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C. W. RASMUSEN.

TRACTION RAILWAY APPARATUS.

No. 266,645. Patented Oct. 31, 1882.

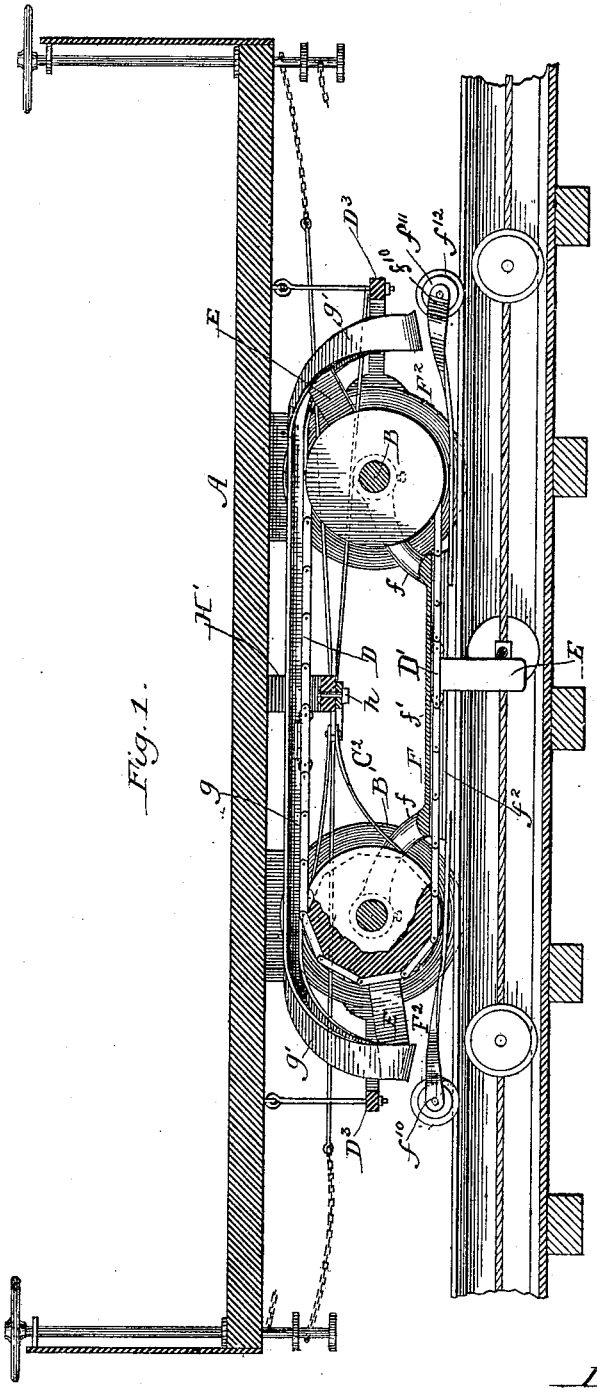

Fig. 1.

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William C. Whiting

Inventor:
Charles W. Rasmusen
By Peirce & Fisher
Attorneys

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(No Model.) 6 Sheets—Sheet 2.

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Fig. 2.

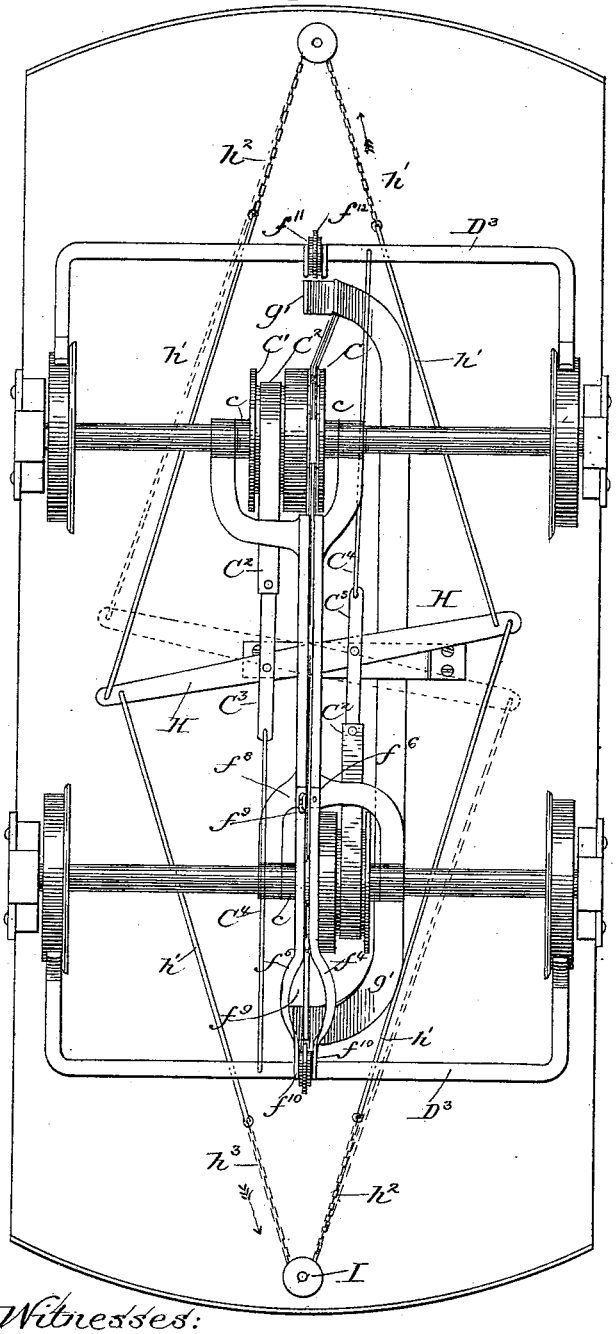


Fig. 4.

