No. 756,870. PATENTED APR. 12, 1904.

M. A. MARKS, Jr.

# ELECTRIC RAILWAY SWITCH.

APPLICATION FILED FEB. 4, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 1

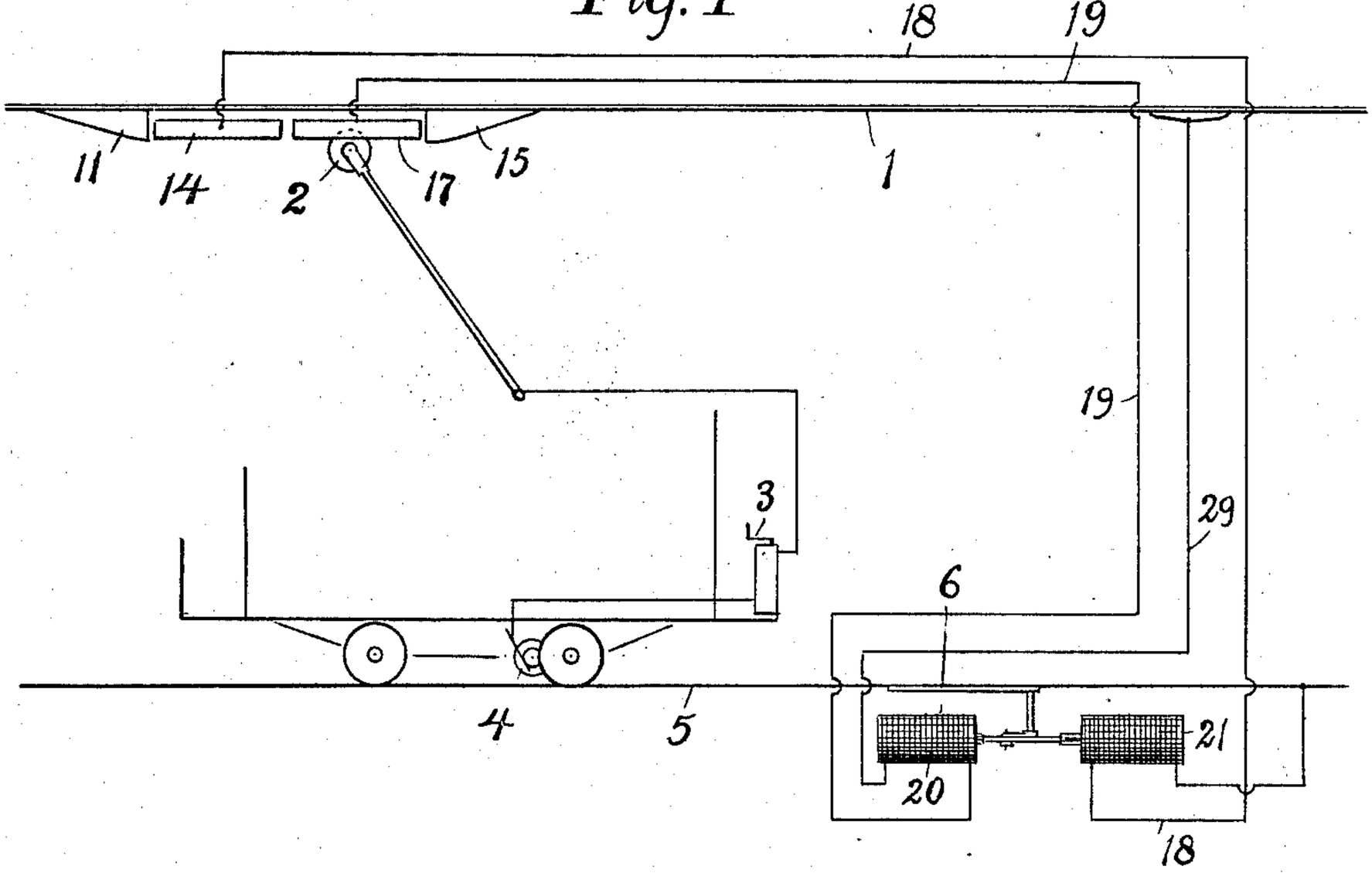
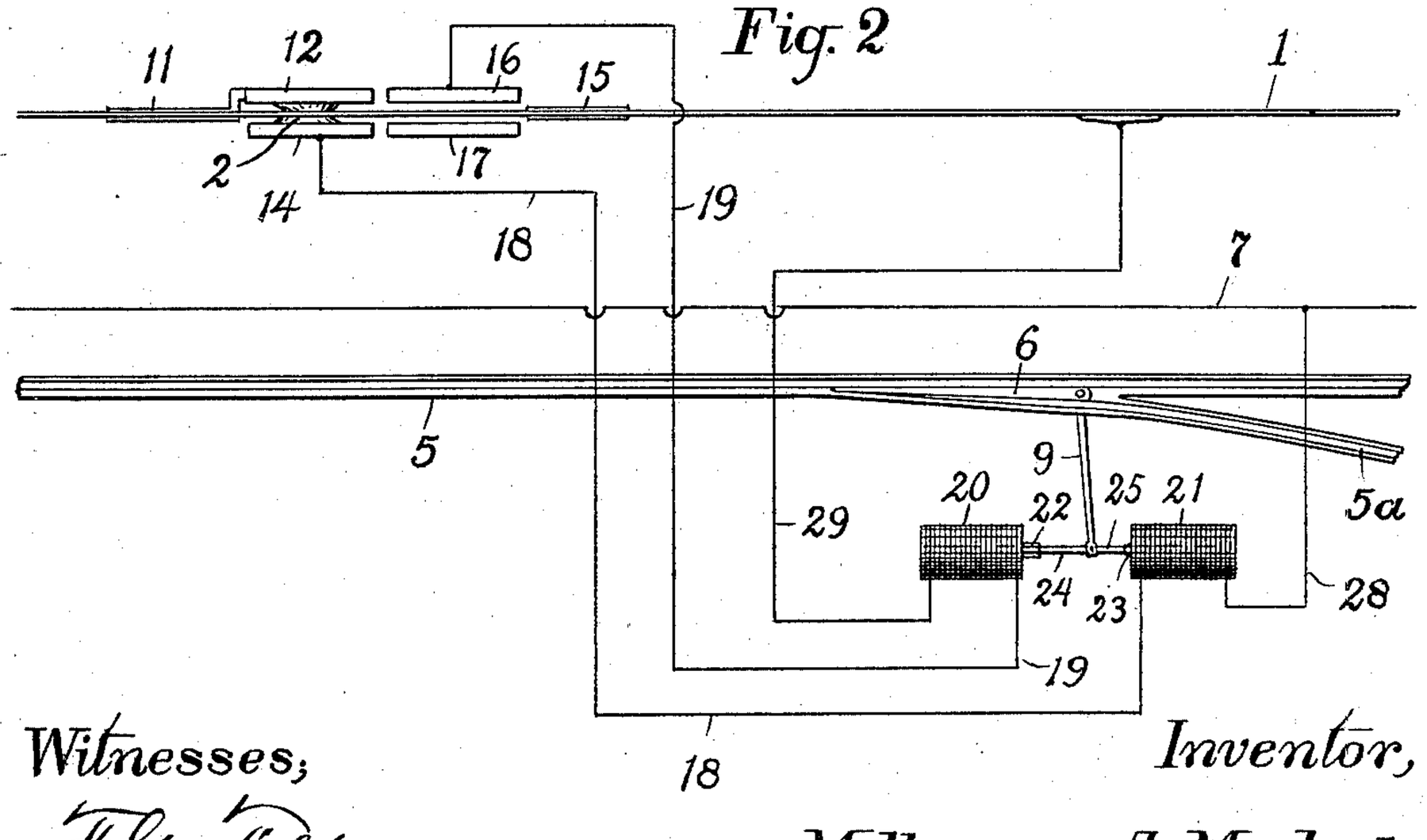



Fig. 2




Witnesses;

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NO MODEL. 3 SHEETS—SHEET 2.

