(No Model.)

3 Sheets—Sheet 1.

C. SKINNER.

ELECTRIC RAILWAY.

No. 577,885. Patented Mar. 2, 1897.

Fig. 1.

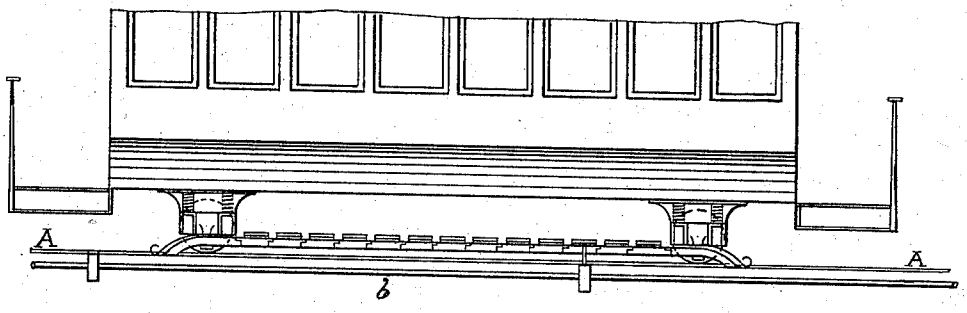


Fig. 2.

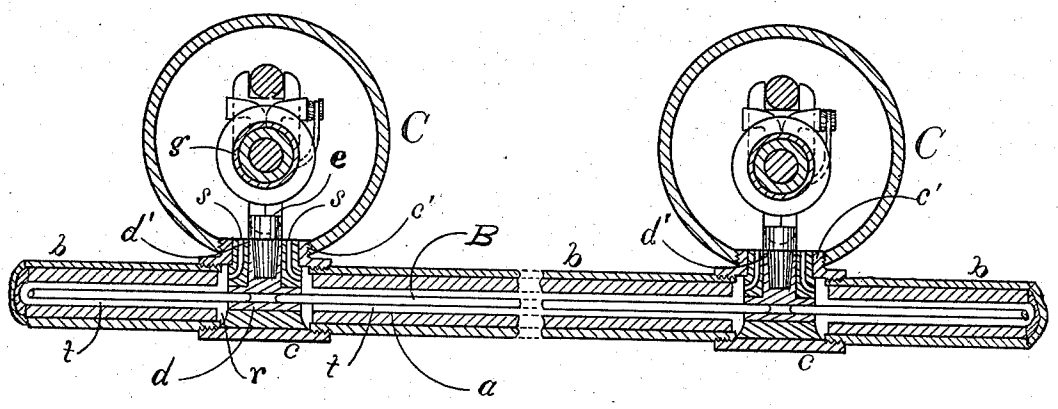


Fig. 6

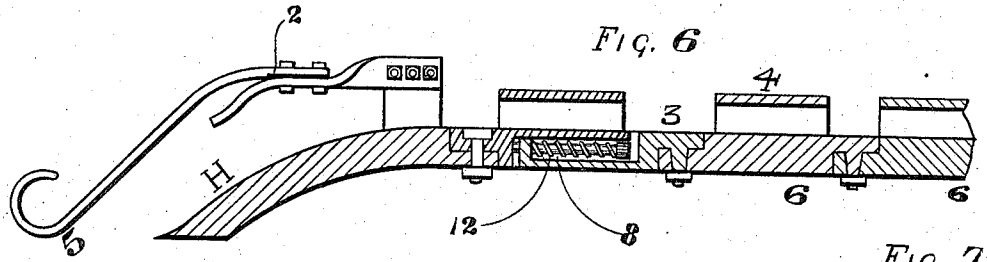
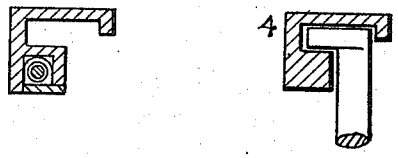


Fig. 7.



Witnesses
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(No Model.) 3 Sheets—Sheet 2.

C. SKINNER.

ELECTRIC RAILWAY.

No. 577,885. Patented Mar. 2, 1897.

Fig. 4.

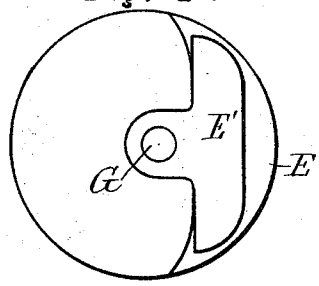


Fig. 3.

