No. 861,018. PATENTED JULY 23, 1907.

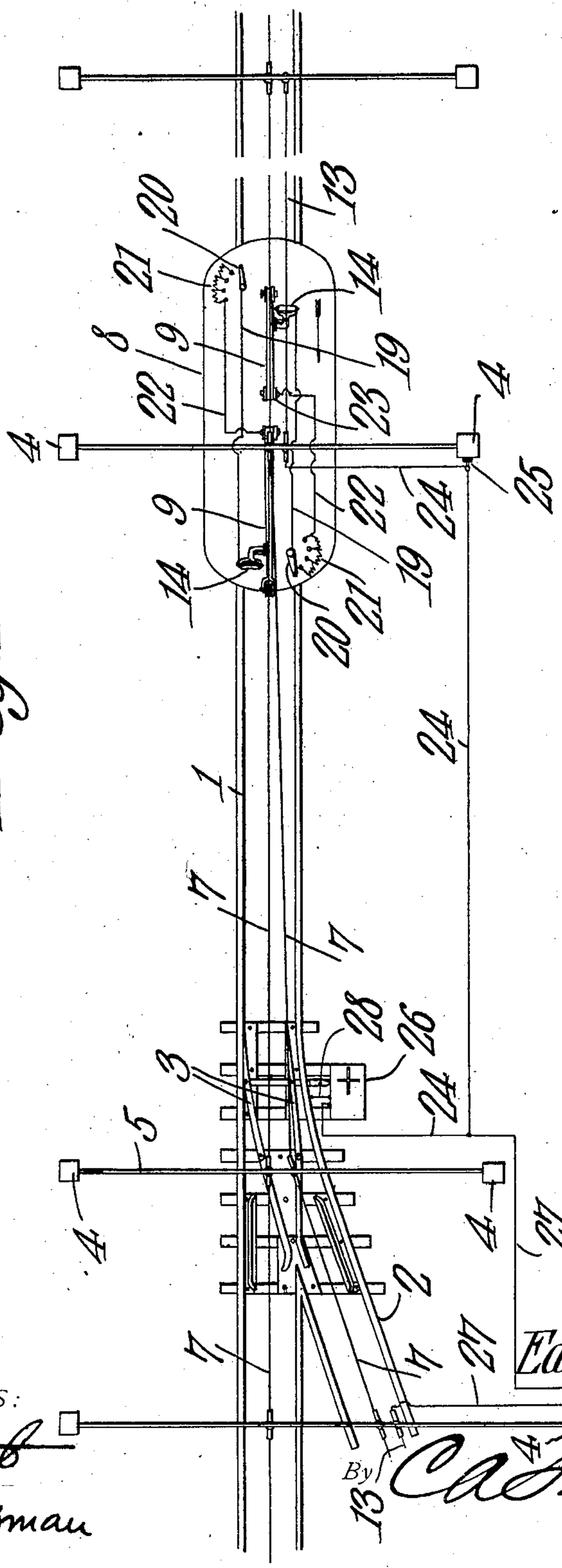
E. W. CLARK.

SWITCHING MECHANISM FOR ELECTRIC RAILWAYS.

APPLICATION FILED MAR. 26, 1907.

4 SHEETS—SHEET 1.

Fig. 1.



