W. C. CARR.

TRANSPORTATION SYSTEM.

APPLICATION FILED FEB. 13, 1909.

956,040.

Patented Apr. 26, 1910.

5 SHEETS—SHEET 1.

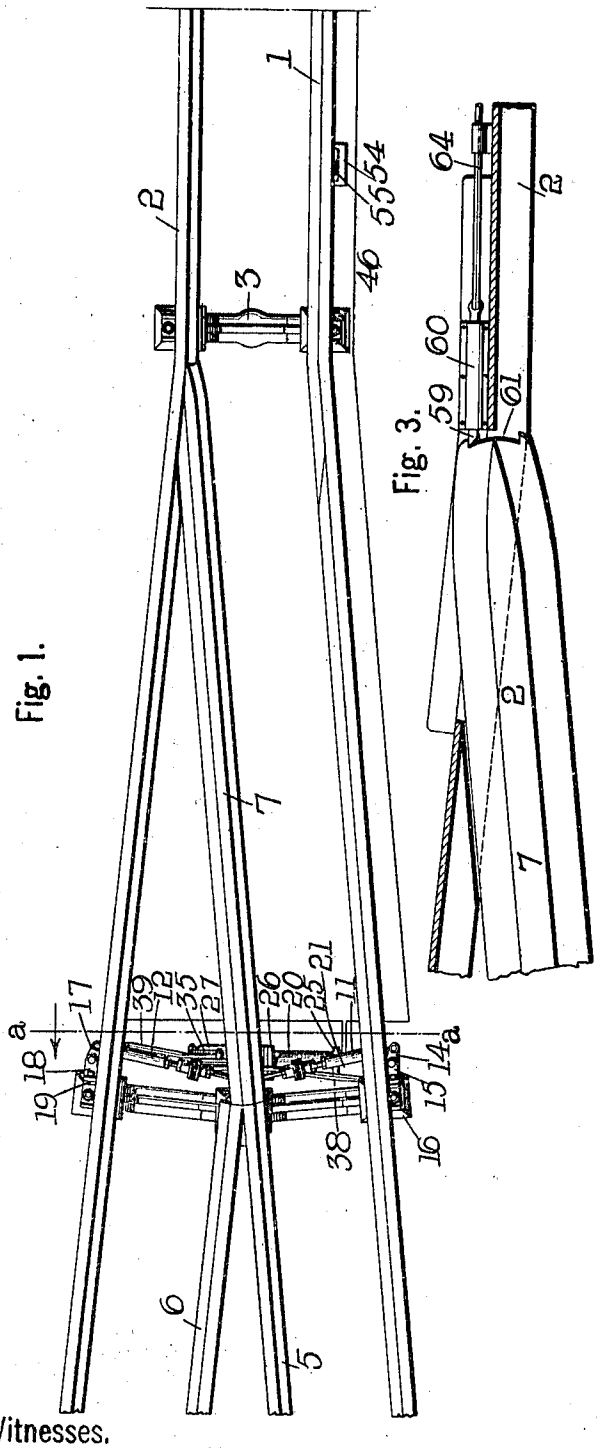

Fig. 1.

Fig. 3.

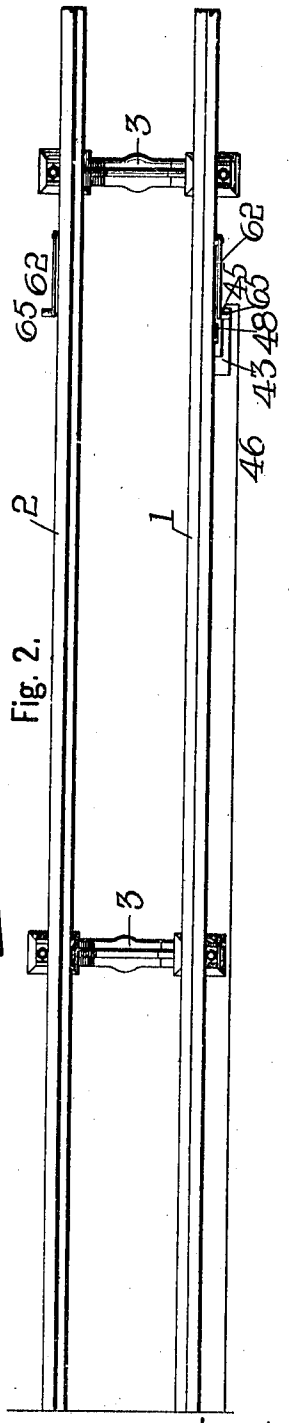

Fig. 2.