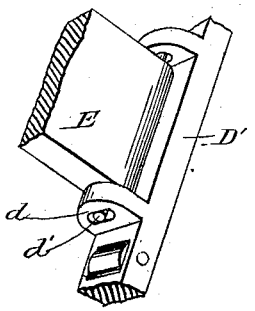
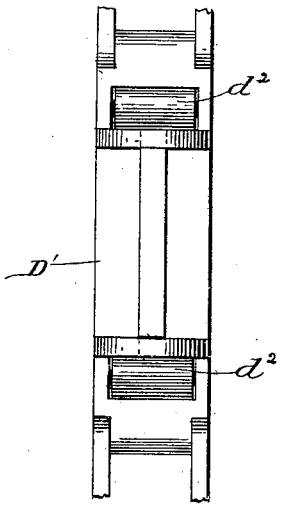


Fig. 3.



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C. W. RASMUSEN.

TRACTION RAILWAY APPARATUS.

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Fig. 5.

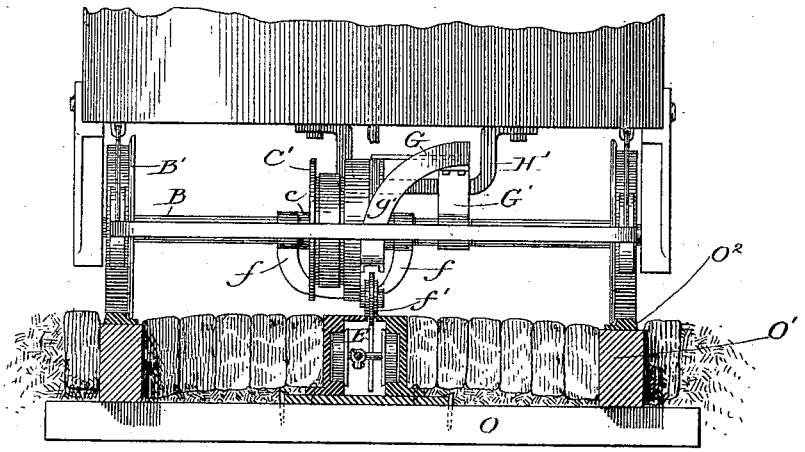


Fig. 7.

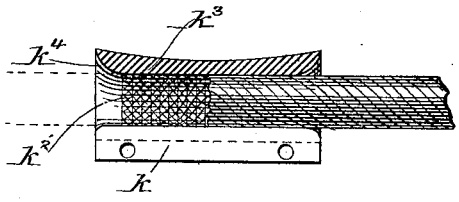


Fig. 6.

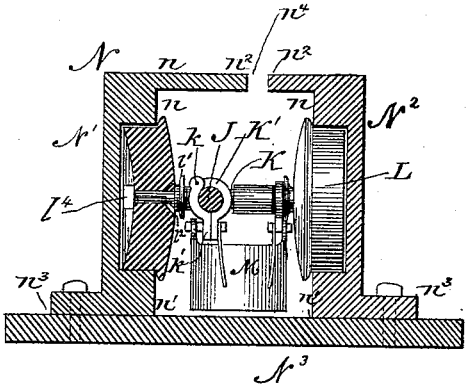


Fig. 8.

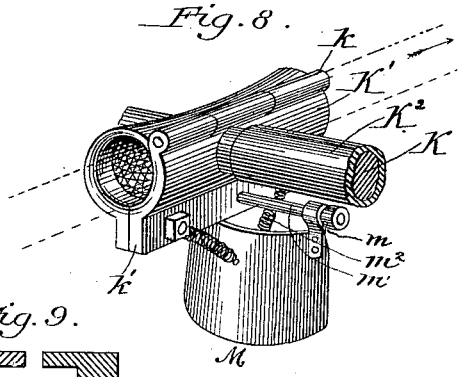
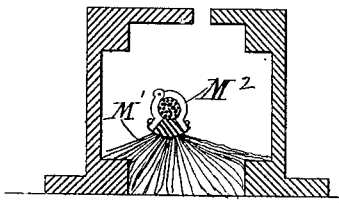


Fig. 9.



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C. W. RASMUSEN.

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Fig. 10.

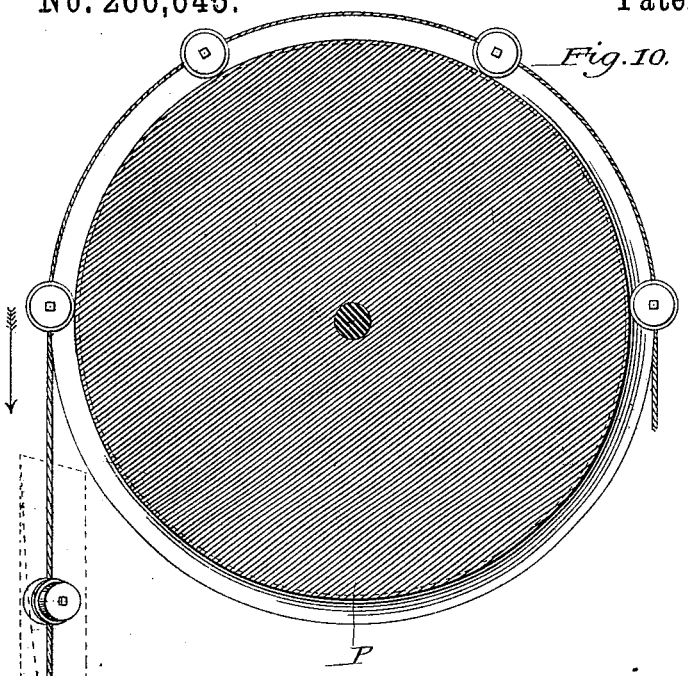


Fig. 11.