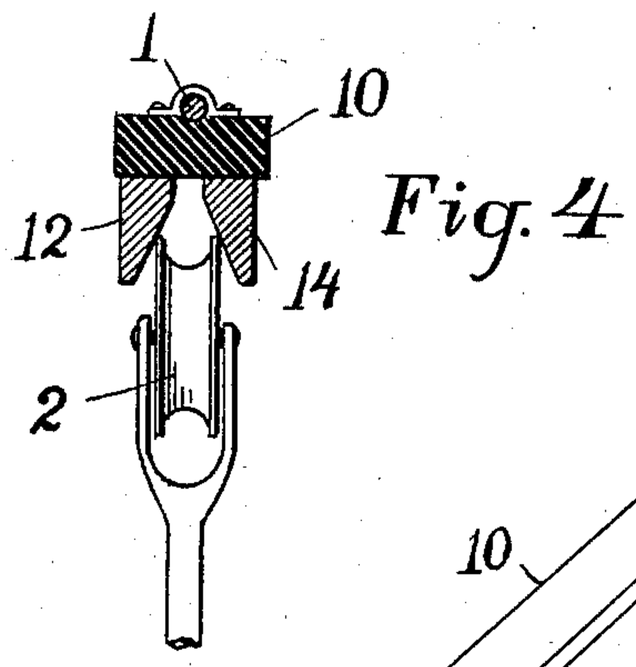


Fig. 4




Fig. 3




Fig. 10

Fig. 5




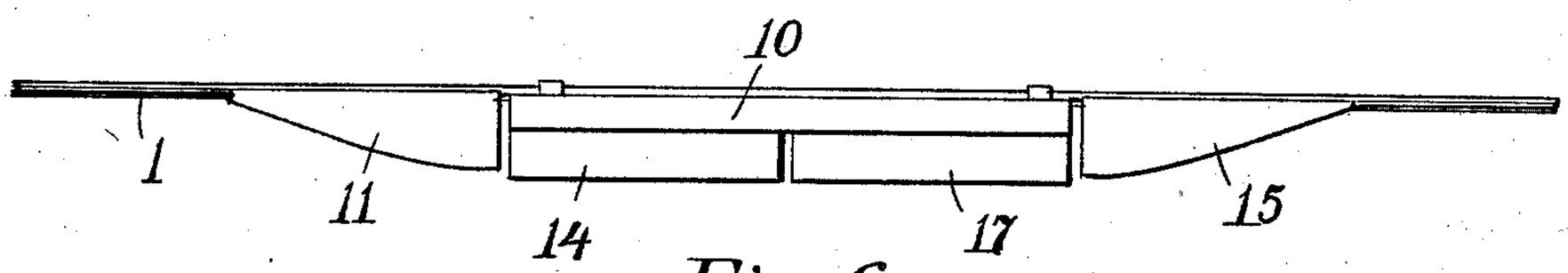


Fig. 6

Witnesses;

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ELECTRIC RAILWAY SWITCH.

APPLICATION FILED FEB. 4, 1903.

NO MODEL. 3 SHEETS—SHEET 3.