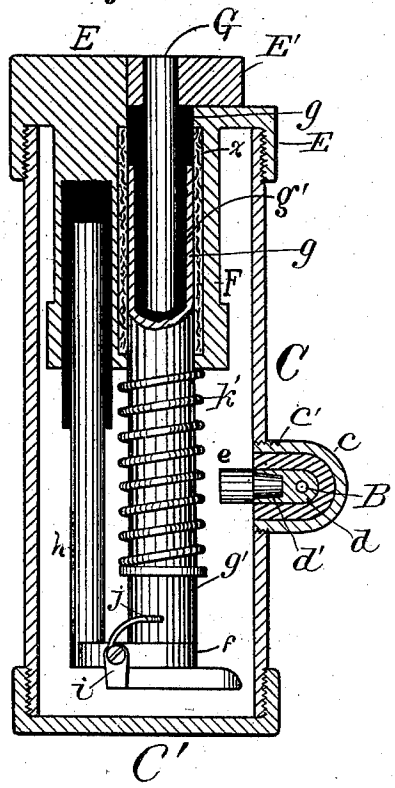


Fig. 5.

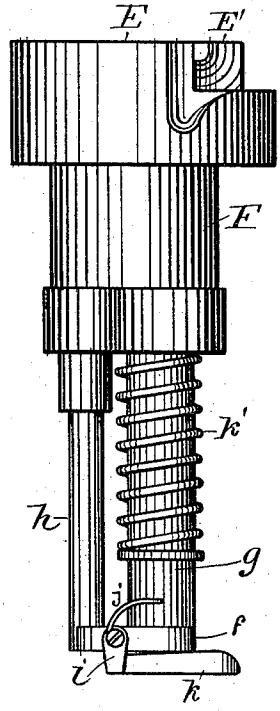
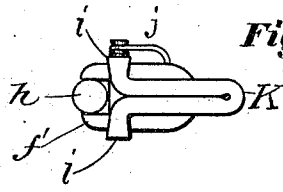


Fig. 8.



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(No Model.) 3 Sheets—Sheet 3.

C. SKINNER.

ELECTRIC RAILWAY.

No. 577,885. Patented Mar. 2, 1897.

Fig. 10.

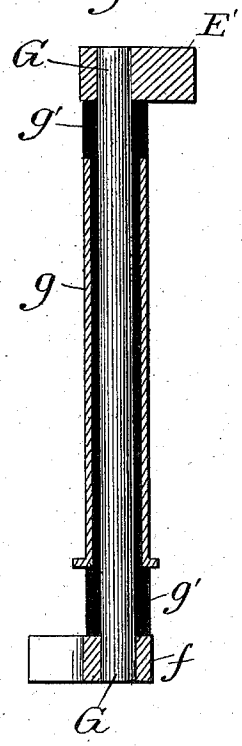


Fig. 11.

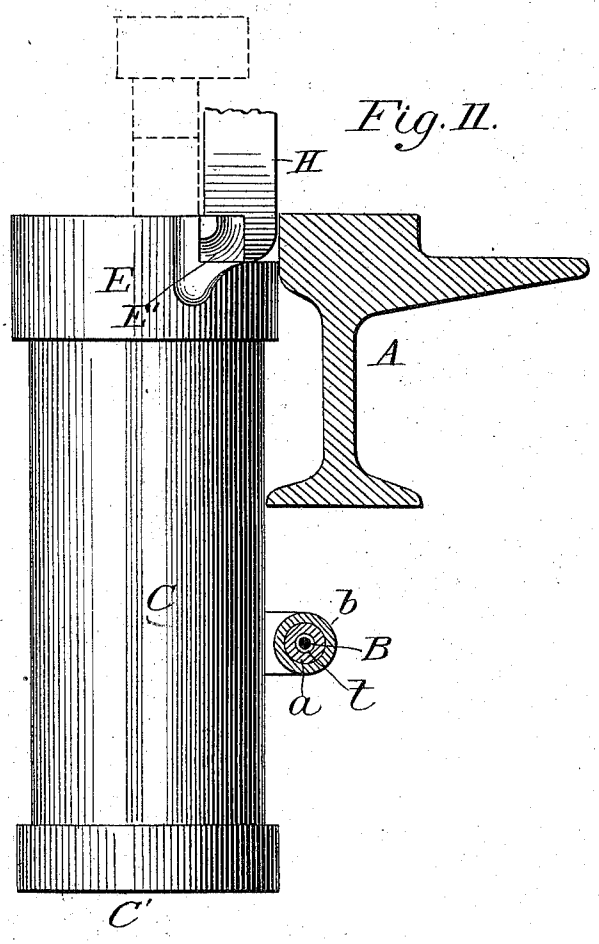
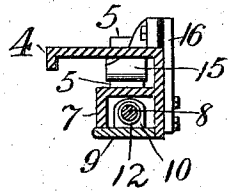