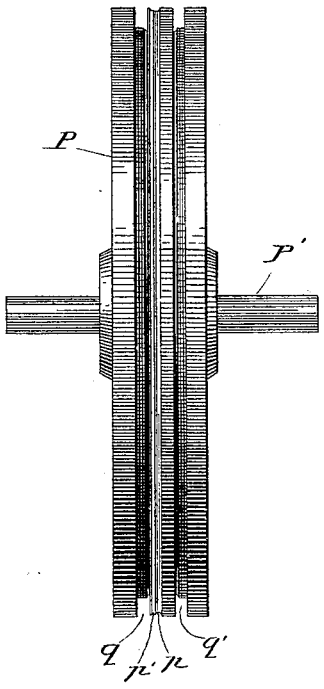


Fig. 12.

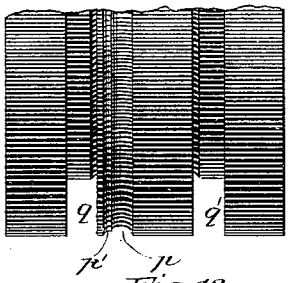
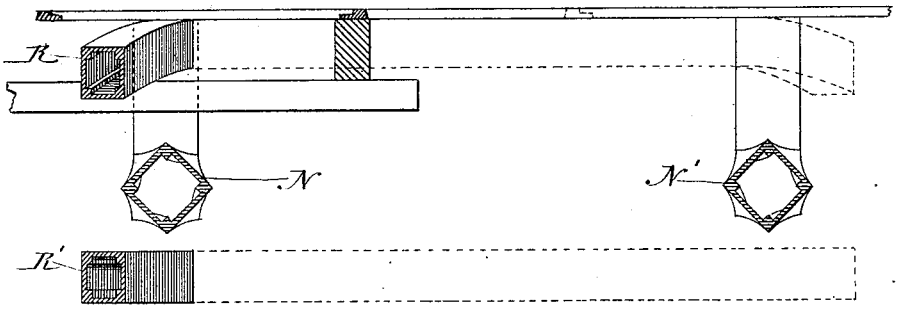


Fig. 13.



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(No Model.) 6 Sheets—Sheet 5.

C. W. RASMUSEN.

TRACTION RAILWAY APPARATUS.

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Fig. 14.

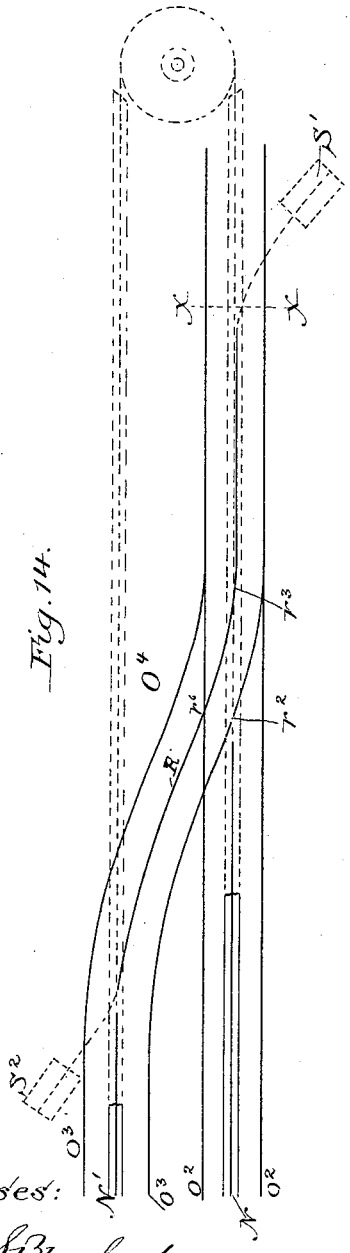


Fig. 15.

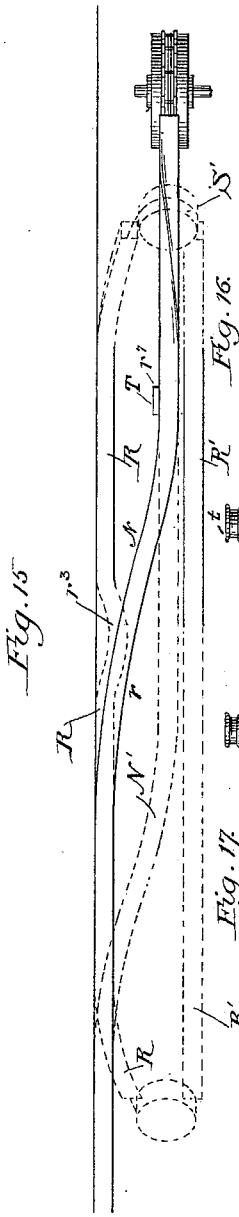


Fig. 16.

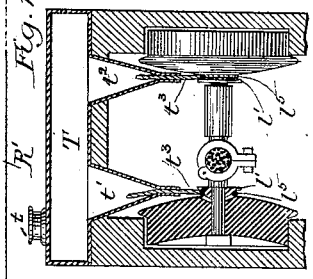
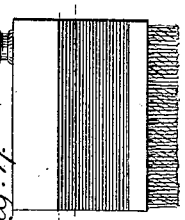


Fig. 17.



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(No Model.) 6 Sheets—Sheet 6.

C. W. RASMUSEN.

TRACTION RAILWAY APPARATUS.