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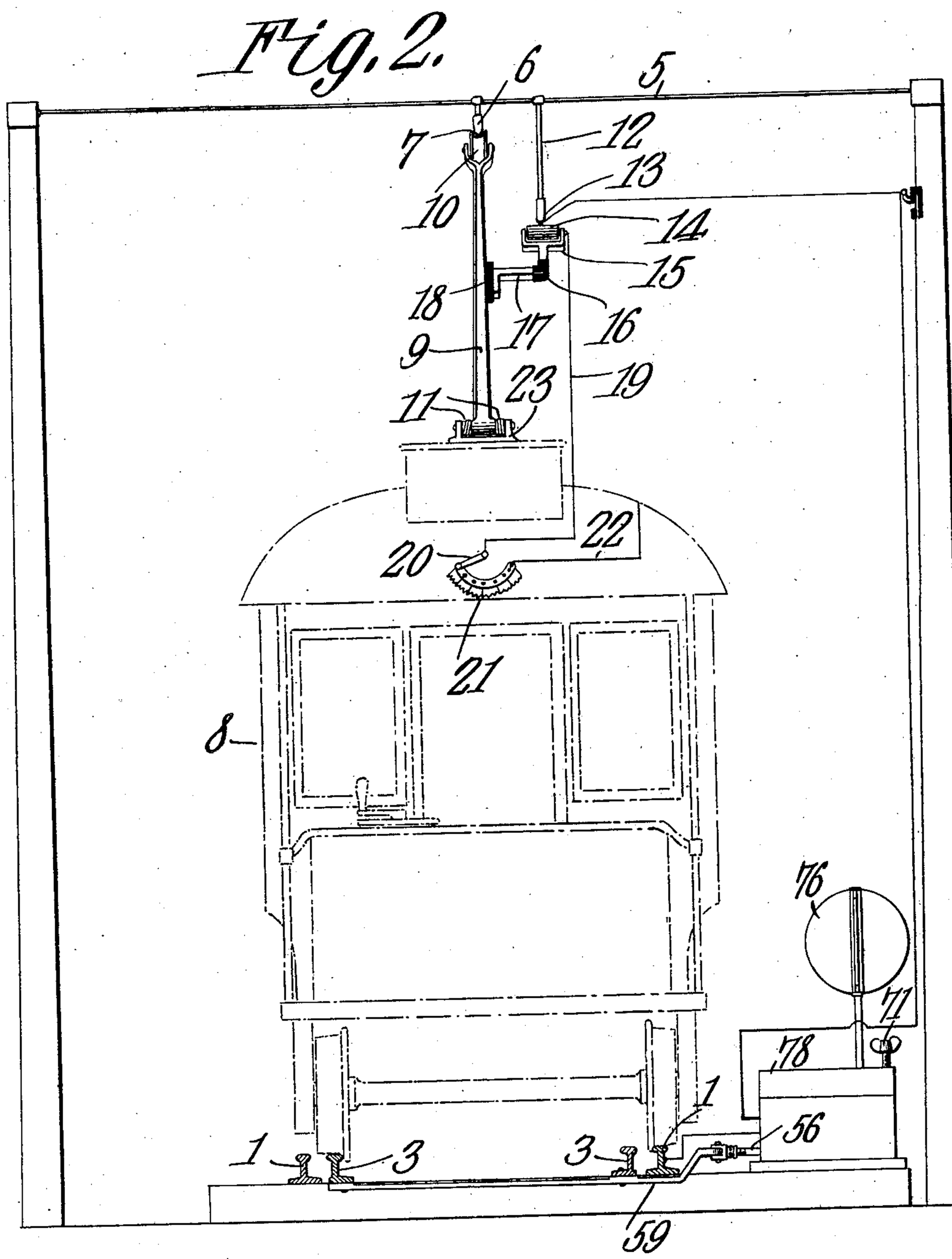
4 SHEETS—SHEET 2.

Fig. 2.



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4 SHEETS—SHEET 3.

Fig. 3.

