(No Model.) 4 Sheets—Sheet 1.

# S. P. WILCOX & J. D. PARTELLO.

## ELECTRIC RAILWAY SYSTEM.

No. 455,956. Patented July 14, 1891.

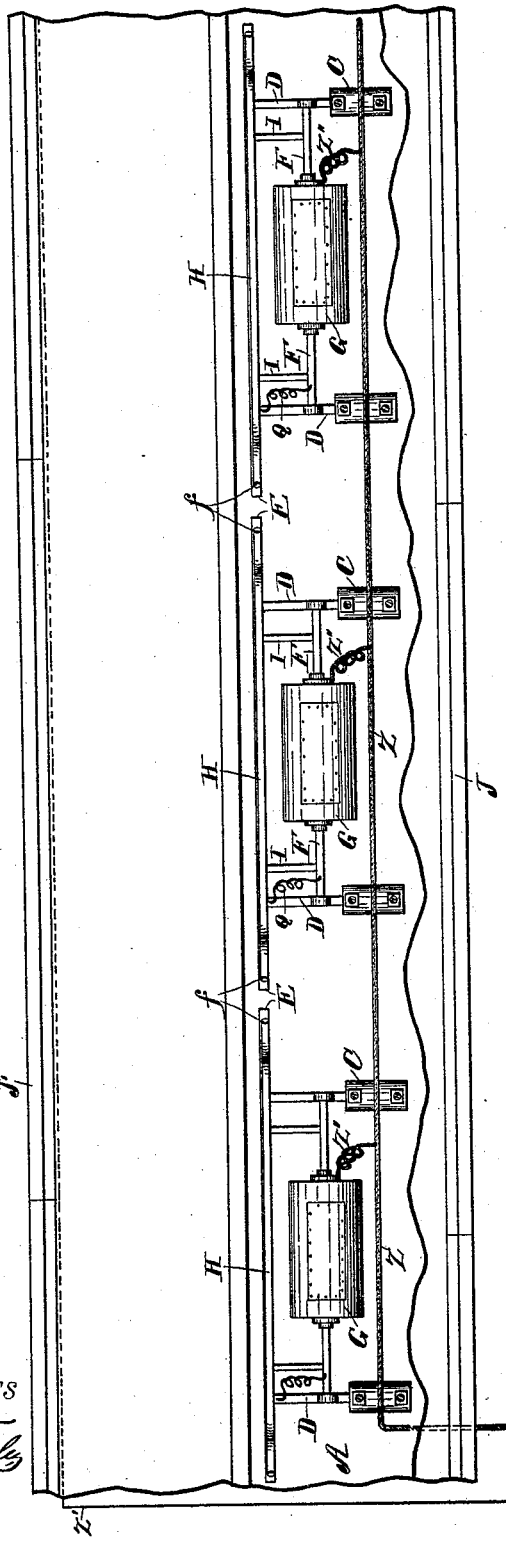

Fig. 1.

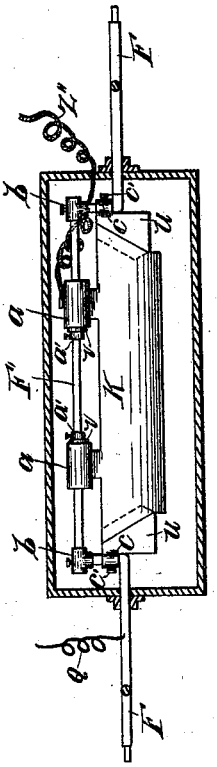

Fig. 2.

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(No Model.) 4 Sheets—Sheet 2.