Witnesses.

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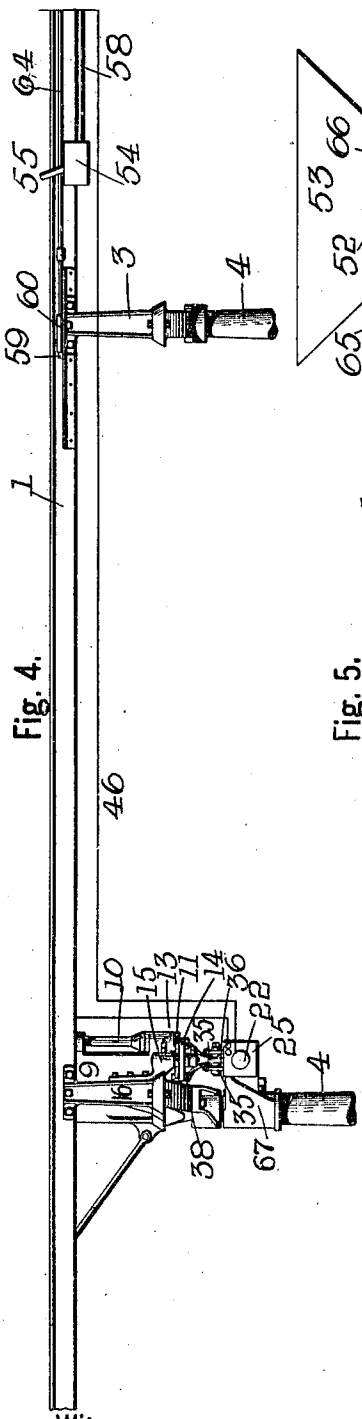

Fig. 4.

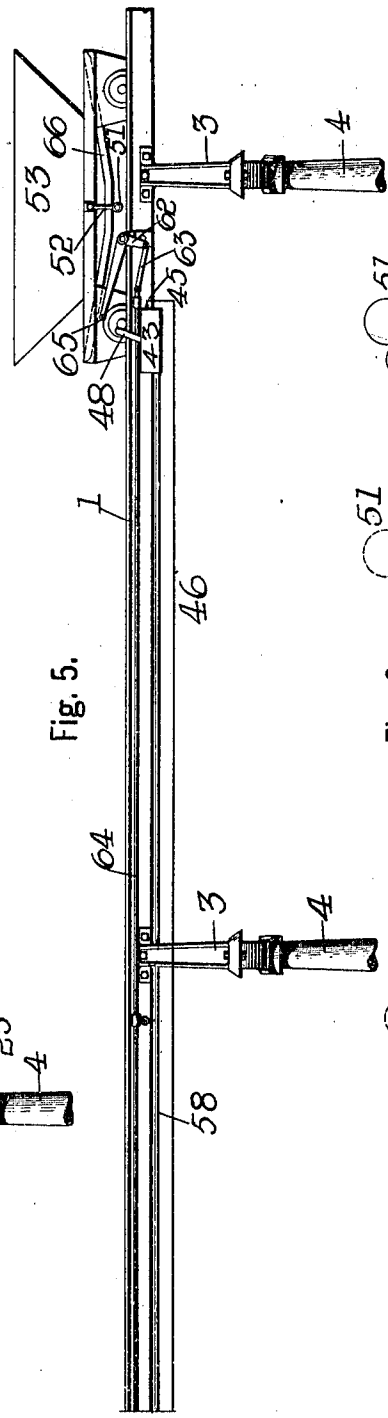

Fig. 5.