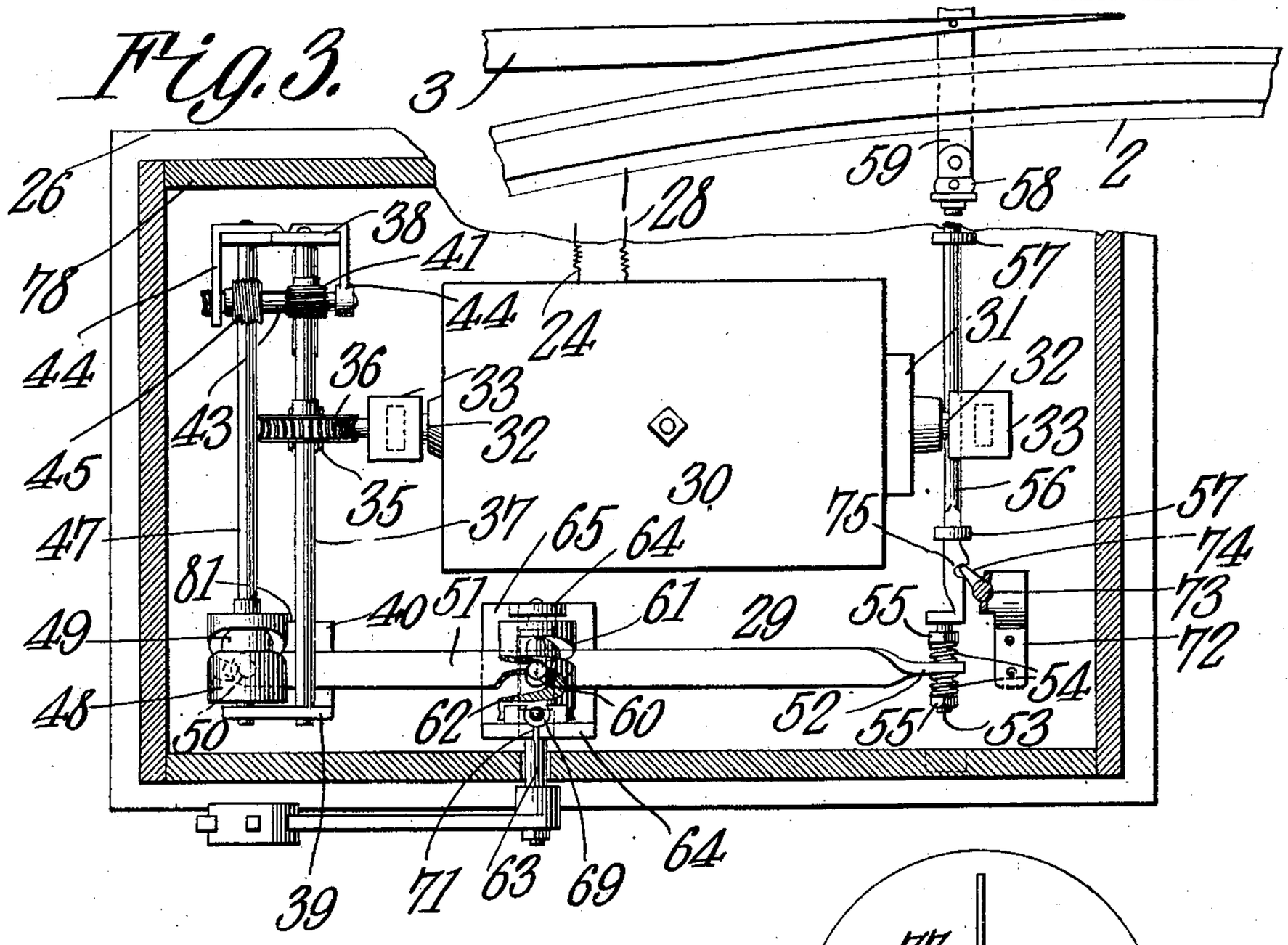