# S. P. WILCOX & J. D. PARTELLO.

## ELECTRIC RAILWAY SYSTEM.

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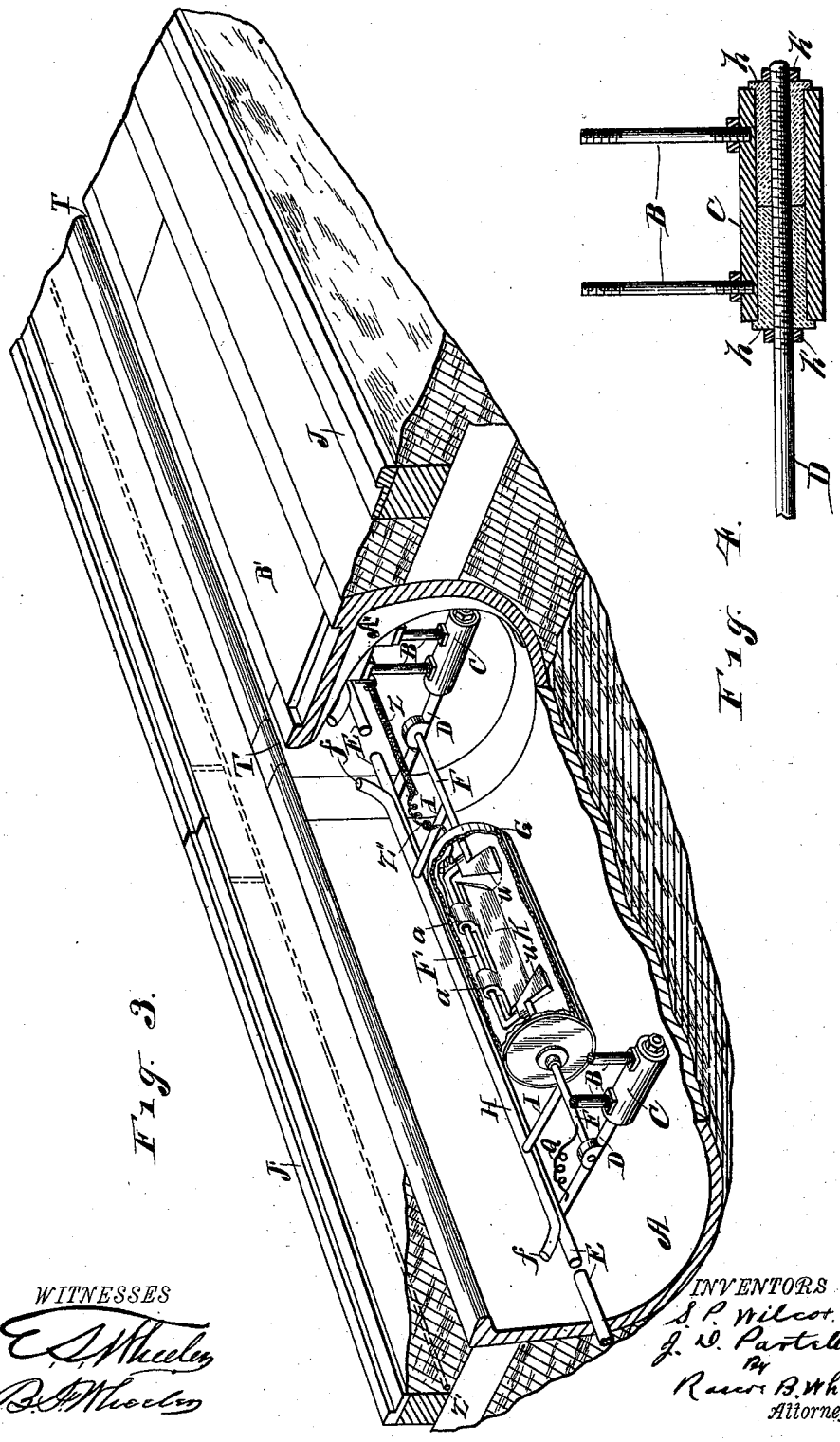

Fig. 3.



Fig. 4.

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(No Model.) 4 Sheets—Sheet 3.