No. 266,645. Patented Oct. 31, 1882.

Fig. 18.

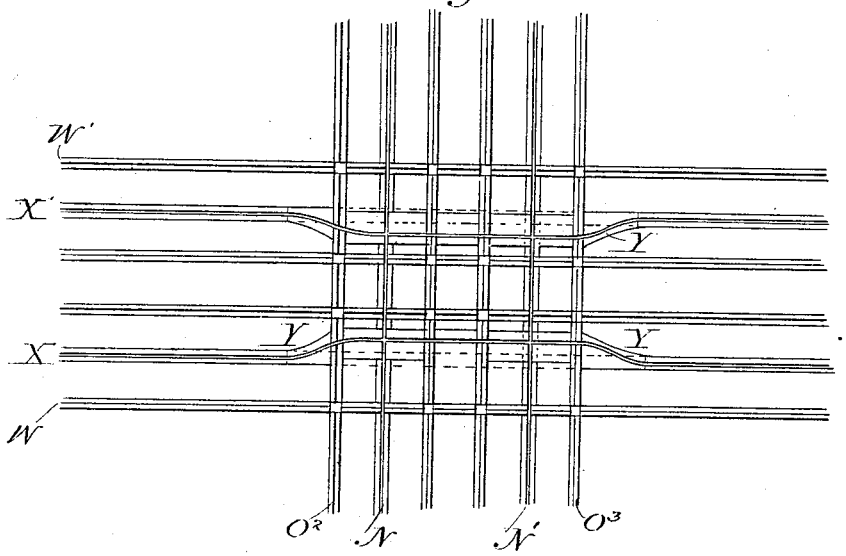


Fig. 19.

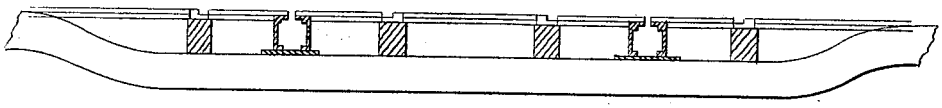
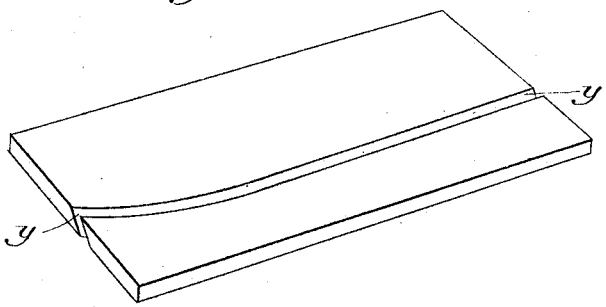


Fig. 20.



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UNITED STATES PATENT OFFICE.

CHARLES W. RASMUSEN, OF CHICAGO, ILLINOIS.

TRACTION-RAILWAY APPARATUS.

SPECIFICATION forming part of Letters Patent No. 266,645, dated October 31, 1882.

Application filed February 7, 1882. (No model.)

To all whom it may concern:

Be it known that I, CHARLES W. RASMUSEN, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Traction-Railway Apparatus, of which the following is a specification.

My invention pertains in general to the improvement of the apparatus of railways the cars of which are propelled by means of an endless wire rope or cable traveling within a tube or casing placed between the tracks, and in particular does it relate to the improvement of the apparatus described in Patent No. 248,668, granted to me on the 25th day of October, 1881, wherein the movement of the car is effected by means of the projecting arms of spider-wheels connected therewith and stops or trucks for engagement with such arms, located at intervals along the cable and supporting the same.

The objects of my present invention are, first, to so improve the mechanism connected to and traveling with the car that the projecting arms may be more accurately and effectively presented for engagement with the stops or supporting-trucks of the cable, that the number of such stops or trucks may be diminished, and that the necessity heretofore existing of slotting the car floor to permit the passage of such arms may be avoided; second, to provide a cable consisting of a single wire rope sustained at intervals by stops or trucks of improved construction; third, to furnish an improved tube-cleaning mechanism for attachment to the cable; fourth, to form the inclosing casing or tube for the cable in such manner as to enable the same to be more readily, simply, and substantially made and put together; fifth, to provide suitable terminal drums or wheels, over which, without unnecessary wear or strain of parts, my cable may pass, and by means of which it may be given a reversed direction of travel; sixth, to so arrange the tracks and cable-inclosing tubes with reference to each other and in connection with a switch-track and a supplemental cable and tube that the cars may be conveniently transferred from one track to another; seventh, to provide at suitable points oiling apparatus of such construction as to effectively lubricate the wheels of the cable-bearing trucks; and, eighth, to provide an effective arrangement of the tracks and corresponding cable-tubes at intersecting points of cable-roads. These several objects of my invention I accomplish by the mechanism hereinafter fully described, and illustrated in the accompanying drawings. I would have it distinctly understood, however, that while I have for the sake of brevity stated the objects of my invention in a somewhat restricted manner, and that while I believe that each of such objects can best be accomplished by the exact construction of mechanism described for that purpose, it is evident that such construction can be modified within wide limits without departing from the spirit of my invention, and I shall therefore define with greater exactness the proper scope of the same in the claims at the end of my specification.