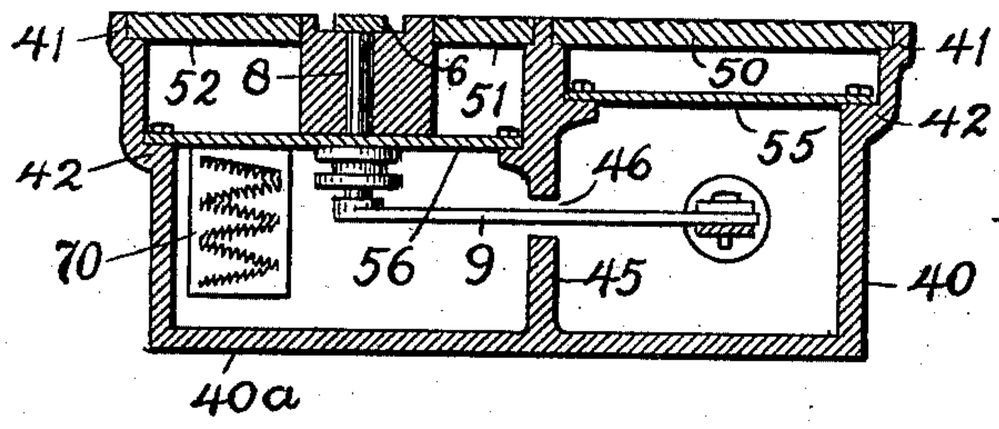
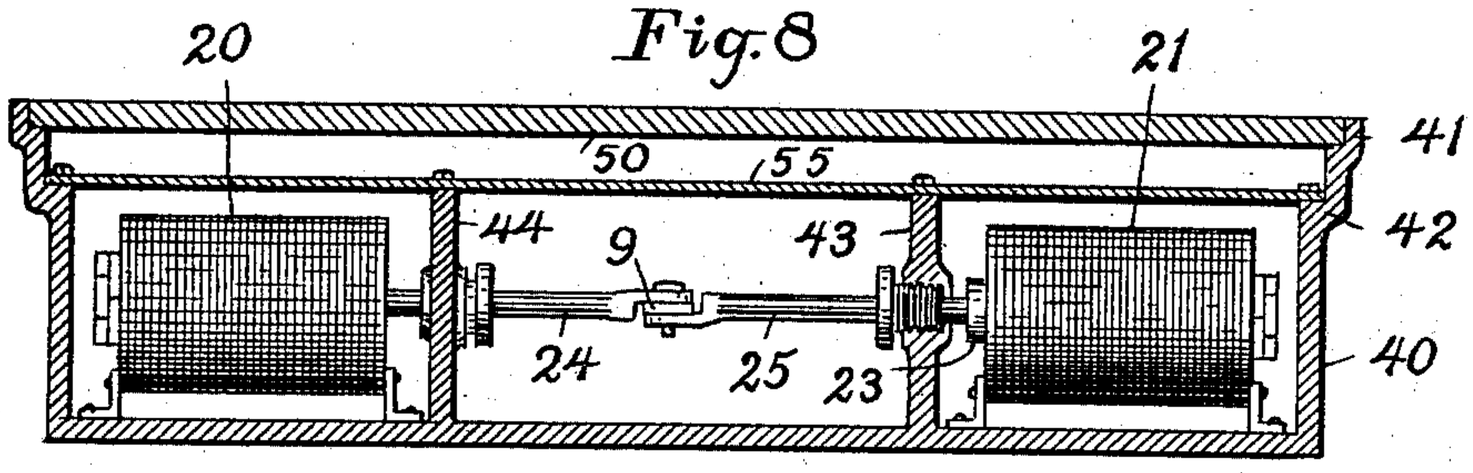



