

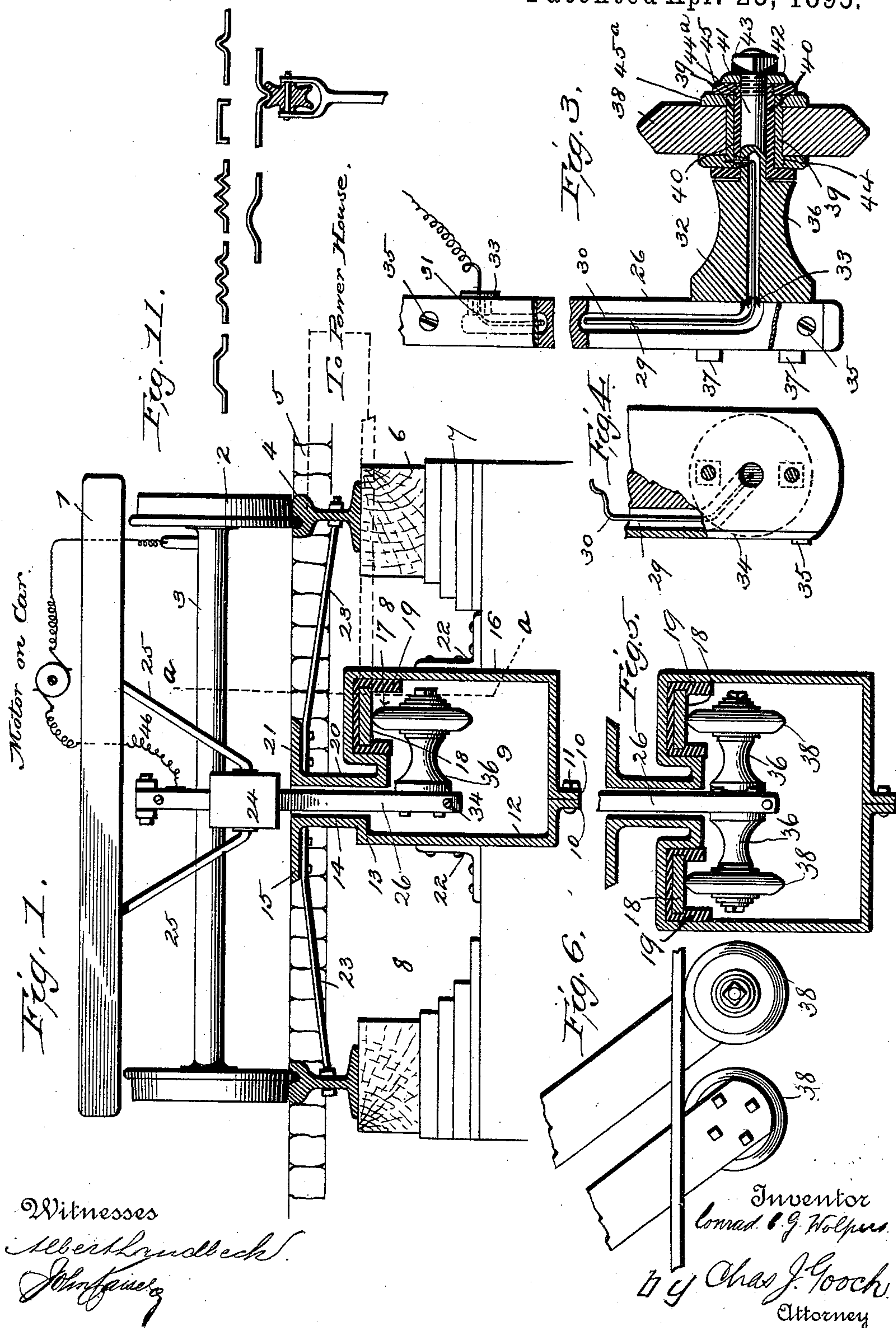
(No Model.)

2 Sheets—Sheet 1.

C. C. G. WOLPERS.
ELECTRIC RAILWAY.

No. 538,005.