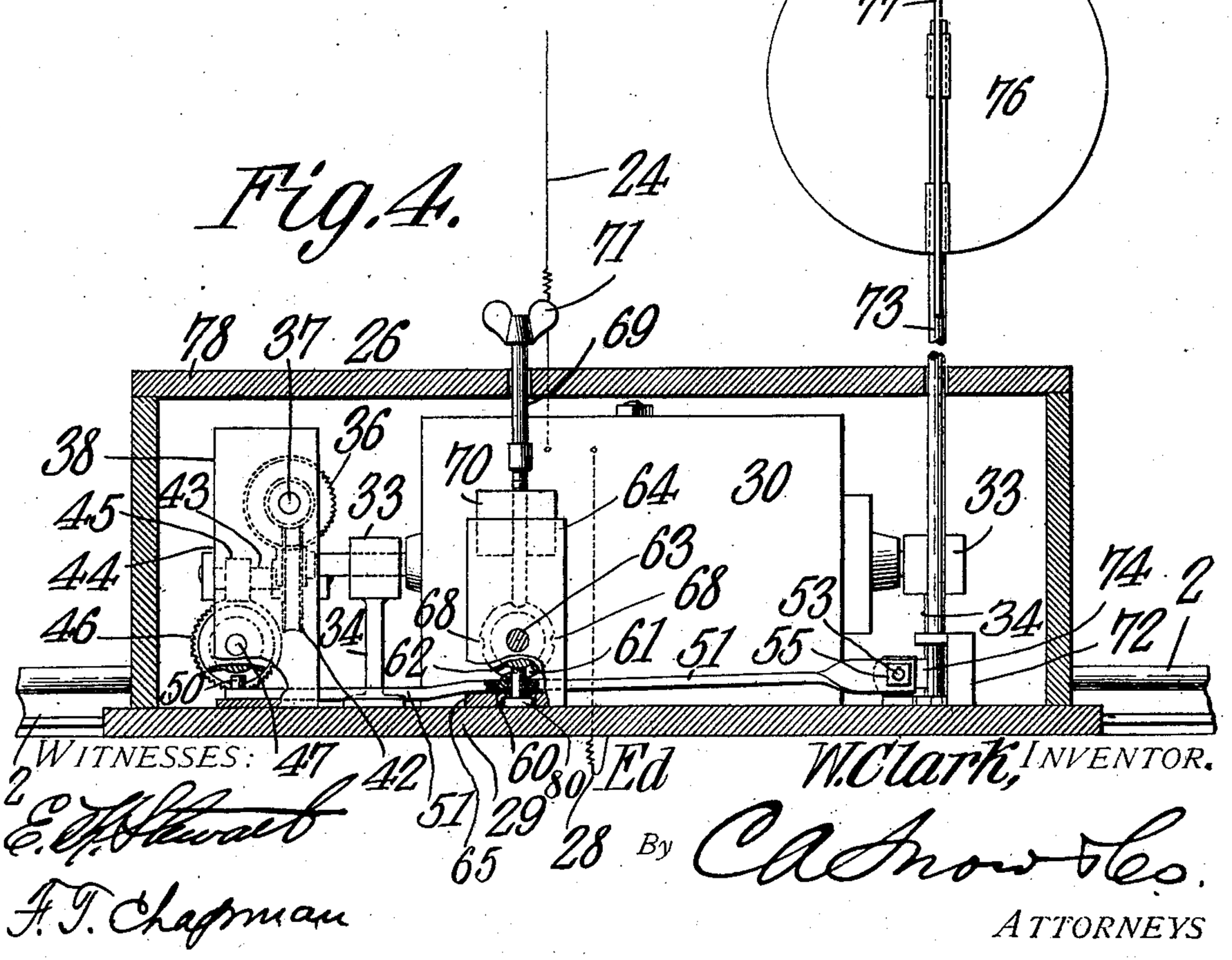