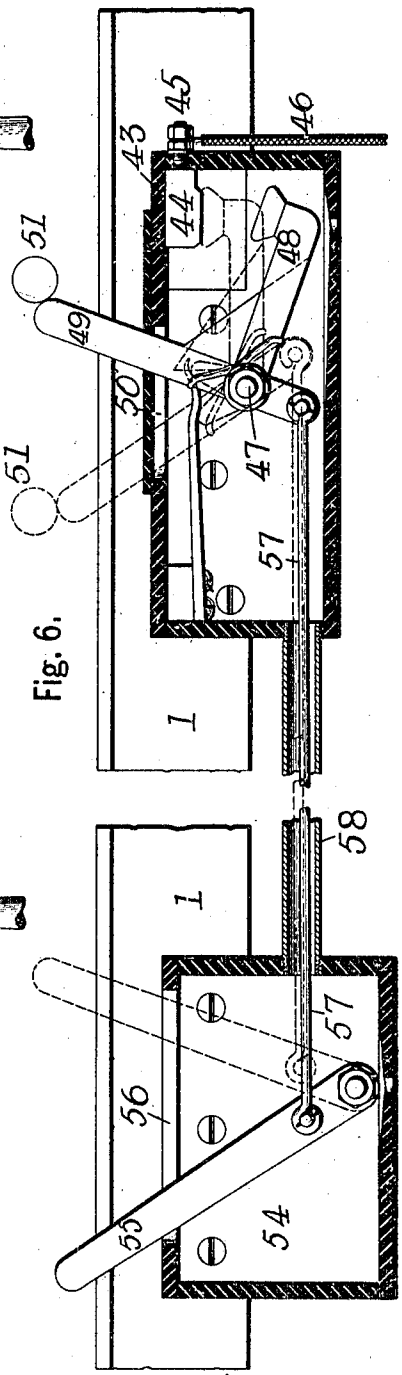

Fig. 6.

Witnesses.

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5 SHEETS—SHEET 3.

Fig. 7.

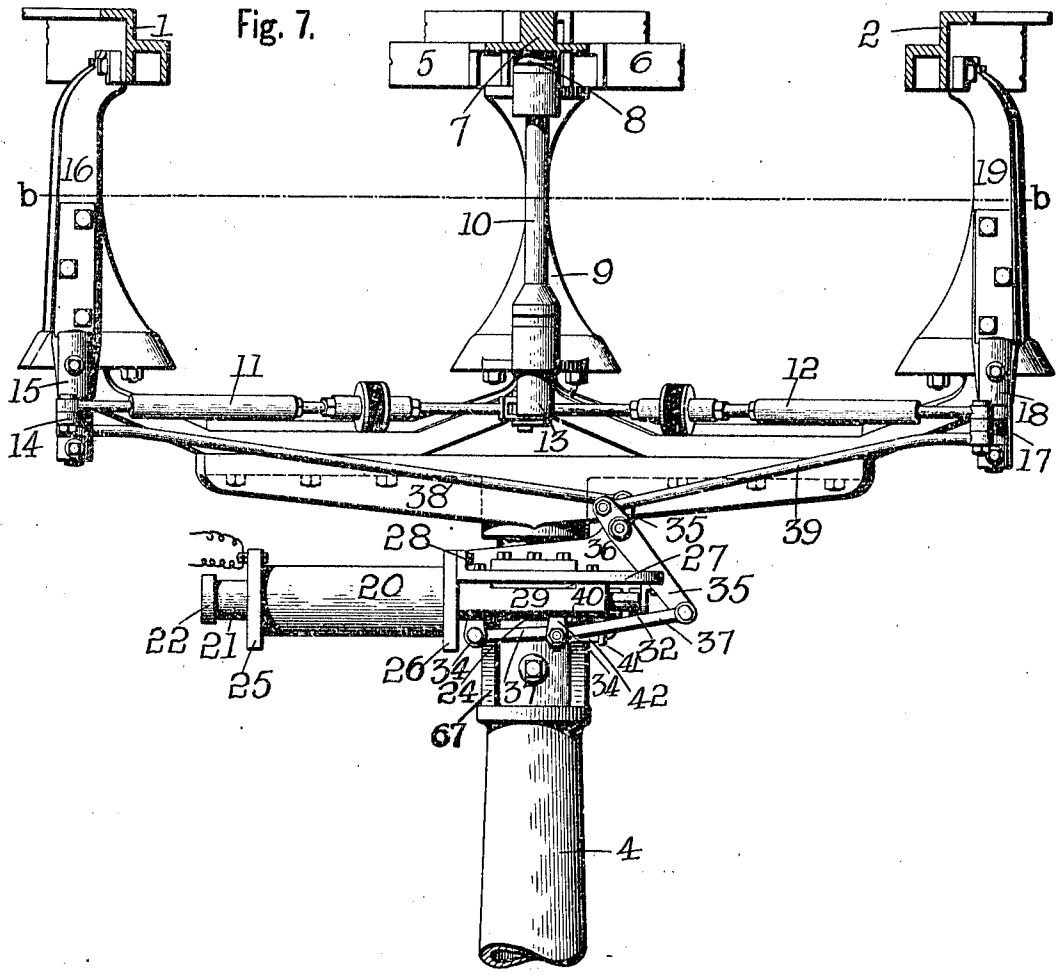
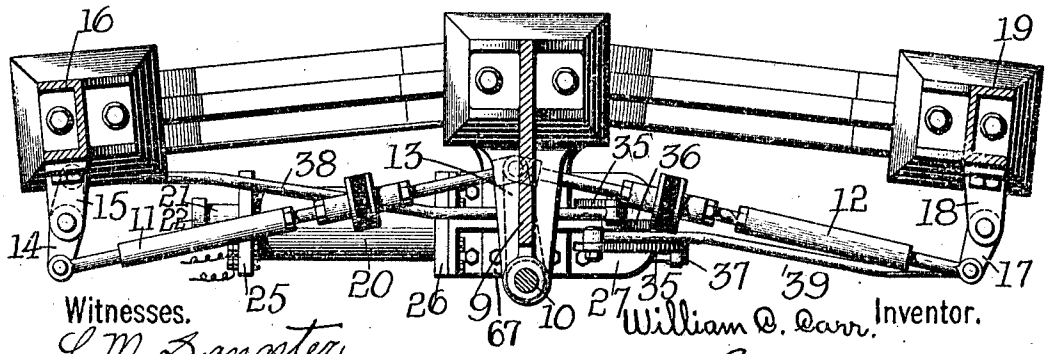