Patented Apr. 23, 1895.



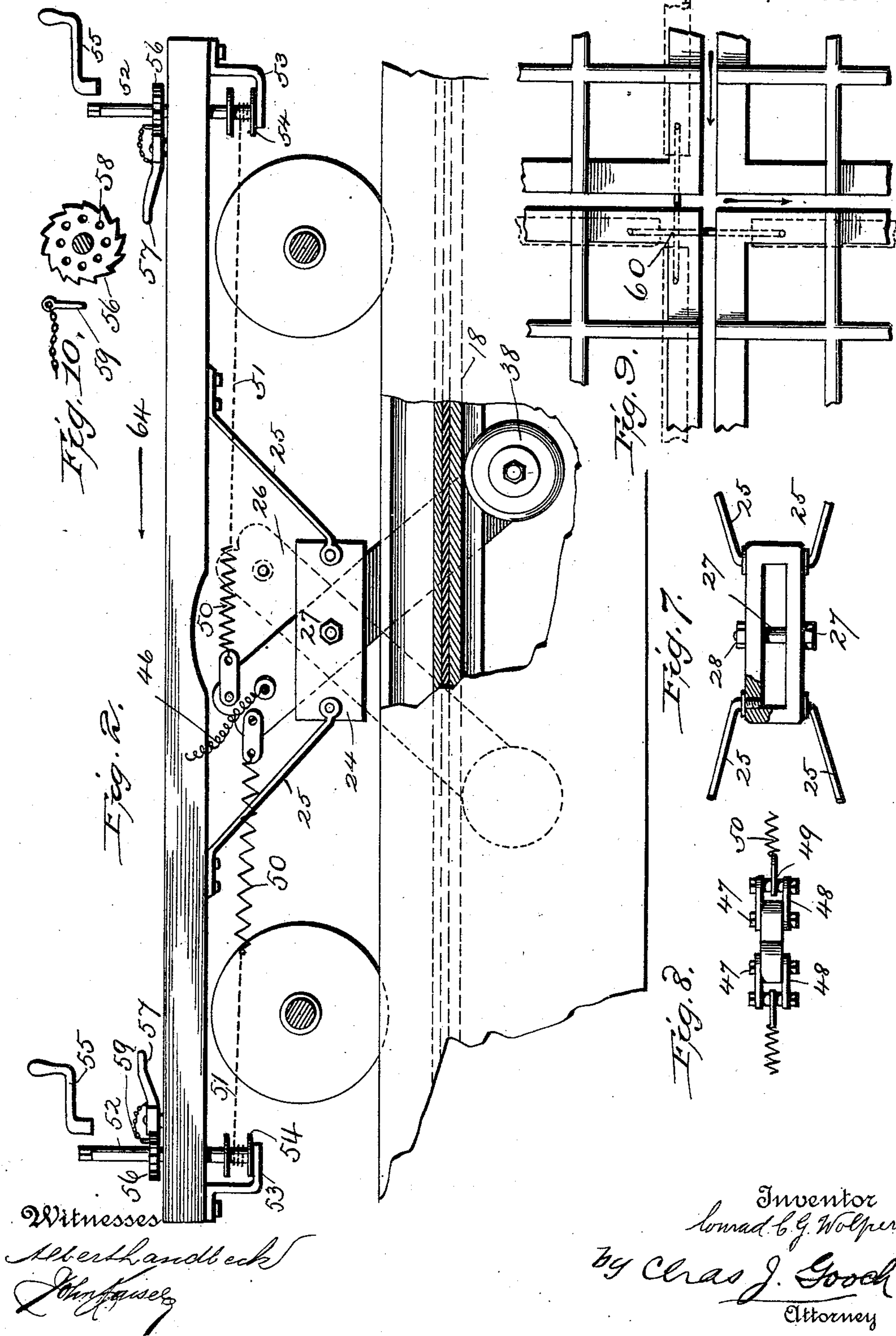
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UNITED STATES PATENT OFFICE.