Fig. 9.



Witnesses:
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M M Towns

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Atty

UNITED STATES PATENT OFFICE.

COURTLAND SKINNER, OF CHICAGO, ILLINOIS.

ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 577,885, dated March 2, 1897.

Application filed May 27, 1895. Serial No. 550,751. (No model.)

To all whom it may concern:

Be it known that I, COURTLAND SKINNER, a citizen of the United States, and a resident of Chicago, Cook county, Illinois, have invented certain new and useful Improvements in Electric Railways, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

My invention relates to that class of electric railways in which the current-wire is laid alongside the track and from which the current is picked up by the car only at the point where the car happens to be, either while in transit or stationary.

The object of my invention is to simplify and make more practicable this class of electric railways, and this I accomplish, first, by circuit-closing devices located at regular intervals apart, which are directly lifted by the car as it passes over them, whereby an electrical connection is established therethrough with the current-wire, and which are returned to their normal position out of the way of ordinary traffic and out of engagement with said current-wire as the car recedes therefrom, and accomplish, second, by so constructing the parts of my invention that there is absolutely no danger of any accidental short-circuiting of the circuit due to the presence of moisture or otherwise, and the said circuit-closing devices can readily be removed, repaired, and replaced without impairment of the system or danger to the person, substantially as hereinafter fully described and as illustrated in the drawings, in which—

Figure 1 is a side elevation of a track with my improvements placed alongside of the same and a side elevation of a car having means for engaging said improvements. Fig. 2 is a horizontal transverse section through a couple of the boxes, illustrating the manner of keeping said boxes supplied with lubricant. Fig. 3 is a vertical transverse section through said box. Fig. 4 is a plan view of one of said boxes. Fig. 5 is a side view of said box, looking at the side next the rail. Fig. 6 is a detail view showing a longitudinal section of one end of the articulated tram, plow on the end of the same, and attachments connected to the latter. Fig. 7 is a detail view showing a cross-section of one of the links of the articulated tram with the upper portion of the circuit-closing bolt within the embrace of the overhanging part of said link. Fig. 8 is a detail view showing a plan of the lower end of the circuit-closing bolt and conjunctive devices. Fig. 9 is a section through the end link of the trolley-tram, which keeps the circuit-closing bolt elevated during the passage of the car. Fig. 10 is a longitudinal sectional view of the circuit-closing bolt. Fig. 11 is a view showing an elevation of the box and the lower end of the plow of the current-collecting devices, a cross-section of the rail and the current-wire conduit, and showing the relative position of the said several parts.

In the drawings, A represents the rail alongside of which the current-wire is laid, and B represents this current-wire, which is laid in the bore of a packing *a*, of suitable insulating material, of the pipe *b*. The sections of pipe *b* are preferably about fifteen feet in length and are connected by T-couplings *c*, the lateral take or offset *c'* of which is exteriorly screw-threaded and tapped into the sealed box C, into which the circuit-closing devices of my invention are placed. Placed centrally in this T-coupling *c* is a core *d*, of copper or other suitable material, which has its alining arms bored out centrally and has the lateral arm *d'* extending flush with the edges of the offset *c'* of the coupling, as shown. This core is thoroughly insulated from the shell of the coupling *c*, and the end of its lateral arm *d'* is preferably recessed longitudinally and centrally, so as to receive the tapered shank of the removable electrode or contact-piece *e*. Of course this arm *d'* could be extended into the box C and the necessity for the removable contact-piece be dispensed with. I much prefer its use, however, because there is a possibility of the current arcing at this point and the consequent injury to the electrode resulting therefrom. By making such electrode removable when injured it can easily be replaced.