Fig. 7

Fig. 8



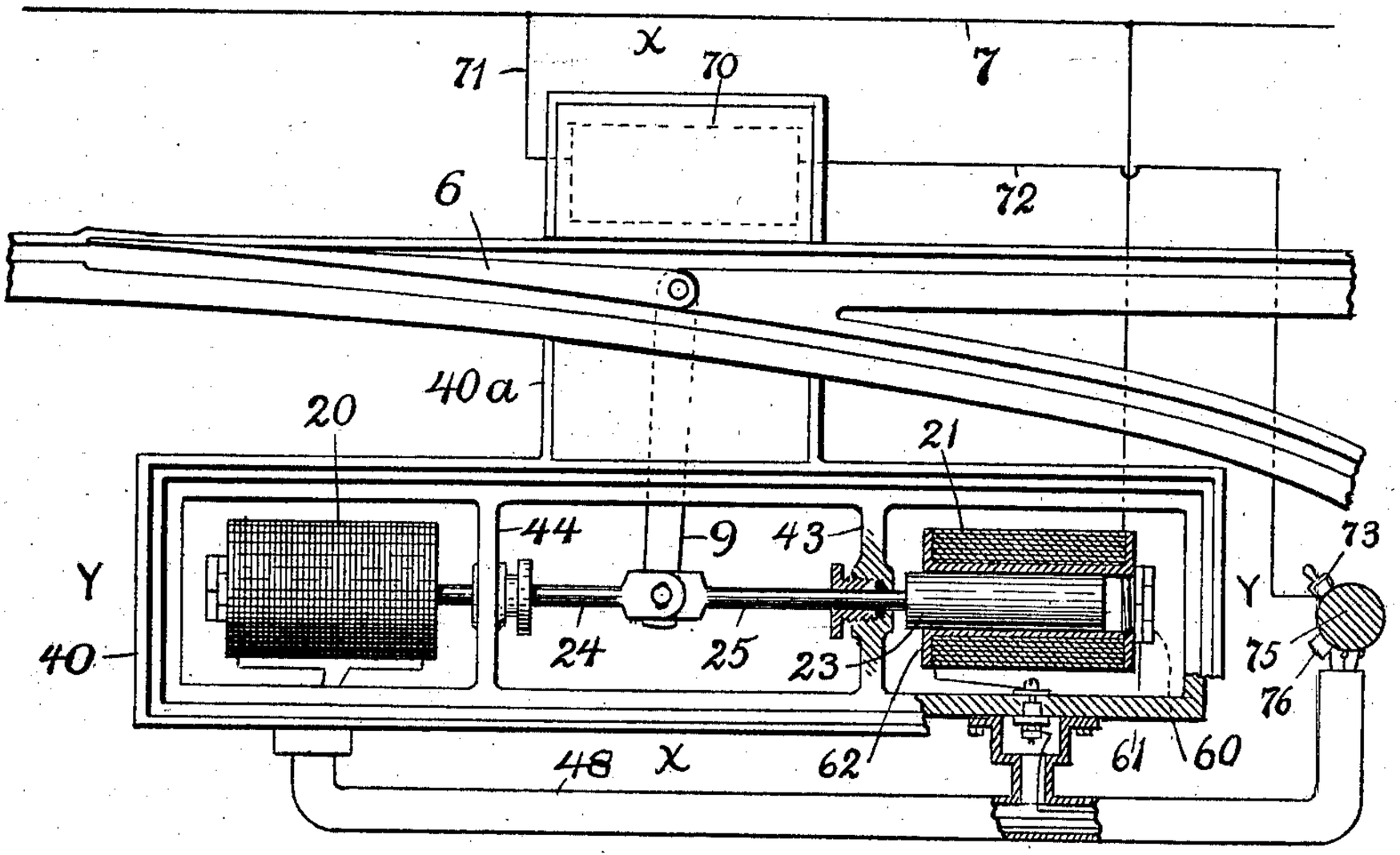




Fig. 9

Witnesses;
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No. 756,870. Patented April 12, 1904.

# UNITED STATES PATENT OFFICE.

MELBOURNE A. MARKS, JR., OF BROOKLINE, MASSACHUSETTS.

## ELECTRIC-RAILWAY SWITCH.

SPECIFICATION forming part of Letters Patent No. 756,870, dated April 12, 1904.

Application filed February 4, 1903. Serial No. 141,828. (No model.)