CONRAD C. G. WOLPERS, OF BROOKLYN, NEW YORK.

ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 538,005, dated April 23, 1895.

Application filed October 2, 1894. Serial No. 524,717. (No model.)

To all whom it may concern:

Be it known that I, CONRAD C. G. WOLPERS, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Electric Railways; and I do hereby 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.

This invention relates to improvements, as hereinafter set forth, in electric railways.

In the accompanying drawings, Figure 1 represents an end elevation, partly in section, of a car truck, track, road-bed, conduit, trolley and connections according to my invention. Fig. 2 represents a side elevation, broken away on the line *a, a*, of Fig. 1. Fig. 3 is an enlarged, broken, sectional view representing the trolley, trolley arm and conducting wire. Fig. 4 is an enlarged front elevation, partly broken away, of a portion of the trolley arm and its covering plate. Fig. 5 represents a transverse sectional view of the conduit and conductors adapted for use with a pair of trolleys the trolleys also being shown in this figure. Fig. 6 represents a front elevation of a portion of said pair of trolleys. Fig. 7 represents an enlarged top plan view, partly broken away, of the trolley-supporting box and its hangers. Fig. 8 represents a top plan view of the trolley-connecting links connecting the trolley by spring connection with the operating chains, and chain operating devices. Fig. 9 represents, in top plan view, a crossing for underground trolley lines constructed according to my invention running at right angles. Fig. 10 represents, in detail, the ratchet-locking device. Fig. 11 shows modified forms of the main conductor.

The objects of my invention are to produce an underground trolley system for electric railways which shall be simple and comparatively inexpensive in construction, manipulation, and maintenance, can be readily installed and operated, will occupy the minimum of space, whereby the conductivity and insulation of the parts are positively assured and maintained and whereby provision is made for the passage of the cars and operating

mechanism connected therewith of cross roads over crossings without interference.

1 represents a car, which may be of any desired construction; 2, the wheels; 3, the wheel-axle; 4, grooved rails; 5, the surface of the road-bed; 6, ties, beams or blocks of any suitable material on which the bases, or webs, of the rails rest; 7, the block foundation for the track; 8, spaces between the conduit, tracks and the surface of the road bed—which spaces are ordinarily filled in with some suitable material which is readily removable when necessary to obtain access to the conduit for any purpose.

The conduit, 9, is composed of a sectional metal frame, the sections having depending lips or flanges, 10, which are bolted together, as at 11. Viewed in cross-section, see Fig. 1, the smaller section, 12, is formed at its upper portion with an inwardly-extending shoulder, 13, and an upwardly-extending portion, 14, constituting one-half of the slot within which the trolley arm travels, and at its top with a lateral flange, 15, which is embedded in the surface of the road bed. The larger section, 16, of the conduit frame is formed with a chamber or channel, or recess, 17, within which is contained the main conductor or line wire, 18, and the insulator, 19, therefor, and with a neck, 20, constituting the other half of the slot, and a lateral flange, 21, which is embedded in the surface of the road bed.

22 represents angle beams or bars by which said sections of the conduit frame are braced in position as shown, and 23 represents brace and tie-bars which at their inner ends are bolted to the top flanges 15 and 21, of the conduit frame, their outer ends extending through and having nut and washer connection with the webs of the rails.

The conduit is, as will be readily understood, formed of a number of longitudinal sections as well as of the vertical sections already described.

The main conductor, or line wire, 18, is, preferably, as shown in the form of a flat strip of metal, though it may be of other form as shown in Fig. 11, and is seated, as shown, in grooves formed in the insulator, 19, therefor, which is composed of any suitable insulating material and is in the form of a canal or chan-

nel, or reverse U-shape in cross-section its inner leg depending below the neck, 20, while its outer leg is of still greater length and depends across the path of the hub of the trolley wheel, as clearly shown in the drawings. By this construction perfect insulation is secured under the lateral oscillation of the trolley. Said channeled insulator and the conduit are formed in sections and of a length and connected together suitably according to requirement, the number of such sections and their contour corresponding with the line of the road.