The current-wire B may extend clear through the alining arm of the T-shaped core *d;* but I prefer, because of the ease of constructing the same, to make the wires in sections, each of a length slightly greater than the sections of pipe *b*, so that the ends of the wire extend beyond the ends of the pipe, and then, in constructing my improved system,

insert the ends of the sections of current-wire into the bore of the alining arms of the copper core *d*, and thus electrically couple together the ends of the sections of current-wire the entire length of the system.

The box C can be cast metal or other material, with the bottom already in. I prefer, however, to take a suitable length of iron piping of the desired diameter and to provide the ends with exterior screw-threads. The lower end I permanently close by a suitable head C′, screwed over or into the same, and the upper end of the box I close by a cover E, which screws over the same. The top of this cover is made very thick, so as to withstand the traffic over it, and its under side is provided with a depending guide-boss F for the vertically reciprocal circuit-closing bolt G. This circuit-closing bolt G is preferably cylindrical throughout its entire length except its ends. Its upper end is provided with a head E′, made integral therewith, which projects laterally toward the rail A, and is provided with horizontal wings extending in opposite directions from said laterally-projecting part of the head parallel with the rail. This head of the bolt is normally seated in a depressed portion of the cover E, and the under surface of the wings of the latter are beveled from their ends toward the laterally-projecting parts of said head. The bolt when in its normal position extends from its head E′, the top of which is then on the same plane as upper surface of the cover, to a point very near the bottom of the box, where it is provided with a collar *f*, as will hereinafter more fully appear. Between its ends it is thoroughly insulated with hard insulating material *g′*, and passes centrally through a section of metallic tubing *g*, which terminates a suitable distance from the ends thereof, so as to avoid the possibility of becoming electrically connected with either said head E′ or collar *f*, as shown. This tubing *g* has its lower end edges flanged, and between said edges and the lower end of boss F a spring *k′* is coiled around it, which keeps said bolt normally depressed, and said tubing comes mostly in contact with and is subject to the greatest wear as the bolt G is moved up and down in its bearings or guide-boss F, which latter between its ends is packed with a suitable soft packing *x*, as shown. This collar *f* on the lower end of the bolt G has a bifurcated arm *f′* projecting laterally therefrom, which passes on either side of a steadying-bar *h*, which is insulatedly secured in the boss F and depends down therefrom parallel to the bolt on the side thereof opposite the rail.

Immediately below the collar *f* on the lower end of bolt G and pivotally connected thereto by means of lugs *i*, which come on opposite sides of the arm *f′* of said collar, (through which the pintle-bar of said connection passes,) is the hinged electrode K. This electrode is kept normally pressing against the lower end of the bolt G by a suitable spring *j*, and its free end extends such a distance beyond the plane of the sides of said bolt toward the rail that when said bolt is lifted to the limit of its upward movement by suitable means carried by the car said electrode K comes in contact with the contact-piece *e* and takes the current therefrom, and, through the bolt, closes the circuit from the current-wire to the car. Of course it is apparent that this hinged electrode could be dispensed with and a projection on the lower end of bolt G be substituted. I much prefer the use of the hinged electrode, however, because the latter permits of sufficient amount of vertical movement of the bolt due to the jolting of the car as it passes over the same.

Besides the difficulties of construction which I overcome by my improvements one of the great difficulties to contend with is the presence of moisture or water in the receptacles or sealed conduits in which are the circuit-closing devices of the class of electric railways to which my invention belongs. The construction hereinbefore fully described overcomes this difficulty to a great extent, but in order to avoid it entirely I keep the boxes C filled with oil.

It is evident that the cover of the boxes could be very easily removed and the boxes filled with oil from time to time. I prefer to connect the boxes by means of a passage in the pipes in which the current-wire is placed, which communicate by means of suitable ducts in the T-coupling with said boxes. I make the oil-passage in the pipes *b* by making the bore *t* of the packing greater in diameter than that of the current-wire and making said packing terminate a slight distance from the ends of the pipes, so that when the latter are screwed to their limit into the T-couplings there will remain an annular space *r*, which readily fills with oil from the bore *t*. This annular space communicates with the interior of the boxes by means of ducts or passages *s s*, made through the packing of the T-couplings, as shown. Thus the necessity of filling each box separately is avoided, and the same may be filled by pressure from the power-house or some other suitable point.