*To all whom it may concern:*

Be it known that I, MELBOURNE A. MARKS, Jr., a citizen of the United States, and a resident of Brookline, in the county of Norfolk, State of Massachusetts, have invented certain new and useful Improvements in Electric-Railway Switches, of which the following is a full, clear, and exact description

My invention is in the line of switches for trolley street-car lines; and it has for its object the effecting of certain improvements in details of construction whereby the switch-point can have the necessary current applied to operate it without requiring the cars to be provided with additional levers or switches; further, in an improved arrangement of the means directly controlling the switch-point, to devices for preventing the switch-point from being rendered inoperative by ice, and to other details hereinafter set forth.

Referring to the drawings forming part of this specification, Figure 1 is a diagram representing in side elevation the general arrangement of the parts. Fig. 2 is a diagram in plan view showing the switch-point, but omitting the car. Fig. 3 is a perspective view of the parts connected with the trolley-wire. Fig. 4 is a transverse section of the same, showing the trolley-wheel contacting therewith. Fig. 5 is an under view of said parts. Fig. 6 is a side view of the same. Fig. 7 is a sectional elevation through X X in Fig. 9 of the switch-operating mechanism. Fig. 8 is a sectional elevation of the same through Y Y in Fig. 9. Fig. 9 is a plan view of the same, a part thereof being in section; and Fig. 10 is a view of the automatic temperature-switch.

The reference-numeral 1 designates the overhead trolley-wire for supplying operative current to the car-motors 4 through the trolley 2, the usual power-handle 3 being provided for turning on and off the energizing-current. (See Fig. 1.)

5 is one of the track-rails, 5ª the branch track therefrom, and 6 the switch-point. Said switch-point is rigidly connected through its pivotal spindle 8 with the lever-arm 9, and the extremity of the said arm is engaged by the rods 24 25, carrying the cores 22 23 of the solenoids 20 21. Current being supplied to one or the other of said solenoids, the switch-point is shifted accordingly. My arrangement for enabling the switch-point to be shifted to switch the car to a branch track or to continue straight ahead without additional levers for the motorman to manipulate is as follows: Secured beneath the trolley-wire 1 at a suitable distance in advance of the switch is the insulating-block 10, carrying beneath it the contact-ways 12 14 16 17, all insulated one from another. As shown in Fig. 4, these contact-ways are inclined upon their inner faces and located at such distance apart as to receive a trolley-wheel between them. To properly guide the trolley-wheel to and from this space, the acute-angled plates 11 and 15 are provided. Of these two the plate 11 is put into permanent circuit with the contact bar or way 12 and also into circuit with the trolley-wire 1. Its companion contact-bar 14 is connected, through the wire 18, with the solenoid 21, while the circuit is completed through the said solenoid, through the wire 28, to the track return-wire 7. Hence when the trolley-wheel 2 reaches the two contact-bars 12 14 and the power-handle 3 of the car is turned to shut off the power to the motor the current from the trolley-wire 1 passes from the same, through the plate 11, to the contact-bar 12, thence through said wheel to the other bar 14, and by the way of the wires already described to the solenoid 21 and return-wire 7. This energizes said solenoid, and thereby attracts within it the core 23, and so sets the switch-point 6 for a straight-ahead course of the car. When the same wheel 2 reaches the two contact-bars 16 17, the current passes from the trolley-wire 1, through the wire 29, to the solenoid 20, and from thence, through the wire 19, to said contact-bar 16, then down the trolley-wheel, pole, and controller to the car-motor, and so back to the track and return-wire 7. The solenoid 20 being thus energized, the lever-arm 9 will be moved to throw the switch-point 6 in the opposite direction, and so guide the car-wheels into the switch-track 5ª. If now the power-handle 3 is turned to keep the current on as the trolley-wheel passes the contact-bars aforesaid, the solenoid

20 will be the one last to operate the switch and the car will be guided to the switch-track 5ª. If then it is desired to keep the car on the main track, the motorman turns off the current just before his trolley reaches the contact-bars, permitting the car to coast for a few feet. In this manner the switch is operated by a perfectly natural manipulation of the power-handle, and all that he has to remember is that the power-handle is to be turned when the car is to keep on the main track and the handle to remain unchanged when the car is to force its way about the curved switch-track 5ª, and inasmuch as power is required to pass about the curve and comparatively none to keep on straight ahead a short distance the motorman can have no difficulty in instinctively recalling what to do under the circumstances.