By forming the main conductor, or line wire, of a flat strip of metal, the perfect contact at all times therewith of the trolley, even under sidewise oscillation thereof, is secured, and by forming the insulating channel of reversed U-shape the perfect insulation of the main conductor and of the conduit are insured.

24 (see Fig. 7), represents a metal frame or box which is suspended from the platform of the car truck by brace-bars or rods, 25. Within this frame or box the trolley arm, 26, is rockingly, or pivotally, supported on a bolt, 27, passing through said box, 24, and removably secured thereto by a nut, or nuts, 28, to facilitate the removal of the trolley when desired. The trolley arm, 26, has milled therein a longitudinal groove, 29, within which is seated the insulated conducting wire, 30, transverse holes, 31, 32, being drilled at the upper and lower portions, respectively, to admit of the passage therethrough of the upper and lower ends, respectively, of said wire, 30. Within these holes, 31 and 32 are removably inserted plugs, 33, formed of any suitable insulating material.

34 represents a protecting cover or plate for inclosing and covering the groove, 29, and wire, 30, said plate, 34, being removably attached to the trolley arm so as to admit of ready access to said groove and wire, by screws or their equivalent, 35, passed through suitable holes in said plate and trolley arm respectively.

36 represents a transverse arm or stud removably secured to the lower end of the trolley arm, 26, by screws or similar devices, 37. This arm or stud, 36, has a central and longitudinal bore through which the lower end of the conducting wire, 30, passes to the contact bushing or spool, 39, on which the trolley wheel, 38, has revoluble bearing.

40 represents an insulating spool or bushing mounted on the spindle, 41, of the arm or stud, 36; 42, a washer of insulating material and 43 a clamp-nut engaged with the threaded outer end of said spindle to clamp the washer, 42, spools or bushings 40, and 39 and trolley wheel on the said spindle. The bushings or spools 39 and 40, each have an outer threaded end, 44, 44^a with which are removably engaged threaded rings or flanges, 45, 45^a so as to permit of the ready placing in or removal from position of the trolley wheel. It will be

readily observed that by this arrangement, by removing the clamp-nut, 43, the threaded rings, 45, on the threaded outer ends, 44, of the respective bushings or spools can be readily removed, and the trolley wheel slid off when desired. Similarly, of course, the trolley wheel can be readily placed in position and said rings, 45, washer, 42, and nut, 43, readily placed in position to hold the trolley wheel in place.

The upper end of the conducting wire, 30, extends out through the hole, 31, in the upper portion of the trolley arm, 26, and is coiled at that portion, as shown at 46, to prevent distortion or breakage under strain when shifting the trolley. Adjacent to each upper corner of the arm, 26, is bored a transverse slot or hole with each of which is pivotally connected by bolts and nuts, 47, or pins, the inner ends of links, 48, the outer ends of said links having bolts or pins, 49, passed therethrough with which are connected the inner ends of spiral or other springs, 50, to whose outer ends are attached the inner ends of either chains, 51, or wire cables, which at their other, or outer, ends are connected with the lower portions of vertical trolley-operating rods, 52, located at the respective ends of the car and supported at their lower ends on, or in, step brackets, 53, attached to the platform.

54 represents spools or drums on either of which the respective chains, 51, or cables, are wound by the rotation of either of the rods, 52, as it may be desired to shift or switch the trolley in either direction according to the direction in which the car is to run.

55 represents levers or handles for operating the rods, 52.

56 represents ratchets keyed or otherwise connected with the rods, 52, and 57 represents foot levers and pawls adapted to be engaged with and disengaged from said ratchets in the customary manner. The respective ratchets have formed therein vertical or transverse slots or key-holes, 58, with which are engaged chain-held keys or pins, 59, the lower ends of said keys or pins, 59, engaging in holes formed in the platform, so that when it is desired to lock either ratchet and its connections from movement, such as when it is desired to so lock said parts at the end of the car where the motor-man is not, the insertion of the key or pin, 59, at such unoccupied end will accomplish such locking whereby the trolley-shifting rod 52, and chain, 51, spring, 50, and link, 48, for the time being out of use, will be held locked.