Figure 1 represents a longitudinal sectional view of the cable-inclosing tube, and of the car-bottom, showing attached thereto my improved mechanism for presenting the projecting arms to the action of the traveling cable. Fig. 2 is a plan view of the car-bottom and attached mechanism inverted, the flexible guide being omitted from one end to better expose the underlying parts. Fig. 3 is a plan view of an arm-carrying link detached. Fig. 4 is a perspective view of an arm-carrying link. Fig. 5 is an end view of the car and its attached mechanism, the tracks and cable-tube being shown in cross-section. Fig. 6 is an enlarged detailed sectional view of the cable-tube, showing one of the wheels of the cable-bearing trucks in section. Fig. 7 is a longitudinal sectional view of the cable-clamp of the trucks detached. Fig. 8 is a perspective view of the cable-clamp of the truck detached, and showing attached thereto a cleaning device of improved construction. Fig. 9 is a transverse sectional view of the cable-tube, showing the cable with a cleaning-brush attached thereto. Fig. 10 is a sectional view of the terminal drum or wheel taken radially. Fig. 11 is a front view of the terminal drum or wheel. Fig. 12 is an enlarged front view of a portion of the terminal drum or wheel. Fig. 13 is a transverse sectional view upon the lines *x x* of Fig. 14, showing the arrangement of the tracks, the main-cable tubes, and the supplemental-cable tubes near the terminal end. Fig. 14 is a plan

view of a terminus of the road, showing the arrangement of the terminal switch and drum and the supplemental cable and its drums. Fig. 15 is a side view of a terminus of the road. Fig. 16 is a detailed sectional view of the cable-tube, showing in position thereon the oil-reservoir, and showing, also, the cable-bearing truck, one wheel of the same being shown in section. Fig. 17 is a side view of the oil-reservoir detached. Fig. 18 is a plan view of intersecting cable-roads. Fig. 19 is a sectional view taken on line *y y* of Fig. 18. Fig. 20 is a perspective view of a portion of the guide-plate used at the intersection of cable-roads.

Like letters of reference designate like parts in the several views of the drawings.

In my patent of October 25, 1881, the cars were provided with spider-wheels having projecting arms which entered the slot of a cable-inclosing tube located between the tracks, and were acted upon by the axles of trucks which were clamped to and supported two endless traveling cables. In order to form a passage for the free revolution of such spider-wheels, it was found necessary to cut the bottom of the car, and in order to insure precision of movement the cable-supporting trucks were placed in such close proximity to each other as to catch each successive projecting arm as it entered the slot of the tube and before the preceding arm had been released, and, as stated, two cables were employed. In my present invention, as in that of my former patent, I employ projecting arms, which are caught by the truck-axles within the cable-tube; but these arms are so constructed and placed at such intervals apart upon an endless chain or belt as to avoid the necessity of cutting the car-bottom, and to permit the cable-trucks to be located much farther apart than was heretofore possible, and in the present invention, also, the trucks are clamped to a single endless cable.

The car A is supported in the usual manner upon the axle B of the transporting-wheels B′. Upon each of these axles is loosely mounted a polygonal sprocket-wheel or drum, C, guarded from lateral displacement by the set-collars *c*, and over these wheels passes an endless chain, D, composed of a number of links of such size as to correspond accurately with the several sides of the sprocket-wheels. To certain of the chain-links, which I have designated D′, are attached by hinge-connections the projecting arms E, equidistant and in any desired number, preferably four. The lugs or knuckles *d* of the hinge-joint are provided with oblong eyes to receive the pins *d′* of the projecting arm, the purpose of this construction being to permit a slight lateral turn of such arm when the car is traversing a curve or is crossing an intersecting track, as will hereinafter appear. Each of the arm-supporting links D′ is provided at its ends, as shown in Fig. 3, with friction-rollers d^2. The function of these friction-rollers will be fully disclosed by the description hereinafter given of the operation of this portion of my improved apparatus. By the arrangement of the projecting arms, as above described, upon an endless chain or belt it is obvious that they may be placed at a much greater distance apart than when such arms project from wheels, and a corresponding increase in the distance between the cable-trucks and a decrease in their number is obtained.

In order to properly direct the projecting arms E into the slot of the cable-tube, a dependent guide, F, attached by suitable lugs or arms, *f*, to the axles B, is employed. This guide consists of a rigid portion formed of an upper plate, *f′*, and a lower plate, f^2, having a slot of such width as to allow a slight lateral movement of the arms E therein. To the ends of this rigid portion the flexible parts F^2 of the guide are attached. Each of these parts F^2 consists of plates f^4 and f^5, the plate f^4 being hinged to *f′* by the bolt f^6, and the plate f^5 being provided with a headed bolt, f^8, working in the curved slot f^9 of the rigid portion f^2. The plates f^4 and f^5 are curved upwardly, as shown, and at their outer ends are bowed to form the space f^9 to freely receive the arms E, and are provided with lugs f^{10}, carrying the guide-wheel f^{11}, having a peripheral flange, f^{12}, to fit and travel in the slot of the cable-tube. It will readily be seen from the above description that whatever may be the irregularities in the slot of the tube or in its relation to the tracks the guide-wheels f^{11} will always retain the hinged or flexible portions of the guide in true position above the same, and will thus enable the projecting arms to be accurately directed thereinto. It is also apparent that when a projecting arm has passed into the slot of the rigid portion of the guide F the small friction-rollers d^2 prevent the wear of the front and rear ends of the arm-carrying links D′, which would otherwise be borne by the action of the cable-trucks directly against the top and bottom plates, *f′* and f^2, respectively, of the rigid portion.

To avoid the necessity of cutting the car-bottom to afford a space for the free passage of the projecting arms when the arm-carrying chain revolves, I employ a guide, G, supported upon the axles B by the standards G′, and having throughout its entire length a recess or grooved way, *g*, and having downwardly-curved flaring ends *g′*. The upper portion of this guide G, as clearly shown in Figs. 2 and 5, is bent to one side of the chain D, while the ends of such guide depend directly in front of the chain. Into the recess *g* of the guide G the projecting arms E of the chain, when revolving, are received, and it is obvious that, by reason of the peculiar curve of this recess, the hinged arms, as they move upward, are turned down, and in such position pass readily beneath the bottom of the car.