My arrangement for keeping the apparatus from moisture is as follows: As shown in Figs. 7, 8, and 9, the switch-operating mechanism is located in the T-shaped box 40, arranged as shown in Fig. 9, with what corresponds to the cross-arms parallel with the track-rail and with its top flush with the surface of the street, and hence with the face of the tracks. The upper edges of the box are formed with rabbets 41 for the reception of the covers 50, 51, and 52, preferably of heavy cast-iron, suitably scored or roughened to prevent horses' feet from slipping thereon. Beneath these outer covers are the plates 55 56, designed to be bolted water-tight upon the shoulders or rabbets 42 of the box. Beneath these inner covers or plates are located the switch-operating mechanism already described. The portion of the track containing the switch-point 6 cuts through the box-section 40ª between the outer covers 51 52 and just above the inner cover or plate 56. Through it passes the spindle 8 from said switch-point to the lever-arm 9, suitable packing-box being arranged for said spindle, as shown in Fig. 7, and said arm reaching through a slot 46 in the partition 45 to the chamber included between the partitions 43 44, between which latter and the box ends are located the solenoids 20 21. The rods 24 25 from the cores of said solenoids pass through said partitions and are supported thereby, suitable stuffing-boxes being provided to insure against the admission of any water to the solenoids from other parts of the box.

To prevent any unnecessary strain upon the spindle 8 and arm 9 when the switch-point is thrown and reaches its limit of movement, I prefer to provide the solenoids with adjustable stops for receiving the impact of the cores 22 23. These adjustable stops comprise the screw-plugs 60, turning in the correspondingly-threaded interior of the solenoids, and check-nuts 61, being added to guard against dislodgment. Each solenoid consisting, preferably, of a brass spool 62, supporting the windings, it is this brass spool which is internally threaded for a short distance at one end.

Inasmuch as frozen snow and ice are the hitherto greatest drawback against the practicability of automatically-operated tramway-switches, I have devised means for preventing such freezing without the aid of salt and its deleterious results upon horses' hoofs. My means consists of an electric heater 70, located within the chamber below the plate 56 within the box and arranged to communicate the required amount of heat to the switch-containing rail just above to wholly prevent water and snow from freezing within its grooves. This heater takes its current from the trolley-wire 1 through a wire 72, connected with a switch 73 on the pole 75, the circuit from said heater comprising the wire 71, joined to the track return-wire 7. (See Fig. 9.) By switching the current onto this heater whenever the weather is cold enough to require it the switch-point 6 is kept from all danger of becoming frozen up. I prefer to have this switch one which is automatically operated by variations in atmospheric temperature, so that whenever the freezing-point is reached the current will be automatically switched to the heater or turned off therefrom, and so dispense with any necessity for the men to operate the switches when there is danger of freezing. This automatic temperature-switch is illustrated in Fig. 10 and consists of the customary arrangement of two united strips of unequally-expanding metals, designed to straighten and complete the circuit at a designated low temperature.

What I claim as my invention, and for which I desire Letters Patent, is as follows, to wit:

1. In an automatic switch, the combination of a switch-point, magnetically-operated devices controlling said switch-point, a trolley-wire, and two pairs of contact-bars supported by said wire; one bar of the first pair being in permanent circuit with said wire but the other normally insulated therefrom and connected with one of said magnetically-operated devices, the two bars of this pair being put into circuit by the passage of a trolley-wheel between and in contact with them; and both of the other pair of bars being permanently insulated from said wire, but one thereof being connected with the other of said magnetically-operated devices and the latter being wired to said trolley-wire; the first-named magnetically-operated device being in circuit with the track-return, substantially as described.