Fig. 8.



Witnesses.

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5 SHEETS—SHEET 4.

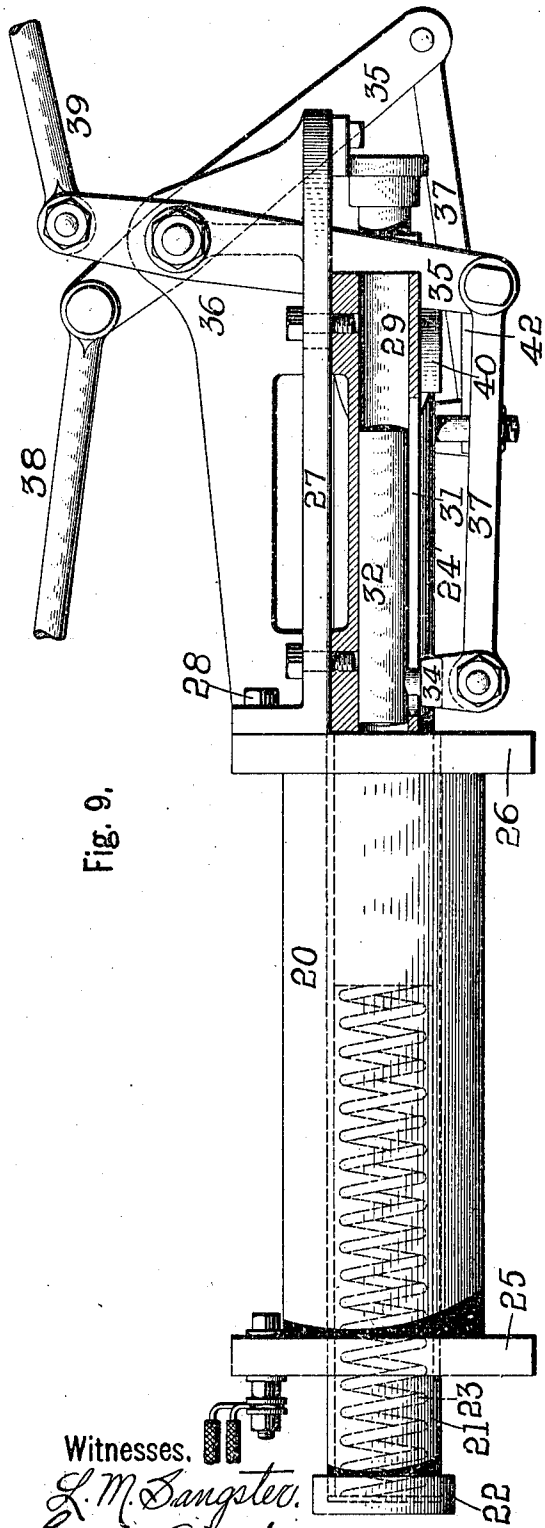

Fig. 9.