Fig. 4.



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4 SHEETS—SHEET 4.

Fig. 5.

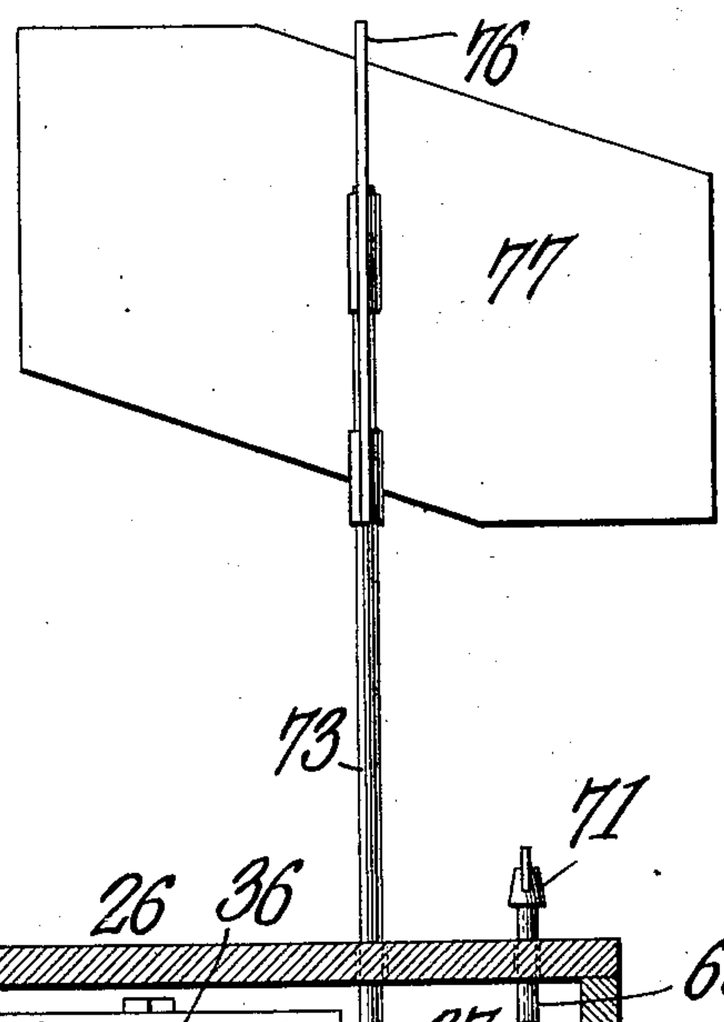

Fig. 6.

Fig. 7.

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UNITED STATES PATENT OFFICE.

ED W. CLARK, OF COALTON, OHIO.

SWITCHING MECHANISM FOR ELECTRIC RAILWAYS.

No. 861,018. Specification of Letters Patent. Patented July 23, 1907.

Application filed March 26, 1907. Serial No. 364,727.

To all whom it may concern:

Be it known that I, ED W. CLARK, a citizen of the United States, residing at Coalton, in the county of Jackson and State of Ohio, have invented a new and useful Switching Mechanism for Electric Railways, of which the following is a specification.

This invention has reference to improvements in switching mechanism for electric railways, and its object is to provide a means whereby a motorman on an electric car may control a switch from a distance, so that the car may be made to take a siding, or, if the switch be already in position to cause the car to take the siding, the motorman may, if desired, throw the switch-points in a direction to open the main line to traffic.

The invention consists essentially in a switch-point operating mechanism under the control of an electric current and circuit connections therefrom to the car within reach of the motorman, which circuit connections are so arranged that the motorman may on approaching a switch and in ample time before reaching the same, close the circuit to the switch-operating devices in such manner as to throw the switch-points so as to open the main track to the siding, that is, so that the car may pass from the main track to the siding; or, to close the main track to the siding, that is, to prevent the car from passing on to the siding but leave it free to continue to travel along the main line of track.

For the purposes of the present invention there is provided an electric motor at the switch arranged, if continuously operated, to alternately open and close the switch-points to the main track in succession, and in addition to this electrically-operated switch-point actuating mechanism, there is provided a hand mechanism by which, when desired, the switch-points may be manually operated. In addition, the usual switch target is provided, so that the motorman may note whether the siding be open or closed to traffic. For a suitable distance on each side of the switch there is provided an electric conductor in the path of a current contact on the car. Each conductor leads to the motor and may be charged through the contact on the car direct from the main power circuit. In this auxiliary circuit leading to the switch mechanism, arranged upon the car within easy reach of the motorman, an ordinary motor-starting switch is provided, so that upon approaching a switch the motorman may start the switch-operating motor without danger to the same and by observing the target ascertain when to again open the motor-starting switch in order to stop the motor when the track switch has reached the desired position.

All this will be fully set forth in the following detailed description and illustrated in the accompanying drawings forming part of this specification, in which,—

Figure 1 is a diagrammatic representation of a portion of a trolley line with my invention applied thereto; Fig. 2 is an end elevation, partly diagrammatic and partly in section, of a motor-car and road-bed with my invention applied thereto; Fig. 3 is a plan view, partly in section and partly broken away, of the switch-operating mechanism; Fig. 4 is a side elevation, partly in section and partly broken away, of the structure shown in Fig. 3; Fig. 5 is an end elevation, partly in section, of the structure shown in Figs. 3 and 4; and Figs. 6 and 7 are detail views of the switch-throwing mechanism to illustrate different phases of the operation thereof.