# S. P. WILCOX & J. D. PARTELLO.

## ELECTRIC RAILWAY SYSTEM.

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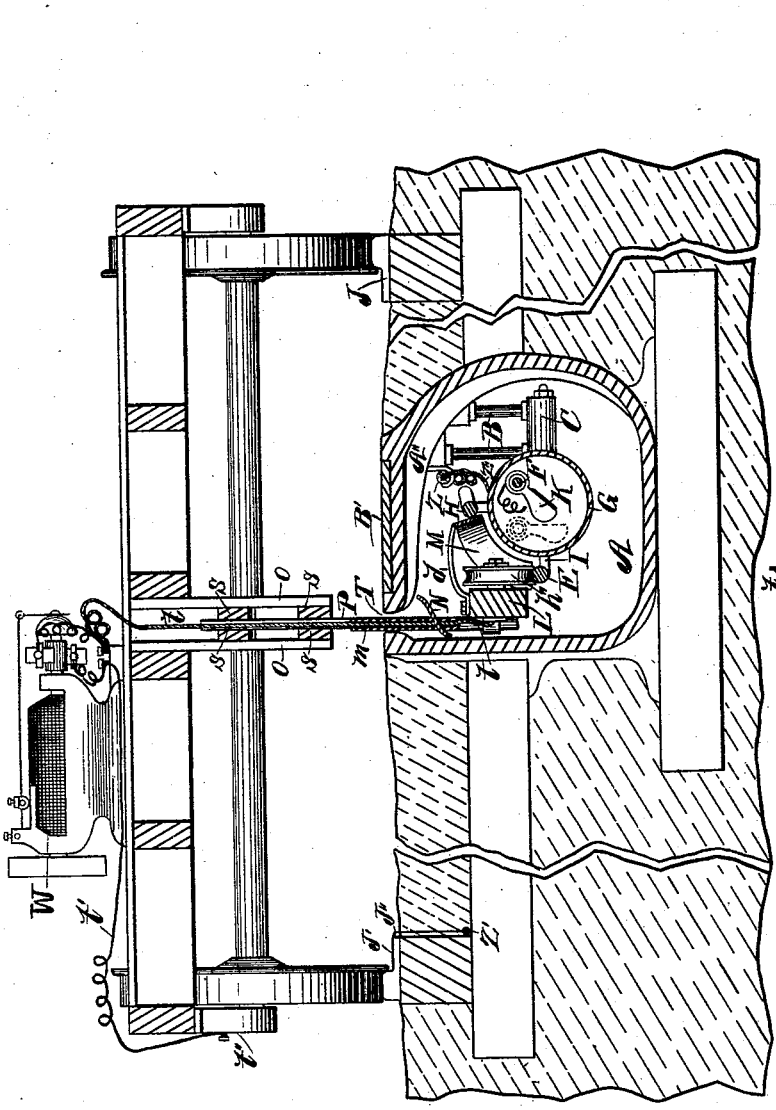

Fig. 5.

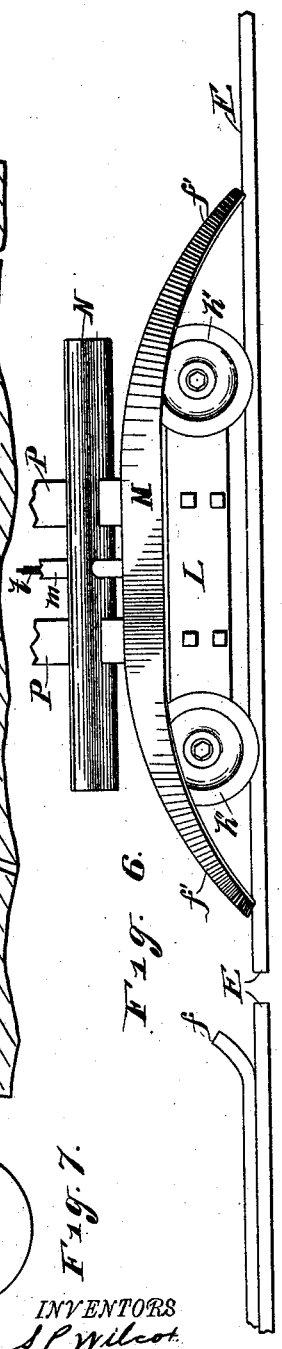

Fig. 6.

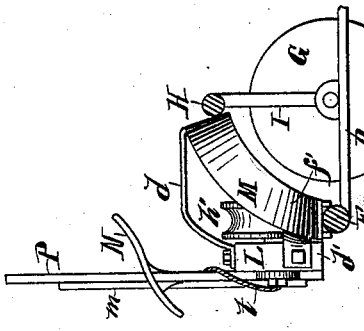

Fig. 7.

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## ELECTRIC RAILWAY SYSTEM.

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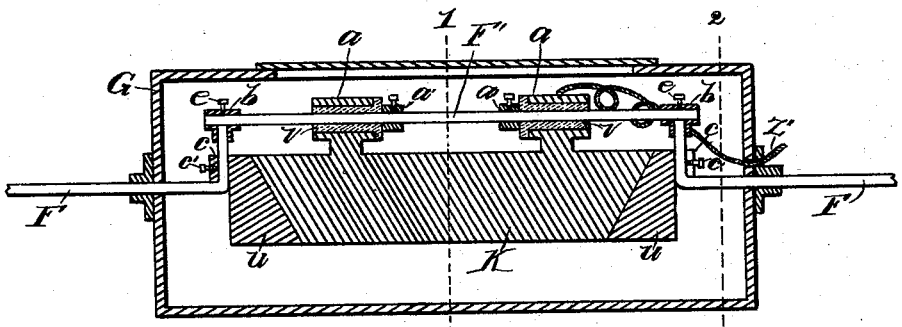

Fig. 8.