The brake mechanism shown for starting and stopping the car is similar to that set out in my patent of October 25, 1881.

Securely fastened to each of the sprocket-

wheels C is a friction hub or drum, C′, and around such hubs pass the flexible metal bands C^2, connected to the rods C^3, attached by the rods C^4 to the brake-beams D^3. The rods C^3 are secured, as shown in Fig. 2, to the lever H, pivotally connected by the bolt *h* to the yoke H′, which depends from the bottom of the car, and through which pass the endless chain and upper guide.

To the ends of the lever H are fastened the rods *h*′, and these rods are connected by chains h^2 h^3 to the winding-posts I, provided with the usual band-wheel and locking-pawl and ratchet. It will be seen that by turning sufficiently either of the winding-posts I in the direction indicated by the arrows in Fig. 3 the lever H will exert a drawing action upon the flexible metal bands C^2, and a consequent friction upon the hubs C′, which will arrest their rotation. When the rotation of the friction-hubs C^2 and that of the attached sprocket-wheels and of the endless chain is checked the projecting arm of the endless chain, which is at such moment fully within the slot of the cable-tube, will be caught by an axle of the cable-truck, and the car will be carried forward thereby. It is to be noticed that the chains h^2 h^3 are wound upon the posts I in reverse direction, so that when a post is rotated in one direction to wind the chains h^2 and apply the friction-bands and lock the sprocket-wheels in order to produce propulsion of the car the chains h^3, connecting with the brake-beams D^3, will be slackened, and the brakes will be lifted off the running-wheels. On the other hand, the reverse rotation of the winding-post I releases the lock of the sprocket-wheels, applies the brakes, and so stops the car. When the friction-brake is thus released and the car is stopped the projecting arms of the endless chain are successively caught by the trucks of the constantly-moving cable. Each arm in turn passes in the guide G under the bottom of the car, and thence into the slot of the cable-tube, being directed thereto with exactness by the hinged portion of the lower guide.

The cable J is securely held upon the truck-axles K by the clamps K′, having the hinge *k* and the bolt-receiving lugs *k*′. At the points where the clamps are applied the cable is preferably covered with leather or rubber, so as to afford a better bearing-surface for such clamps. A portion of the interior surface of these clamps is serrated, as shown at k^2, in order to more firmly grip the cable, and their upper surface is slightly curved, as shown at k^3, to conform to the periphery of the terminal wheel, to be hereinafter described. The ends of the clamps K′ are interiorly curved or beveled, as at k^4, the purpose of this being to avoid the wearing or cutting action which sharp edges would exert upon the cable, either when sagging or when bent in passing around the terminal wheel. The axles K of the cable-trucks are furnished with friction-sleeves K^2 to prevent any wear of the axles from contact with the projecting arms E.

To the axles K are fitted, in a manner free to revolve, the wheels L, having an interior convex surface, an exterior concave surface, and provided with the supplemental groove or hub *l*′ and the channels l^2. My object in thus making the interior surface of the truck-wheels convex is in part to avoid any possible interference with the projecting arms E when, as in turning a curve, the trucks are canted, and the exterior surface of the wheels is concaved to give room for the retaining-nut l^4 without increasing the width of the tube for this purpose. The function of the grooved supplemental hub *l*′ is to receive wicking l^5, which, when saturated with oil, as hereinafter explained, distributes it freely through the channels l^2, and thus effectively lubricates the axles.

By the above described construction of cable mechanism not only is a great saving made in original cost, but by decreasing the friction of the parts an increase in length of wear is obtained. It will be noticed that the cable is clamped to the trucks somewhat to one side of their centers, the purpose of this being to more evenly distribute the strain in propelling the car and to allow greater space for the projecting arms of the endless chain.

To some of the clamps K′, at suitable points of the cable, are attached the improved scrapers M, preferably in the manner shown in Fig. 8, by means of the lugs *m* and rod *m*′, passing through and held securely to the clamping-lugs *k*′. These scrapers M are formed of sheet metal concavo-convex, in order to better catch and retain the dirt until the same is deposited in suitable traps at intervals in the bottom of the cable-tube. To permit the scrapers to yield to obstacles which might otherwise occasion breakage, springs m^2 are provided, as shown.

At any desired points along the cable may also be placed cleaning-brushes M′, held firmly in position by the hinged clamp M^2.

The cable, with its supporting-trucks, travels within an inclosing tube or casing, N, formed separably of the side portions, N′ N^2, and the bottom plate, N^3. The side portions are each provided with upper and lower rails, *n* *n*′, rolled or cast integral therewith, and have each a top flange, n^2, and a bottom flange, n^3. The top flanges, n^2, form the cover of the tube, and when in position are separated such distance as to leave the slot n^4 for the passage of the projecting arms of the endless chain, and, as will be seen, the flange n^2 of the side portion N′ is made somewhat broader than that of the portion N^2, that the slot of the tube may be slightly at the side of the center and in proper position with relation to the cable and trucks. The bottom flanges, n^3, serve to receive bolts, whereby the side portions, N′ N^2, are fastened to the bottom plate, N^3. As clearly shown in Fig. 5, the bottom plate, N^3, is spiked to the cross-ties O, supporting the sleepers O′, upon which rest the rails O^2. This construction of cable-inclosing tube, while very simple, is also easy of manufacture, requires but little space,

and can be readily and quickly put together without the aid of skilled labor.