Referring to the drawings, there is shown an ordinary railroad track 1 such as is commonly employed in connection with trolley cars. In Fig. 1 there is shown in connection with this track 1 a siding 2 under the control of switch-points 3, all arranged in the usual manner. On each side of the track are trolley poles 4—4 between which are extended the supporting strands 5 carrying about midway of their length insulated hangers 6 to which the usual trolley wire or conductor 7 is secured. All these parts may be of the usual construction found in a trolley system, and the drawings show these parts simply in a diagrammatic or conventional manner.

There is also shown in Figs. 1 and 2 a trolley car 8 which may be of the ordinary type and needs no especial description. The trolley car is provided with the usual under-running trolley arm 9 having the usual wheel or roller 10 for engaging the conductor 7 and urged into contact therewith by a suitable spring mechanism such as indicated at 11.

For some distance, say, sufficient to include two or three poles 4 in a direction approaching the switch, the strands 5 are provided with other hangers or brackets 12 alongside of but sufficiently removed from the hangers or brackets 6 for the purposes of the invention. These brackets 12 extend downward to a greater distance than the brackets 6 and carry a conductor 13 in the path of a cylindrical roller 14 mounted upon the trolley arm 9. The means of supporting the roller consists of a forked arm 15 connected by an insulating angle coupling 16 to a bracket 17 projecting laterally from the arm 9 but having interposed between it and the arm 9 an insulating block 18 so that the roller 14 is most effectually insulated from the trolley arm 9. It will be noticed that the collecting roller 14 is cylindrical while the ordinary trolley collecting roller 10 is grooved. The roller 14 is made cylindrical so as to accommodate itself to any variation of distance between the conductors 7 and 13 without bringing strain upon either, and it will be found that for the purposes for which this roller 14 is designed the contact surface between this roller and the conductor 13 will be ample.

In the particular structure shown in the drawings the motor car is provided with two trolley arms 9, each of which carries a roller 14, and each of these rollers 14 is connected by a heavily insulated conductor 19 to one terminal, say, the switch arm 20, of a motor-starting switch 21, and these two switches have their other terminals connected by a conductor 22 to the main circuit of the car, say, to the bracket 23 forming the trolley arm support or to any other point in the main power circuit of the car.

The conductor 13 terminates at the last set of trolley poles 4 in advance of the switch and from the terminal of the conductor 13 the circuit passes through another conductor 24 leading to an insulator 25 on one of the poles 4 and from thence it is carried in any suitable manner to a switch-operating mechanism 26 adjacent to the switch-points 3, which switch-operating mechanism will be hereinafter described. The conductor 24 may be carried down the trolley pole 4 carrying the insulator 25 and from thence carried under ground to the switch-operating mechanism 26, or it may reach this switch-operating mechanism in any other desirable way providing only that it shall be out of reach of the roller 14 which up to this point had been in contact with the conductor 13. Another conductor 27 may lead from the conductor 24 to an insulator 25 on a trolley pole beyond the switch and from thence the conductor 27 may be connected to the end of another conductor 13 arranged parallel and below the main trolley wire 7 over the siding, so that the roller 14 may again come in contact with the conductor 13 after the car has passed on to the siding and the track switch-operating mechanism be again brought under the control of the motorman after the car has passed upon the siding, so that the track switch may be so moved as to again open the main track to traffic.

Now, let it be assumed that the switch-operating mechanism 26 is such that it may be actuated by an electric current, that the trolley car is approaching a siding, and that the appropriate roller 14 has come in contact with the conductor 13, which latter, of course, is a bare conductor like the trolley wire 7. At this time no current will flow because the switch arm 20 is on an idle contact. Let it be assumed that the motorman desires to take the siding. He moves the switch arm 20 across the several contacts of the motor-starting switch 21 in the usual manner. As soon as the first contact is reached the circuit is completed from the main conductor 7 to the power circuit of the car, thence by conductor 22 to the starting switch 21, thence by conductor 19 to the roller 14, thence to the conductor 13 and by the conductor 24 from this conductor 13 to the track switch-operating mechanism 26, and the latter is connected to the rails by another conductor 28, thus completing the circuit, it being assumed that the rails constitute the return circuit in the system under consideration. When the switch-points 3 have been moved to close the switch to the siding, the motorman opens the motor-starting switch 21 and the movement of the switch-points ceases, since the auxiliary circuit through the conductor 13 has been broken at the electric switch 21. The trolley car may now take the siding, and after having safely passed thereon the roller 14, which had passed off the end of the conductor 13 on approaching the siding, again makes contact with the same where it begins over the tracks of the siding and the motorman may then again manipulate the electric switch 21 so as to cause the switch-points to be closed to the siding in order to open the main line of way to traffic.