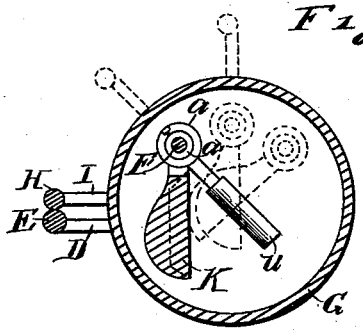

Fig. 9

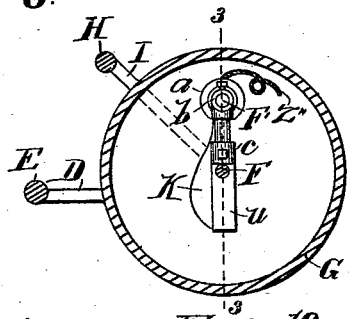

Fig. 10.

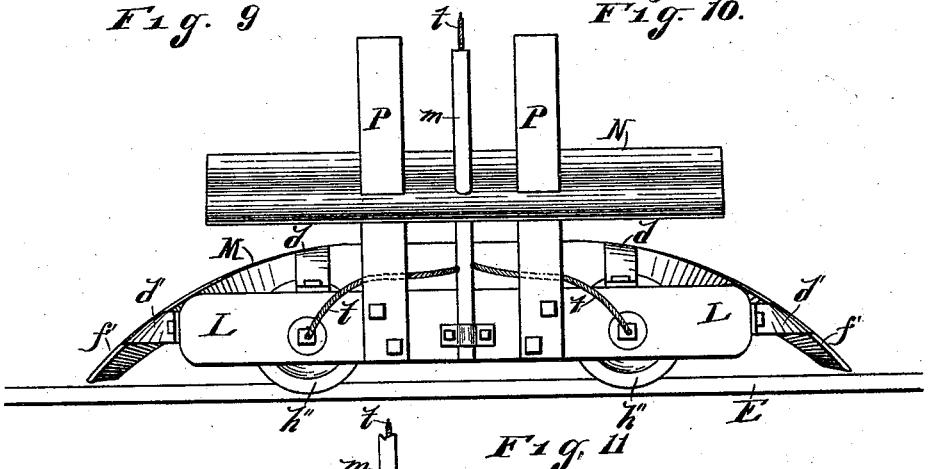

Fig. 11

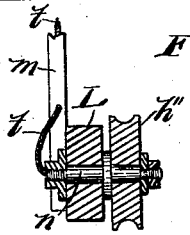

Fig. 12.

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# UNITED STATES PATENT OFFICE.

SAMUEL P. WILCOX, OF ELKHART, INDIANA, AND JOSEPH D. PARTELLO, OF ROCHESTER, MICHIGAN.

## ELECTRIC-RAILWAY SYSTEM.

SPECIFICATION forming part of Letters Patent No. 455,956, dated July 14, 1891.

Application filed June 16, 1890. Serial No. 355,545. (No model.)

*To all whom it may concern:*

Be it known that we, SAMUEL P. WILCOX, residing at Elkhart, in the county of Elkhart and State of Indiana, and JOSEPH D. PARTELLO, residing at Rochester, in the county of Oakland and State of Michigan, both citizens of the United States, have invented certain new and useful Improvements in Electrical-Railway Systems; and we do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to electric railways in which the conduit and electric cables are located under the ground, the electric force being conveyed to the motor on the car through a contact-trolley or trolley-plow traveling on a sectional track suspended within the conduit, the trolley-plow being secured to an arm depending from the car and projecting into the conduit through a slit in the covering-plate or top thereof. In conduits of this class it has been found difficult to prevent great loss of electric force through induction or grounding of the current and by the conduit becoming choked and flooded during a heavy rain or a wet season. To overcome these difficulties is the object of this invention, which we accomplish in a simple and effective manner by a perfectly-insulated system and by "cutting out" or rendering inactive the entire length of the sectional conducting rail or track within the conduit, except that section of said track immediately below the traveling car and through which it receives its propulsive force, each succeeding section of the conducting-rail being alternately energized and "cut out" by the trolley-plow or current-collector, which operates the contact mechanism to that effect as the car is traveling along the track, all of which will be hereinafter more fully set forth, and the essential features pointed out particularly in the claims.