In order to reverse the direction of travel of the cable, that the cars in adjoining tracks may be oppositely propelled, I provide at each terminus of the road the drum or wheel P, located between the adjoining tracks, somewhat below the surface, as shown in Fig. 15. Each terminal wheel P is driven by power applied in any suitable manner to the axle P′, and is provided upon its periphery with the shallow grooves *p p′* and the deeper grooves, *q*. Around each wheel passes the endless cable, being presented thereto in a manner to be hereinafter described. The shallow groove *p* receives the cable J, and into the groove *p′* the hinges K^2 of the truck-clamp fit. The grooves *q* are made of such size and depth as to permit the truck-wheels to pass freely and move loosely therein, so that all strain will be borne by the cable, and practically none by the wheels and trucks.

Since, as above described, the cable J is provided with scrapers and brushes, it is obviously necessary to present the cable to the terminal wheel in such manner that these may not interfere with its free passage around the same. This end I accomplish by twisting gradually the cable-tube a quarter of a revolution, so that the upper portion of the cable and its trucks will be presented to the periphery of the terminal wheel, allowing the free movement of the scrapers and brushes attached to the under side.

The arrangement of the tracks and tubes at the termini of the road I shall now proceed to describe more fully.

The way or track O^2, upon which the cars travel toward a terminal wheel, is intersected at a distance from the end by the adjoining track O^3, forming the switch O^4, over which the cars are transferred from one track to another to be propelled in the opposite direction. At a short distance in front of the point of juncture of the switch O^4 with the track O^2 the main-cable tube N of the track O^2 begins to sink, as shown at *r*, Fig. 15, in order to allow the projecting arm E to pass out of the slot of the same, and this being accomplished the tube N is twisted one-quarter of a revolution in order to properly present the upper surface of the cable to the terminal wheel. From the point at which the tube N sinks sufficiently to release the projecting arm E to a point beyond the switch O^4 the car will readily move by its acquired momentum. As shown at r^2, Fig. 14, one of the tracks of O^4 is cut to permit the passage of the projecting arm. When the car has passed on the track O^2 beyond the switch O^4 the locking-bands C^2 should be released from the friction-hubs C′ and the brakes put on, thus stopping the car and leaving the projecting arms E of the endless chain free to move.

Underneath the switch O^4 and a portion of the track O^2, near its end, is placed, in suitable tubes, R R′, a supplemental cable, S, similar in construction to the main cable, hereinbefore described. This supplemental cable passes over wheels or drums S′ S^2, formed like the terminal wheels P, driven in any suitable manner by the power driving the main terminal wheels. The upper tube, R, of the supplemental cable passes flush with the surface of the switch-track O^4, except at the point r^2, Fig. 15, where it is depressed, in order to prevent the arm E, projecting from the car, from striking the side of the tube R, and to allow such arm to pass freely into the slot of the tube R, that the car may be propelled by the supplemental cable along the switch O^4 to the track O^3. At a point, r^6, the track O^2 is cut to permit the passage of the projecting arm E; and it is to be noted that in order to enable the trucks of the supplemental cable to be canted, and so turn the several curves of the switch, the outer rails of the tubes R R′ are elevated, either by slightly twisting such tube or by enlarging the same at such points. The main-cable tube N′ of the track O^3 is depressed similarly to the tube N of the track O^2 from a point shortly in front of the switch, and before reaching the terminal wheel it is in like manner turned a quarter of a revolution. It will thus be seen that as the car, traveling upon the track O^2, nears the switch O^4 the projecting arm E passes out of the slot of the depressed cable-tube and over the depressed portion r^3, and into the slot of the tube R of the supplemental cable, and the winding-post I having been rotated so as to release the clutch of the flexible band C^2 upon the friction-hubs C′, the projecting arm E will be moved by the trucks of the supplemental cable until the post I is oppositely rotated, to tighten the flexible bands upon the friction-hubs and lock the sprocket-wheels, when the arm which is at the time in the slot of the tube R will be caught by a truck of the supplemental cable, and the car will be propelled thereby over the switch to the track O^3, to be further moved by the main cable in the tube N′. The main cable, after leaving the terminal wheel, enters the twisted portion of the tube N′, where it is turned a quarter of a revolution, in order to restore it to the position necessary for propelling the cars. Preferably the end of the tube N′ is somewhat enlarged to more effectually guide the cable-trucks into the same.

At a point, r^7, of the depressed cable-tube and at such other point or points as may be found practicable and desirable, I place an oil-reservoir, T, having filling-nozzle *t* and elongated dependent discharge-spouts *t′ t²*, each provided with suitable wicks, t^3. When the oil-reservoir is located on the tube these discharge-spouts *t′ t²* pass through corresponding openings in the tube to a point just over the supplemental hubs or grooves of the truck-wheels, and as the cable-trucks pass beneath the reservoir oil is delivered through the elongated spouts *t′ t²* and wicks t^3 to the wicking in the groove of the supplemental hubs, and

from such wicking through the channels to the axles of the trucks, which are thus kept constantly lubricated.

In order to permit traction-railways running in different directions to intersect or cross each other, I provide the arrangement of tracks, tubes, and guide-plates shown in Figs. 18, 19, and 20. In these figures, O^2 O^3 designate the tracks of one road, and W W′ designate those of the intersecting road. N N′ and X X′ denote the respective cable-tubes of these roads. The tracks O^2 O^3 and W W′ are laid in the ordinary way of intersecting car-tracks. The cable-tubes N N′ of the tracks O^2 O^3 remain flush with the road-bed, while the tubes X X′ of the tracks W W′ are depressed just before reaching the tracks O^2 O^3, and so pass under the same. It will thus be seen that as a car in traveling upon either of the tracks W W′ nears the tracks O^2 O^3 the projecting arm E, by which such car is being moved by the cable, will pass out of the tube X at its depressed portion *x*. At this point a guide-plate, Y, having a beveled cam-slot, *y*, receives the projecting arm E, and as the car is carried forward by its momentum turns the arm upon its hinge-joint to one side, and thus enables such arm to pass freely over the tubes N N′ of the intersecting tracks O^2 O^3, and in like manner restores it to the tube, to be again acted upon by the cable.

