a working conductor contained therein, a supply-conductor, a branch connecting the supply and working conductors, a switch in said branch conductor, connecting-circuits between the working and supply conductors including the switch, a chamber formed in the side of the conduit to contain said switch, and a cover to said chamber, opening onto the street.

40. In an electric railway, a slotted conduit, a working conductor contained therein, a supply-conductor, a branch connecting the supply and working conductors, a switch in said branch conductor, connecting-circuits between the working and supply conductors including the switch, a chamber formed in the side of the conduit to contain said switch, but having no communication with the interior of the conduit, and a cover to said chamber, opening onto the street.

41. In an electric railway, a slotted conduit, a working conductor contained therein, a supply-conductor, a branch connecting the supply and working conductors, a switch in said branch conductor, connecting-circuits between the working and supply conductors, including the switch, a chamber formed in the side of the conduit to contain said switch, but having no communication with the interior of the conduit, and a passage in the side of the conduit through which the branch conductor passes to the switch-chamber sealed with insulating material, which also insulates the branch conductor from the conduit, and a cover to said chamber, opening onto the street.

42. In an electric railway, a slotted conduit, a working conductor contained within said conduit, a supply-conductor exterior to the conduit, a branch conductor connecting the supply and working conductors, and an insulated passage through the walls of said conduit for said branch conductor.

43. In an electric railway, a slotted conduit, a working conductor contained within said conduit, a supply-conductor exterior to the conduit, a branch conductor connecting the supply and working conductors, and an insulated and sealed passage through the walls of said conduit for said branch conductor.

44. The combination of an electrically-propelled vehicle, an electrical conductor extending along the path of the vehicle, a frame loosely connected at its forward end to the vehicle and having its rear end free to move laterally, and a current-collecting device connected to the frame at its rear end and movable about a vertical axis.

45. The combination of an electrically-propelled vehicle, an electrical conductor extending along the path of the vehicle, a frame loosely connected at its forward end to the vehicle-axles independent of the vehicle-body and having its rear end free to move laterally, and a current-collecting device connected to the frame at its rear end and movable about a vertical axis and supported by the axles independent of the vehicle-body.

46. The combination of an electrically-propelled vehicle, electrical conductors extending along the path of the vehicle, a frame loosely connected at its forward end to the vehicle and having its rear end free to move laterally, and two independent current-collecting devices connected to the frame at its rear end and each movable about a vertical axis.

47. The combination of an electrically-propelled vehicle, a slotted conduit, an electrical conductor extending along the path of the vehicle and located within the conduit, a frame loosely connected at its forward end to the vehicle and having its rear end free to move laterally, and a current-collecting device connected to the frame at its rear end and movable about a vertical axis.

48. An electrically-propelled vehicle, in combination with a frame supported by the vehicle by a loose joint at its forward end and with provision for lateral movement at its rear end, a current-collecting device carried by said frame at its rear end and movable about a vertical axis, and a conductor extending along the path of the vehicle.

In testimony of which invention I hereunto set my hand.

RUDOLPH M. HUNTER.

Witnesses:

RICHD. S. CHILD, Jr.,

ERNEST HOWARD HUNTER.