In the accompanying drawings, forming a part of the specification, Figure 1 is a plan view of a section of track equipped with our improved system, the upper portion of the conduit being broken away, showing the main or feed cable passing therethrough and the series of contact-cylinders suspended therein, also the sectional conducting-rail and the series of swinging bails by means of which the contact-cylinders are rotated. Fig. 2 is a vertical longitudinal section through the contact-cylinder, the mechanism therein being in elevation. Fig. 3 is a perspective view of a section of track or roadway, the side of the conduit and that of the contact-cylinder located therein being broken away, showing the arrangement of parts. Fig. 4 is an enlarged view, partly in section, of the hangers that support the mechanism within the conduit. Fig. 5 is a vertical cross-section through a car and the track and conduit and showing the trolley-plow or current-collector in position, as when actuating the mechanism within the conduit to make the contact that diverts the electric current through the motor on the car, whereby the car is propelled. Fig. 6 is a side elevation of the trolley-plow and a portion of the sectional rail or track on which it travels within the conduit. Fig. 7 is an end view of the trolley and contact-cylinder, showing the fender of the trolley as actuating the swinging bail to rotate the cylinder in making the contact. Fig. 8 is a vertical longitudinal section through the rotating contact-cylinder and its interior mechanism, taken on dotted line 3 3 of Fig. 10. Fig. 9 is a vertical cross-section through the cylinder, taken on dotted line 1 1 of Fig. 8. Fig. 10 is a like section on dotted line 2 2 of Fig. 8, looking toward [illegible] terior of the cylinder. Fig. 11 is a side elevation of the trolley, looking at the reverse side of Fig. 6. Fig. 12 is a detail section through one of the trolley-wheels and the beam in which its journal is supported.

Referring to the letters of reference, A indicates the conduit, which is located at one side of the center of the track, between the rails J J′ thereof, one side of the conduit being parallel with a vertical line through the center of the track, the other side being arc-shaped and supported by the braces A″, (shown in Figs. 3 and 5,) its upper surface having the covering-plates B′ and the slot-opening T therethrough.

B indicates a series of hangers depending

from the upper wall of the conduit. One end of the rod D is secured in the body C of the hangers, the other end of said rod supporting the sectional conducting-rail E. (Clearly shown in Fig. 3.)

F indicates a crank-shaft, the ends of which are journaled in the supporting-rods D. Mounted on said shaft F is a hollow cylinder G, said shaft passing through the ends of said cylinder and being firmly secured thereto, the crank portion of the shaft lying within the cylinder. From the horizontal portion F′ of the shaft within the cylinder G is suspended a heavy metal contact-plate K by passing said portion of the shaft loosely through the heads *a a* of said plate, which permits the plate K to swing freely thereon. Secured to each of the right-angle portions of the shaft F within the cylinder G is a stop-plate *u*, against which the ends of the plate K strike as said cylinder is rotated to bring the plate K into contact therewith, the face of said stop-plates being beveled to correspond with the beveled ends of the plate K, so as to afford a greater contact-surface. The stop-plates *u u* are secured to the shaft F by forming an eye *c* in said plates and passing said shaft therethrough, in which it is secured by means of the set-screw *c′*, as shown in Fig. 8. This form of attachment permits of the proper adjustment of said plates.

The swinging bail is formed of the horizontal rod H and the transverse rods I, that connect the rod H with the shaft F. By raising said bail the shaft F is turned, thereby rotating the cylinder G, mounted thereon, for purposes hereinafter explained.

A″ indicates the ordinary dynamo. Leading from and returning to said dynamo are the line-cables Z Z′ of the system. The feed-cable Z, which is perfectly insulated, passes through and is supported in the conduit, as shown in Figs. 1, 3, and 5. The return-cable Z′ is located beneath the rail J′ and connected thereto by conducting-strips J″. (Shown in Fig. 5.)

From the main cable Z are a series of branches Z″, that pass through the ends of each of the cylinders G, and are attached to one of the heads *a* of the plate K, as shown in Figs. 2, 3, and 8. To provide against the current passing into the shaft F′ from the heads *a*, we insulate said heads from said shaft by means of a glass sleeve *v*, (shown in Fig. 8,) which is placed in said heads around the shaft F′, thus thoroughly insulating the plate K from said shaft.