The guide-plates Y may be made in several pieces abutting against the tracks O^2O^3, which are cut at the proper points to correspond with and render practically continuous the slots *y*; or such plates Y may each be made of but three pieces placed above the tubes N N and below the tracks O^2 O^3, spaces being left between the abutting ends to correspond with the slot of the cable-tubes N N′.

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

1. The combination, with a traction-railway car, of an endless chain or band mounted upon the car, and provided with projecting arms, substantially as described.

2. The combination, with a traction-railway car, of an endless chain or band carried thereby, and provided with projecting arms and wheels for supporting such chain or band, substantially as described.

3. The combination, with the truck-axles of a traction-railway car, of sprocket-wheels journaled thereon and an endless sprocket-chain provided with projecting arms, substantially as described.

4. The combination, in a traction-railway car, of an endless chain or band having projecting arms and mechanism for guiding such projecting arms, substantially as described.

5. The combination, with a traction-railway car, of a chain or band provided with projecting arms and friction-rollers for such arms, substantially as described.

6. The combination, with a traction-railway car, of chain-carrying wheels, a chain or band provided with projecting arms, friction-rollers located near said arms, and a guide to receive said arms, and friction-rollers, substantially as described.

7. The combination, with a traction-railway car, of an endless chain or band having projecting arms hinged thereto, substantially as described.

8. In a traction-railway car, the combination of hinged projecting arms and a guide for directing said arms into the slot of the cable-tube, substantially as described.

9. In a traction-railway car, the combination, with the chain-carrying wheels, of a chain or band provided with arms hinged thereto, and a guide for turning said hinged arms and permitting the same to pass beneath the car-bottom, substantially as described.

10. The combination, with a traction-railway car, of movable projecting arms connected therewith and a hinged guide for said arms, substantially as described.

11. The combination, in a traction-railway car, of movable projecting arms connected therewith, a guide for said arms, and mechanism arranged to travel in the slot of the cable-tube and retain the guide in correct position above the same, substantially as described.

12. In a traction-railway car, the combination of movable projecting arms and a guide having an expanded end to receive said arms, substantially as described.

13. In a traction-railway car, the combination of sprocket-wheels, an endless chain provided with projecting arms, and mechanism for locking the movement of the endless chain, substantially as described.

14. The combination, with a single-rope traction-cable, of a truck having a single hinged clamp, to each side of which is attached an axle for supporting one of the truck-wheels, substantially as described.

15. The clamp for the stops or trucks of a traction-cable, having its upper surface curved longitudinally, substantially as described.

16. The combination, with a traction-cable, of stops or trucks the clamps of which are provided with interiorly-beveled ends, substantially as described.

17. The clamp for traction-cables, having its upper surface curved, and having its hinge located upon one side of said upper surface, substantially as described.

18. A traction-cable truck consisting of a single axle, a single clamp, and two loosely-journaled wheels, substantially as described.

19. The combination, with the cable, of stops having friction-sleeves adapted to revolve in the plane of travel of the cable and to relieve the stops from the friction of the arms depending from the car, substantially as described.

20. The combination, with a traction-railway car having an arm or arms depending therefrom, of a cable-tube having tracks arranged out of horizontal plane, and a cable provided

with trucks the wheels of which have their interior surface convex, substantially as described.

21. A wheel for cable-trucks, provided with an open supplemental hub or wick-holder, and with a channel extending from said wick-holder on its inner surface to the axle-bearing, substantially as described.

22. A cable-tube formed of a bottom plate and separable side portions having top flanges to form the cover of the tube and bottom flanges to receive bolts, substantially as described.

23. The combination, with the cable, of a cleaning-brush and a clamp for attachment to the cable, substantially as described.

24. A terminal drum for traction-cables, provided with separate grooves to receive the wheels of the cable-trucks, substantially as described.

25. A terminal drum for traction-cables, provided with a cable-groove, and with grooves extending around its periphery to receive the wheels of the cable-truck, substantially as described.

26. A terminal drum for traction-cables, provided with a groove for the cable and a groove for the clamps, substantially as described.

27. The combination, with the terminal drum, of the main-cable tubes, having their terminal portions twisted, substantially as described.

28. The combination, with the main car-track and its depressed cable-tube, of a switch-track, substantially as described.

29. The combination, with the two adjacent main tracks of a cable-railway, of a switch-track connecting the same and a supplemental cable for propelling the car from one main track to the other, substantially as described.

30. The combination, with the switch-track, of a cable-tube having a portion depressed to admit the arm projecting from the car, substantially as described.

31. In traction-railway apparatus, an oil feeder or reservoir having wick-holders at a distance from each other corresponding with the distance between the cable-truck wheels, substantially as described.

32. In traction-railway apparatus, an oil feeder fixed in the path of the cable-supporting truck-wheels, and provided with an elongated wick-holder, substantially as described.

33. The combination, with the main track, of the depressed cable-tube and supplemental guide mechanism for directing the arm depending from the car while out of the cable-tube, substantially as described.

34. The combination, with the intersecting tracks, of the cable-tubes arranged one above the other, substantially as described.

35. The intersecting traction-railway tracks having their respective cable-tubes arranged one set above the other, and having guide-plates at their intersection, substantially as described.

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