2. In an automatic switch, the combination with the trolley-wire of the insulating-block suspended therefrom, the contact-bars fixed to the under side of said block and having inclined inner faces constructed to receive a trolley-wheel between them, and the acute-angled plates fixed to said trolley-wire and having their vertical ends close to said block and bars,

whereby the trolley-wheels of passing cars are directed to and from their path between said bars, substantially as described.

3. In an automatic switch, the combination with the trolley-wire, of the insulating-block suspended therefrom, the contact-bars fixed to the under side of said block and having inclined inner faces constructed to receive a trolley-wheel between them, and the two acute-angled plates fixed to said trolley-wire with their vertical ends close to said block, and with one of said plates in permanent circuit with one of said contact-bars, substantially as described.

4. In an automatic switch, the combination of the trolley-wire, the insulating-block suspended therefrom, the two pairs of contact-bars fixed to the under face of said block, one bar of one of said pairs being in permanent circuit with the trolley-wire, means for guiding trolley-wheels to and from the space between said bars, a switch-point, two electrically-operated solenoids having their cores constructed to throw said switch, electric connections between one of said solenoids with the trolley-wire and with the pair of contact-bars not in circuit with the trolley-wire, and electric connections between the other of said solenoids and the track-return and also with that one of the contact-bars of the pair which is companion to the one in permanent circuit with the trolley-wire, substantially as described.

5. In an automatic switch, the combination with the switch-point having the vertical spindle rigid therewith, the lever-arm fixed to the lower end of said spindle, the solenoids having the cores movable therein, the rods projecting from said cores and terminally joined to the extremity of said lever-arm, a water-tight box inclosing said parts, and partitions in said box having openings through which said rods reciprocate and by which they are supported, substantially as described.

6. In an automatic switch, the combination with the track, switch-point, spindle, lever-arm and solenoids connected with said arm, of the T-shaped box fitted to said track and inclosing said arm and solenoids and having the water-tight covers, substantially as described.

7. In an automatic switch, the combination with the track, switch-point and lever-arm rigidly connected with said switch-point, of the T-shaped box divided by vertical partitions into four chambers one of which partitions is slotted to permit the passage of said lever-arm, solenoids located in the two chambers in the arms of the T, cores in said solenoids, rods rigid therewith and projecting through the remaining two of said partitions and joining said lever-arm, and stuffing-boxes for said rods in said partitions, substantially as described.

8. In an automatic switch, the combination with the track, switch-point, spindle and lever-arm, of the T-shaped box having the rabbets in its upper edges and another set below the first, three vertical partitions, two rising only to the level of the lower set of rabbets and the other partition slotted for the passage of said lever-arm, a plate secured water-tight to the lower rabbets below said track and having a stuffing-box and opening for said spindle, a plate secured water-tight upon the lower set of rabbets over said low partitions, covers fitted to the upper rabbets, and electrically-operated devices located in said box and connected with said lever-arm, substantially as described.

9. In an automatic switch, the combination with the switch-point, solenoids and cores for said solenoids constructed by their reciprocation to shift said switch, of stops for receiving the impact of said cores and thereby relieving the other parts of strain and shock, substantially as described.

10. In an automatic switch, the combination with the switch-point, spindle rigid therewith, and lever-arm projecting from said spindle, of two solenoids having cores connected with said arm, and stops for said cores comprising screw-plugs fitting within the rear ends of the solenoids, substantially as described.

In testimony that I claim the foregoing invention I have hereunto set my hand this 30th day of January, 1903.

MELBOURNE A. MARKS, JR.

Witnesses:
JAMES H. MCKINLEY,
A. B. UPHAM.