It has before been stated that the bolt G has to be raised by the passing car to close the circuit between the current-wire and the electrical-transmission devices on the car. The means employed to do this consists of a plow H, which gradually rises or slopes from a point just outside of the rail next which the boxes C are placed, so that as the car moves along the point can come under the beveled wing of the head of the bolt G, and after the manner of a moving wedge force up the bolt until it has been lifted to such a height that the circuit is established therethrough. The plow does not come in electrical contact with bolt G except through the head E′ of the latter. The insulating material surrounding the upper end of the belt immediately below the

head prevents any lateral current between the plow and bolt. The slope or incline of the plow terminates when the point is reached at which the bolt will reach the limit of its raised position. There is one of these plows located at each end of the car and their upper ends are connected by a straight tram 3, upon which the head of the bolt G slides and imparts its current, which is taken therefrom by suitable electrical connections to the motor and from thence to the rail of the track in the usual manner. In order to prevent the plows from carrying the current back to the rail adjacent to which the boxes are placed and shunting the circuit, and in order to keep the head of the bolt on the tram 3, I provide the same with an overhang guide 4, which rises from the edge of the tram opposite that against which the vertical part of the bolt comes in contact, and at a suitable point it extends laterally and horizontally over the plane of the top of the bolt-head and then down slightly, so as to bear against the opposite side of the bolt-head, so as to prevent it from accidentally working sidewise off said tram. When the bolt reaches the following end of the trolley-tram it first passes out of contact with the same, then is given a preliminary downward push to move the electrode K out of contact with the contact-piece *e*, and then, finally, the bolt is pushed downward to the limit of its downward movement. This I accomplish by means of an initial depressor 15, one end of which is connected to, but insulated from, a post 16 arising from the upper articulated end of the plow. This depressor 15 is preferably made of flat metal, and is twisted so as to present its broad surface to the bolt, as shown, and its free end is bent slightly downward, just so as to cause the bolt to move out of engagement with current-wire. Secured to the back of depressor 15, but insulated therefrom by means of the insulating material 2, is the main depressor 5, against which the head of bolt strikes after it has been pushed down by the depressor 15 and electrically disconnected from the current-wire. Depressor 5 is of such length and shape, substantially as shown, as to push and to return the bolt to the limit of its downward movement or to its normal position again.

It is apparent that at the curves of the track of the system in which my improvements are to be used the boxes would have to be located differently than as hereinbefore described with reference to a straight track. While not considered absolutely necessary, it is advisable to locate the plows opposite the ends of the car-axles and to so construct the same and the tram connecting them that they will describe a curve practically conforming to that of the tracks as the car goes around the curve, and thus avoid the necessity of arranging and locating the boxes other than next the rail. This result I accomplish by jointing the tram or making it consist of a suitable number of links 6 6 6, which are articulated in such manner, substantially as shown, as to permit lateral movement, but not vertical. Each of the links 6 has an overhanging guide structure, like that referred to hereinbefore when describing the straight tram, so as to prevent the bolt becoming displaced. Now it is apparent that this jointed tram could not curve or change its position from a straight line unless its connection with the plows was made extensible. I accomplish this by making the upper pivoted portion 7 of the plows extend horizontally a suitable distance, which in cross-section is an inverted-U shape, and providing a longitudinally-extending bar 8, which comes within the channel of said portion 7. The link 6, connecting to this part 7 of the plow, has a longitudinal extension 9, which works in the channel of part 7 and which has a lug 10 arising from its end through which bar 8 passes. Now surrounding bar 8, between lug 10 and a head on the end of said bar, is a strong spring 12, which is compressed when the jointed tram is curved and which immediately restores said tram to a straight position when the curve of the track is past. This curvature of the tram is caused by the bolts, to the position of which the tram must conform as the car moves around the curve.

My invention, as hereinbefore described, is practicable, because there can be nothing to prevent its being raised and nothing to prevent its being shoved down into its normal position again. Besides this, it will be noticed that the boxes being filled with oil there can be no fear of any of the parts of my invention becoming rusted by reason of the presence of water or excessive moisture, and, further, the oil thoroughly insulates the parts one from the other.

It will be understood and appreciated that changes in the construction of my invention may be made, but all such changes not constituting a departure from the principle of my invention I claim as coming within the scope of the same.