In road crossings where two lines intersect, the continuity of the respective intersecting main conductors or wires must necessarily be broken to admit of the cross passage of the trolleys of the respective lines. Such a crossing is represented in Fig. 9 of the drawings. In order to insure the proper electrical connection and continuity of the current between such disconnected main conductors, I attach thereto, adjacent to the respective ends

thereof as shown, the ends of connecting cables, 60, which are looped and depend within the cross conduits sufficiently to permit of the trolleys of the respective lines passing each other without interference.

In Fig. 5 of the drawings is represented an arrangement whereby both the negative and positive poles may be laid underground, and two trolley arms and trolleys, in lieu of one, employed. In this arrangement, the conduit is formed with a pair of chambers or recesses, 61, within each of which is contained one of the channeled insulators and also one of the main conductors or wires, one in this case being positive and one negative. Two trolleys are employed in this case, which are of the same general construction as is the trolley heretofore described, except that in this instance they are so arranged that the trolley or contact wheels shall run right and left, as clearly shown in the drawings.

As represented in Fig. 2 of the drawings, the trolley shown in full lines, is positioned to cause the car to travel in the direction of the arrow, 64, (the dotted lines in this figure indicating the switched position of the trolley to travel in the opposite direction.) In this arrangement, as will be clearly apparent, the rod, 52, at the forward end of the car, for the time being, has been turned to coil sufficient of the chain, 51, at that end around its spool, 54, to draw the spring, 50, connected with said chain to tension, which act draws forwardly and downwardly the adjacent upper corner of the trolley arm, 26, and, consequently, raises the trolley wheel rearwardly into contact with the flat metal main conductor, whereby perfect contact between the trolley and conductor is assured. When it is desired to stop the car, all that is necessary is to slightly turn the, then, front rod, 52, to slightly unwind the chain, whereupon the tension on the spring, 50, is released, or lessened, and the lower end of the trolley arm then, automatically, by gravity, drops down and temporarily releases the trolley wheel from contact with the main conductor, 18. When it is desired to again start the car, all that is necessary is to simply return the rod, 52, to draw on the spring, 50, and again raise the trolley wheel to contact with the main conductor, 18. When the car has reached the end of its run, and it is desired to run it in the reverse direction, the rod, 52, which has been in use is turned to unwind the chain, 51, connected therewith and entirely release the tension on the spring, 50, and then insert the locking key or pin, 59, through the ratchet wheel, 56, and into engagement with the slot or hole in the car platform. Then the locking pin, 59, at the other end of the car is released, the rod, 52, at that end turned to coil a portion of the adjacent chain on the drum, 54, and thereby draw the spring, 50, connected therewith to tension and thus, as shown in dotted lines in Fig. 2, shift or switch the trolley to the other end of the car and into contact

with the main conductor, 18, in the conduit. By this construction and arrangement a perfect contact is attained at all desired times between the trolley and the main conductor, the tension exerted by the spring, 50, on the trolley arm insuring the maintenance of the contact wheel securely and firmly in contact with the conductor strip and overcoming any tendency said wheel may have in use to oscillate in either direction.

By constructing the extending upper end of the insulated conducting wire located in the trolley arm of spiral form all possibility of said conducting wire breaking under strain in shifting the trolley is obviated. This end of said wire is connected either with an ordinary register-box, pole-changer or switch (which may be of usual and known construction, and which it is, therefore, not thought necessary to show), under the car. The path or line of travel of the positive and negative currents will be well understood. The positive current from the power house travels along the sectional main conductor, 18, of flat metal, while the negative current travels through the trolley, conducting wire, 30, motor or register-box, axles, wheels and rails to the power house.