It will now be apparent that when the plate K is free from contact with the stop-plates *u u* the electric current from the branch cable Z″ will be confined to the plate K within the cylinder G; but when the bail H is raised, so as to rotate the cylinder G sufficiently to cause the plate K to swing against the stop-plates *u u*, a contact is made between said plates, causing the current to pass out of the cylinder through the shaft F and cross-wire Q to a section of the conducting-rail E, from which it is collected by the trolley traveling on said rail and conveyed to the motor on the car, and when the bail is dropped back the cylinder will rotate to its normal position, causing the plate K to swing away from the stop-plates *u u*, (shown in Fig. 3,) thus breaking the contact and cutting out the current from that section of the rail E.

To prevent a waste of electric force through the hangers B, the supporting-rods D D are insulated from the body C of the hangers by a glass sleeve *h*, (shown in Fig. 4,) which is placed around the rod D within the body of the hanger and is secured in place by the nuts *h′*, screwed onto the rod D at each end of the sleeve *h*, thus perfectly insulating said supporting-rod from the body of the hanger.

It will be seen on looking at Figs. 1 and 3 that each section of the conducting-rail E is independently supported from the hangers B B and provided with the contact-cylinder G and actuating-bail. The length of said sections is somewhat greater than that of the car, or about twenty-five feet in length, and being disconnected the electric current cannot pass from one to the other directly, but enters each section through its contact-cylinder only, which is actuated by the plow or collecting-trolley as the car is traveling along the track and which automatically "cuts out" its section after the car has passed that point.

The plow or collecting-trolley is composed of the horizontal beam L, in which is secured the journals *n*, that carry the grooved wheels *h″*. (Shown in Figs. 6, 11, and 12.) Mounted on the trolley over the wheels *h″*, and secured to the beam L by means of the brace-arms *d d′*, is a curved fender M, the ends *f′* of which dip nearly to the rail E, on which the wheels *h″* of the trolley travel. Bolted to the non-conducting beam L of the trolley are two uprights P, that are adapted to pass through the slot T in the conduit and enter between the guide-blocks *s s*, secured to the adjacent faces of the depending braces O O, attached to the frame of the car, as shown in Fig. 5, and between which said uprights are adapted to slide vertically. By this arrangement the springing motion of the car is not imparted to the trolley within the conduit.

*m* indicates a tube secured to the beam L of the trolley, into which the cables *t t* lead from the journals of the wheels *h″*, as shown in Fig. 11. Said cables unite within said tube and pass therethrough to the motor W on the car, as shown in Fig. 5.

N indicates a guard or shield through which the uprights P and the tube *m* pass, and which is secured thereto. Said shield prevents dirt or any substance from falling through the slot in the conduit onto the wheels of the trolley, said shield being shown in Figs. 5, 6, and 11.

It will be apparent that as the car moves

along the track with the trolley coupled thereto and traveling on the conducting-rail E within the conduit the curved end $f'$ of the fender M of the trolley will engage under the upwardly-bent end $f$ of the bail H and raise said bail, whereby the cylinder G is rotated, so as to cause the contact-plate K therein to swing against the stop-plates $u$ $u$, thereby making a contact that forms a circuit through the cylinder G, the current passing out of said cylinder through the shaft F, thence into the section of the conducting-rail E on which the trolley is traveling and from which it is collected by the trolley-wheels $h''$, and, passing through the journals $n$ of said wheels to the cable $t$, connected thereto, as shown in Fig. 12, is conveyed through said cable to the motor W on the car, (shown in Fig. 5,) by means of which the car is propelled. From the motor the current is conveyed through the cable $t'$ to the journal of the car-wheel, (shown at $t''$,) thence through said wheel to the track-rail J', and through the conducting-strips J'' to the line-cable Z', through which it is returned to the dynamo. When the fender M of the trolley has passed the bail H, said bail, by force of gravitation, will fall to its normal position, as shown in Fig. 3, rotating the cylinder back and causing the plate K to swing away from the plates $u$ $u$, breaking the contact and cutting out the section of the rail E over which the trolley-plow has just passed. Before, however, the fender M of the trolley has released the bail H of one section it has raised the bail H and actuated the contact mechanism of the succeeding section, so that the current is simply shifted from one section of the rail E to another as the car moves along the track through the medium of the actuating-bails and contact-cylinders G, and by this means a circuit is always maintained between the main cable Z and the motor on the car while the trolley is on the track E. The bails H are provided with the upwardly-bent ends $f$ at each end thereof, so that the fender of the trolley will raise said bails to actuate the shaft and the contact-cylinder with the car moving in either direction.