The upper end of the vertically-movable bolt G is so formed that the side of it opposite that from which the head projects preserves its cylindrical form to the very top, and the portion of the guide-opening in the cover in which this upper portion of the bolt normally rests is inset in the ledge or shoulder made by depressing the top surface of the cover next the rail, as shown. The side of this portion of the guide-opening nearest the rail and the face of said shoulder are practically on the same vertical plane. Thus it will be seen, considering the fact that the upper end of the bolt exactly fits its guide-opening, that no dust or dirt or debris of the road can get in under it to prevent its return to its normal depressed position. As no foreign substance can find lodgment under the head of the bolt because of the fact that the plow keeps the bed beneath the same clean, there is absolutely nothing to prevent the unob-

structed return of said bolts to their original positions. The importance of this will be clearly seen when it is understood that the great difficulty heretofore experienced in getting any sort of movable device in the surface of the road to operate by engaging it from the outside has been that the very devices employed to thus engage said movable devices have proven the means by which the dirt and debris of the road have collected around them and impeded their free movement and rendered them impracticable.

What I claim as new is—

1. In an electric railway, the combination with a sealed receptacle, an insulated current-wire, a lateral branch therefrom entering said receptacle, and a circuit-closing bolt movable bodily vertically, but normally depressed in said receptacle, of a car, motor therefor and devices carried by said car for directly engaging the top of and lifting said bolt, so as to bring the same in electrical contact with said lateral branch and close the circuit therethrough between said current-wire and car.

2. In an electrical railway, the combination with a sealed receptacle, a current-wire, a vertically-movable circuit-closing bolt, and a spring-electrode hinged to the lower end of the same, of a car, a motor therefor, and devices carried by said car for directly engaging and lifting said bolt so as to bring said hinged electrode in electrical contact with said current-wire and close the circuit from the latter to the car, and a vertically-movable circuit-closing bolt normally depressed in said receptacle, of a car, motor therefor, and devices carried by said car for directly engaging and lifting said bolt so as to close the circuit between said current-wire and car.

3. In an electrical railway, the combination with a sealed receptacle, a current-wire, a normally-depressed, circuit-closing bolt movable bodily vertically, and a spring-controlled electrode hinging to the lower end of the same, of a car, a motor therefor, and devices carried by said car for, directly engaging and lifting said bolt so as to bring said hinged electrode in electrical contact with said current-wire and close the circuit from the latter to the car.

4. In an electric railway, the combination with a sealed receptacle, a current-wire, a lateral branch therefrom entering said receptacle, and a vertically-movable circuit-closing bolt, and a spring-controlled electrode hinged to the lower end of the same, of a car, a motor therefor, and devices carried by said car for directly engaging and lifting said bolt so as to bring said hinged electrode in contact with said lateral branch, and thereby close the circuit from said current-wire to said car.

5. In an electric railway, the combination with a sealed receptacle, a current-wire, a lateral branch therefrom entering said receptacle and provided with a removable end piece, a vertically-movable circuit-closing bolt normally depressed in said receptacle, and a spring-controlled electrode hinged to the lower end of the same, of a car, a motor therefor, and devices carried by said car for directly engaging and lifting said bolt so as to bring said hinged electrode in contact with the removable end piece of said lateral branch, and thereby close the circuit from said current-wire to said car.

6. The combination with a current-wire, sections of pipe within which said current-wire is insulated, vertical cylindrical boxes from which said wire is insulated but with the interior of which it electrically communicates, a head closing the bottom of said box, a cover screwed to the top of said box having a guide-boss depending therefrom, and a normally-depressed circuit-closing bolt, so constructed that when lifted it is insulated from said box through the cover of which it moves, of a car, a motor therefor and devices carried by said car which directly engages and lifts said bolt and thereby closes the circuit between said current-wire and car.

7. The combination in an electric railway with a current-wire, sections of pipe within which said current-wire is insulated, T-couplings connecting said sections of pipe, vertical cylindrical boxes into which the lateral arm of said T-coupling into which T-coupling a branch of said current-wire extends, and a normally-depressed vertically-movable circuit-closing bolt, which moves through the top of said boxes, of a car, motor therefor, and devices carried by said car which directly engage and lift said bolt and thereby close the circuit between said current-wire and car.