What I claim, and desire to secure by Letters Patent, is—

1. In an underground system for electric railways, an underground conduit consisting of a metal frame comprising a chambered lower portion having at the upper corner of one side thereof a recess of reverse U-shape in cross-section and, laterally thereof, a vertical neck having at its upper end laterally-extending flanges, an insulator canal or channel of reverse U-shape in cross-section fitted within said recess and having longitudinal side grooves adjacent to the upper portion, a main conductor seated in said grooves and resting against the upper portion of said insulated canal, substantially as and for the purpose set forth.

2. In an underground system for electric railways, a conduit consisting of a sectional metallic framing having connecting bottom flanges, one section having at its upper corner a reverse U-shaped recess and, laterally thereof, an inwardly-extending shoulder and a vertical wall and a horizontal top flange, the other section having at its upper portion an inwardly-extending shoulder and a vertical wall and a horizontal top flange, braces for bracing the upper and lower portions of said sections, a reverse U-shaped insulator canal or channel located in said recess and having longitudinal side grooves and a main conductor seated in said grooves and having seating against the top of said insulator, substantially as and for the purpose set forth.

3. In an underground electric railway system, a box or frame suspended from the platform of and medially of the wheels of a car, a trolley having pivotal bearing in said box or frame and consisting of a vertical arm hav-

ing at its upper portion and adjacent to its edges transversely-bored ears, a transverse insulated bore mediatly of said ears, an inner longitudinal groove, a transverse insulated bore connecting with the bottom of said groove, and a removable groove-covering plate, a horizontal longitudinally-grooved arm removably secured to said vertical arm, a spindle and a trolley wheel mounted thereon, links 5 pivotally connected at one of their ends with said ears, springs connected with the other ends of said links, chains connected with said springs, vertical rods and chain-reeling spools located at the opposite ends of the car frame, 10 and ratchet and pawl mechanism connected with said rods, substantially as and for the purpose set forth.

4. In an underground system for electric railways, a box suspended from a car frame, 20 a trolley arm having pivotal bearing in said box and having a trolley, or contact, wheel, operative shafts or rods and cranks located at opposite ends of the car, chain reels carried by the lower portions of said rods, pawls and 25 vertically-bored ratchets connected with said rods above the car platform and ratchet-locking pins adapted to engage the bores in said ratchets, and spring and chain connections between said rods and the respective corners 30 of the upper portion of the trolley arm, substantially as and for the purpose set forth.

5. In combination with a trolley, operating rods located at opposite ends of the car frame, yielding and chain connections connecting 35 said rods and the upper portion of the trolley arm adjacent to its respective edges, ratchets attached to said rods and having a series of vertical pin holes inwardly of their peripheries, pawls adapted to engage the teeth of said 40 ratchets and chain-guarded pins adapted to engage said pin holes and lock said ratchets

and the thereto-connected operative rods, trolley and connecting devices, substantially as and for the purpose set forth.

6. A trolley consisting of a vertical arm having a longitudinal wire-receiving groove and transverse bores connecting with the respective ends of said groove, insulating plugs contained within said transverse bores, a covering plate removably attached to said arm, a longitudinally-bored wire-receiving arm removably secured to the lower end of said vertical arm, a trolley, or contact, wheel journaled on said horizontal arm, and an insulating spool or washer and a contact bushing interposed 55 between said wheel and horizontal arm, substantially as and for the purpose set forth.

7. A trolley consisting of a vertical arm having a longitudinal current-conducting wire-receiving groove and transverse end bores 60 connecting with said groove, plugs of insulating material seated within said end bores, a groove-covering plate removably secured to said arm, a horizontal arm removably secured to the lower portion of said vertical arm and 65 having a longitudinal wire-receiving groove and a transversely-bored threaded and outwardly-extending stud or spindle, an insulating plug contained within said transverse bore, flanged contact bushings and insulating 70 spools mounted on said spindle, a trolley, or contact, wheel having rotatable bearing on said contact bushing, and a clamp nut for removably securing said bushing, spool, and trolley wheel on said spindle substantially as 75 and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

CONRAD C. G. WOLPERS.

Witnesses:

ALBERT LANDBECK,
JOHN KAISER.