The mechanism for operating the switch-points is shown in Figs. 3 to 7, inclusive, and reference will now be had to those figures.

Upon a suitable base or support 29 there is mounted an electric motor 30, indicated in the drawings simply as a rectangular box since it is immaterial what type of motor be used so long as it is adapted to be actuated by the current employed to drive the trolley car. The armature 31 of the motor has its shaft 32 mounted in suitable journal bearings 33 supported on short standards 34 fast on the base 29. At one end the armature shaft carries a worm 35 arranged to engage a worm gear wheel 36 fast on a shaft 37, the ends of which have journal bearings in posts 38—39 erected on the base 29, the post 39 being provided with a flange or foot 40 to be hereinafter referred to. The shaft 37 also carries a worm 41 arranged to engage a worm gear wheel 42 mounted on a short transverse shaft 43 having journal bearings in brackets 44 fast on the post 38 and this short shaft 43, in turn, carries a worm 45 arranged to engage still another worm gear 46 upon a shaft 47 parallel with but displaced with relation to the shaft 37 and having journal bearings at a lower point in the posts 38 and 39. Upon one end of the shaft 47 there is secured to rotate therewith a drum 48, entirely around which extends a cam slot 49 appropriately shaped to perform certain functions which will hereinafter appear. Within the cam slot there is arranged a stud 50 rising from a lever arm 51 extending to the other end of the motor where the end of the lever arm is given a quarter twist, as indicated at 52. This twisted end of the lever is appropriately perforated for the passage of a threaded rod 53 carrying springs 54 on each side of the end 52 of the lever 51, and these springs are confined against the lever end 52 by tension adjusting nuts 55. The threaded rod 53 is fast in one end of another rod 56 sliding in bearings 57 fast on the base 29, and having a pivotal connection 58 with a link 59 extending under the track and fast to both switch points 3. Between the two ends of the lever 51 there is provided another stud 60 arranged to engage in a cam slot 61 extending part of the way around another drum 62, which latter is mounted on a shaft 63 journaled in uprights 64 rising from a base plate 65 fast on the base 29. The stud 60 is mounted on a short plate 80 having a limited movement lateral to the longitudinal plane of the lever 51, and housed in a suitable recess in the bottom of the base plate 65. The stud 60 extends upward through a slot 81 in the base plate 65. The shaft 63 has on its outer end an operating lever 66 provided with a weighted end 67. This lever 66 is the ordinary hand-operating lever found on certain types of switch stands. The drum 62 is provided near one end with notches 68 in which is arranged to engage one end of a rod 69 appropriately threaded and passed through a nut formed in a side extension 70 of the adjacent upright 64. This rod has at its upper end a wing nut 71, or other suitable means of operation, and it is intended to lock the drum 62 against rotation when so desired.

Mounted at one side of the rod 56 in a suitable

bracket 72 is an upright shaft 73 having near its lower end a laterally extending stud 74 arranged to engage in a notch 75 in the rod 56, while at the upper end the shaft 73 carries an ordinary switch target composed of a disk 76 and an inclined vane 77 mounted at right angles to each other in the usual manner, and, of course, appropriately colored, that is, the disk is usually painted white and the vane is painted red.

All the parts of the track switch-operating mechanism except the end of the rod 56 where it is connected to the link 59, the lever 66, the upper end of the rod 69 where it carries the wing nut 71, and the upper end of the vertical shaft 73 where it carries the target signals, are inclosed in a suitable box indicated generally by the numeral 78.