8. The combination in an electric railway, with insulated sections of current-wire, sections of pipe within which said sections of circuit-wire are placed, T-couplings connecting said pipe-sections, and a T-shaped metallic core, insulated in said T-couplings for connecting the sections of current-wire, vertical cylindrical boxes into which the lateral arm of said T-coupling is tapped, and into which the lateral arm of said metallic core extends and a normally-depressed vertically-movable circuit-closing bolt, which moves through the top of said boxes, of a car-motor therefor, and devices carried by said car which directly engage and lift said bolt and thereby close the circuit between said current-wire and car.

9. The combination in an electric railway with insulated sections of current-wire, sections of pipe within which said sections of wire are placed, T-couplings connecting said pipe-sections and a T-shaped metallic core insulated in said T-couplings for connecting said sections of current-wire, the end of the lateral arm of which is provided with a longitudinal hole, a removable contact-piece the shank of which is seated in said hole, vertical cylindrical boxes into which the lateral arm of said T-coupling is tapped, and into which the removable contact-piece extends, and a normally-depressed vertically-movable circuit-closing bolt which moves through the top of said boxes, of a car, motor therefor, and

devices carried by said car that directly engage and lift said bolt, and thereby close the circuit between said current-wire and car.

10. The combination in an electric car with an insulated current-wire, boxes from which said wire is insulated but with the interior of which it electrically communicates, and normally-depressed bolts movable bodily vertically so constructed that when elevated they are insulated from said boxes through the top of which they move, of a car, motor therefor, a plow on each end of said car, and a tram connecting the upper ends of said plows directly engaging the upper ends of said bolts and lifting them to said tram thereby closing the circuit between said current-wire and tram.

11. The combination in an electric car with an insulated current-wire, boxes from which said wire is insulated, but with the interior of which it electrically communicates, and normally-depressed bolts, movable bodily vertically, and so constructed that when in their elevated position they are insulated from said boxes through the tops of which they move, of a car, motor therefor, a plow on each end of said car, and a tram connecting the upper ends of said plows which can curve laterally but not vertically; said plows directly engaging the upper ends of said bolts and lifting them to said tram and thereby closing the circuit between said current-wire and tram.

12. The combination in an electric railway, with an insulated current-wire, boxes from which said wire is insulated but with the interior of which it electrically communicates, and normally-depressed bolts movable bodily vertically so constructed that when in their elevated position they are insulated from said boxes through the tops of which they move, of a car, motor therefor, a plow on each end of said car, a tram communicating with the upper ends of said plows, and depressors insulated from said car and plows; said plows lifting said bolts and thereby closing the circuit between said current-wire and tram, and said depressors depressing said bolts, as set forth.

13. The combination with an electric railway, with an insulated current-wire, boxes from which said wire is insulated but with the interior of which it electrically communicates, and normally-depressed vertically-movable bolts so constructed that when in their elevated position they are insulated from said boxes through the tops of which they move, of a car, motor therefor, a plow on each end of said car, a tram consisting of several links connecting with which are extensible portions, substantially as described, said tram capable of curving laterally but not vertically, said plows directly engaging and lifting said bolts, and thereby closing the circuit between said current-wire and tram, as set forth.

14. In an electric railway, the combination with a normally-insulated underground current-wire, a car, a motor carried thereby, and collector therefor, of a normally depressed and insulated current-closing bolt, movable bodily vertically, and insulated between its exposed ends, which when raised by said collector closes the circuit between said current-wire and motor.

15. In an electric railway the combination with a normally-insulated underground current-wire, a car, a motor carried thereby and collector therefor, of a normally depressed and insulated circuit-closing bolt, movable bodily, vertically and consisting of a central metallic bolt, insulating material covering the same between its exposed ends and a metal casing or jacket surrounding said insulation so as to leave the end portions of said insulating material exposed and so as to avoid contact with the ends of said bolt; said bolt when raised by said collector closing the circuit between said current-wire and motor.

16. In an electric railway the combination with a normally-insulated underground current-wire, a car, a motor carried thereby and collector therefor, of a normally depressed and insulated circuit-closing bolt, movable bodily, vertically, and consisting of a central metallic bolt, and insulating material covering the same between its exposed ends; said bolt when raised by said collector closing the circuit between said current-wire and a motor.

COURTLAND SKINNER.

Witnesses:
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