It will be seen on looking at Fig. 7 that the maximum height to which the bail H is raised by the fender M of the trolley is sufficient to effect a one-quarter rotation of the cylinder G. On looking at Fig. 10 it will be seen that a one-eighth rotation of said cylinder is sufficient to swing the plate K into contact with the stop-plates $u$ $u$. The further rotation of the cylinder after such contact, and which is shown by the two dotted positions of Fig. 9, is to prevent the plate K being swung away from the plates $u$ $u$ by any jarring or vibration of the parts, thus making a sure and perfect contact.

In Figs. 2 and 8 the crank portion F' of the shaft F is shown as separate from said shaft, and connected thereto by the T-joints $b$ and set-screws $e$. By this arrangement the contact-plates may be readily located on the shaft within the cylinder, which would be difficult to accomplish if said shaft were formed of a continuous piece. It will also be seen that by suspending the contact mechanism within the conduit from the hangers B the bottom of the conduit is free from all obstructions, affording a perfect drainage therefor and permitting of the attachment of a brush to the plow or trolley to travel upon the bottom of the conduit, by means of which it may be cleaned.

The cylinders G form a housing which excludes dirt and dampness from the operating parts within them, which, taken in connection with the system of suspension and insulation within the conduit, makes a substantial, simple, and effectual means of electrical transmission in its application to the propulsion of passenger-cars.

Having thus fully set forth our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In an electric-railway system, the combination of two electrical conductors forming the main electrical circuit, a series of disconnected conductors, a cylinder for each disconnected conductor, each cylinder having electrical connection with one of the disconnected electrical conductors and one of the main electrical conductors, each cylinder being journaled in suitable supports and having electrical conductors within, said electrical conductors within the cylinder adapted to be brought together and separated by the rotation of the cylinder, and means for rotating the cylinder, substantially as specified.

2. In an electric-railway system, the combination of the main electric conductors along said system, a third conductor composed of a series of disconnected sections, a cylinder for each disconnected section, a shaft supporting each cylinder, electric conductors within the cylinder, said electric conductors adapted to be brought together and separated by the rotation of the cylinder, the electric conductors within the cylinder being in an electric circuit between one of the main electric conductors and one of the disconnected sections, a bail connected with the shaft of each cylinder, and a trolley-plow traveling on the disconnected sections actuating the cylinders, substantially as and for the purposes specified.

3. In an electric-railway system, the combination of the main electric conductors along said system, a third conductor comprising a series of disconnected sections placed end to end, a shaft for each section, each shaft carrying two conducting stop-plates and an interposed conducting-plate, the latter plate having a pivotal connection to said shaft and being insulated therefrom, means for electrically connecting said shaft with the conductor-section and a main conductor of the system, a swinging bail made fast to said shaft,

and a trolley-plow traveling on the disconnected sections to actuate said bail, said trolley-plow having an electrical connection with the car and motor of an electric-railway system, substantially as specified.

4. In combination with the rails, car, and conduit of an electric-railway system, an electric motor on said car, a pair of continuous electric conductors along said system, a third electric conductor comprising a series of disconnected sections placed end to end and within the conduit, a trolley-plow traveling in the conduit on the disconnected sections and having electrical connection with the motor on the car, a swinging bail projecting into the path of the trolley-plow, and means for making and breaking the electric circuit as said bail is actuated, substantially as specified.

5. In an electric-railway system, the combination of the rails, a slotted conduit along said system, a pair of main electric conductors, a third electric conductor comprising a series of disconnected sections arranged end to end and within the conduit and being insulated therefrom, a shaft for each conductor-section, each shaft journaled in suitable supports and carrying electric conducting-plates, said conducting-plates adapted to be brought together and separated by the rotation of the shaft, each shaft having an electrical connection with one of the main electric conductors and one of the said electric conductor-sections, an arm mounted on each shaft to actuate the same, and a current-collector traveling on the series of disconnected conductors, said current-collector actuating the arm of each shaft as it advances, said current-collector adapted to be connected with the motor on the car, substantially as specified.

In testimony whereof we affix our signatures in presence of two witnesses.

SAMUEL P. WILCOX.
JOSEPH D. PARTELLO.

Witnesses:
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B. S. WHEELER.