Let it be assumed that the lever 51 is in the position shown in Fig. 6, that is, the switch-points 3 are in the position whereby the main line is open to traffic and the siding is closed to traffic. Suppose that under these conditions the motorman desires to enter the siding. He closes the motor-starting switch in the manner before described and the motor begins to rotate in a certain predetermined direction. This will cause the drum 48 to rotate slowly. The cam groove 49 engaging the pin 50 on the lever 51 will cause the latter to move about the pin 60, seated in the groove 61, as a fulcrum or axis and the other end 52 of the lever 51 will be moved in a direction to open the switch, which means that the siding is connected to the main track in such manner that the car may pass from the main track on to the siding.

The condition of the parts after the operation just described has ceased is shown in Fig. 3 of the drawings. When this position is reached the red target is displayed to the motorman and he can then break the circuit at the motor-starting switch and the switch-points will remain fixed in the position allowing the car to enter the siding. Having passed on to the siding, the motorman will again close the motor-starting switch and the motor will start rotating in the same direction and the cam groove 49 of the drum 48 still acting upon the pin 50 will move the lever 51 about the pin 60 as a pivot in the opposite direction, thus again bringing the parts to the position shown in Fig. 6 wherein the switch-points are closed to the main track, so that another car may pass over the main track without entering the siding. During this time the drum 62 has been locked against rotation by the rod 69 which has been so adjusted as to enter one of the notches 68. Now, suppose that it is desirable to operate the switch-points by hand. The drum 48 is held immovable by its connection to the gearing between it and the motor. The drum 62 is unlocked by the suitable manipulation of the rod 69 and then the hand lever 66 is thrown in the usual manner, rotating the drum 62 upon its longitudinal axis. Under these conditions the lever 51 is again moved so that its end 52 will engage the rod 56 in a manner to cause the opening of the switch to permit the car to enter the siding, and when the hand lever 66 is moved back to its first position the switch-points are again closed to leave the main line of track open to traffic.

The motor-starting switches are located in the vestibules of the cars and are preferably placed above the motorman's head so that he may have ready access to them but they will be out of the notice or reach of the passengers.

It will, of course, be understood that at night the switch-operating mechanism will be provided with suitable lights as is usual, so that the motorman will be able to ascertain from looking at the lights the position of the switch-points relative to the main track.

I claim:—

1. In a switch-operating system for electric railways, a main power conductor, a supplemental conductor adjacent thereto, an electric switch-operating mechanism connected to the supplemental conductor, a trolley collecting arm for the main circuit of a car, and a supplemental arm attached to but insulated from the trolley arm and carrying a collecting roller having an extended engaging face for the supplemental conductor.

2. In a switch-operating system for electric railways, a main power conductor, a supplemental conductor adjacent thereto, an electric switch-operating mechanism connected to the supplemental conductor, a trolley collecting arm for the main circuit of a car, a supplemental arm attached to but insulated from the trolley arm and carrying a collecting roller having an extended engaging face for the supplemental conductor, circuit connections between the supplemental collecting roller and the main circuit on the car, and a switch interposed in the last-named circuit connections.

3. In a track switch-operating means for electric railways, a lever, connections between the same and the track switch-points, a rotating member having a continuous cam groove and engaging one end of said lever, means for driving said rotating member in one direction only, another member provided with a cam groove and engaging said lever between its two ends, and means for rocking the last-named member to cause its cam groove to move the switch-point-operating lever in the opposite direction.

4. In a switch-operating means for electric railways, a lever, connections between the same and the switch-points, an electric motor for operating the lever, connections between the same and the lever, and hand operating means for the lever, the electrically-operated means for moving the lever and the hand-operated means for moving the lever acting interchangeably as the fulcrum or pivot point of said lever.

5. In a switch-operating means for electric railways, a lever, connections between the same and the switch-points, an electrically-operated lever-actuating means, a hand-operated lever-actuating means, the said hand and electrically-operated lever-actuating means acting interchangeably as the pivot point for said lever, and a locking means engaging the hand-operated means for holding the latter against movement.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

ED W. CLARK.

Witnesses:
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R. L. GRIMES.