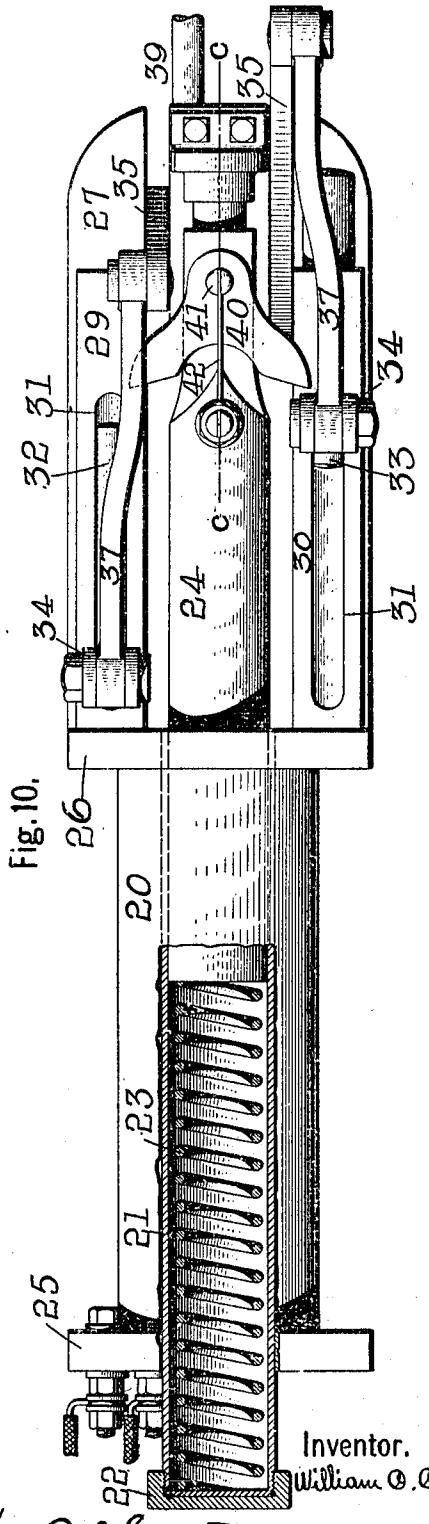

Fig. 10.

Witnesses.

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APPLICATION FILED FEB. 13, 1909.

956,040. **Patented Apr. 26, 1910.**

5 SHEETS—SHEET 5.

Fig. 11.

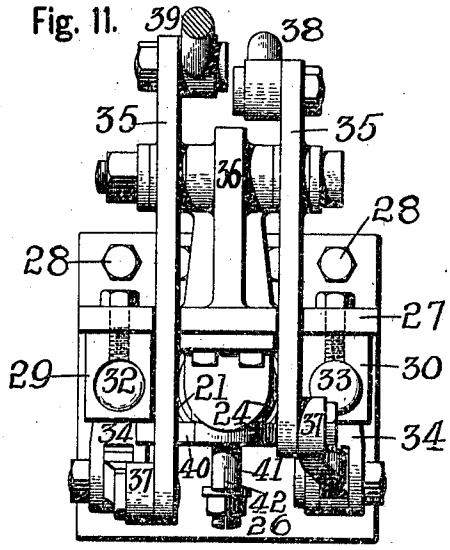


Fig. 12.

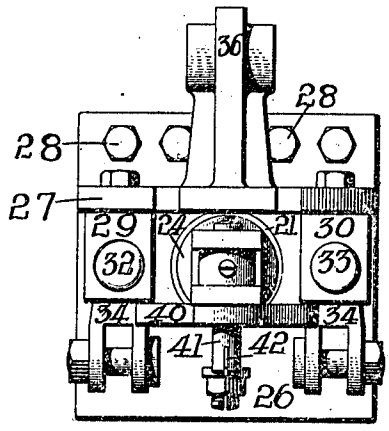


Fig. 13.

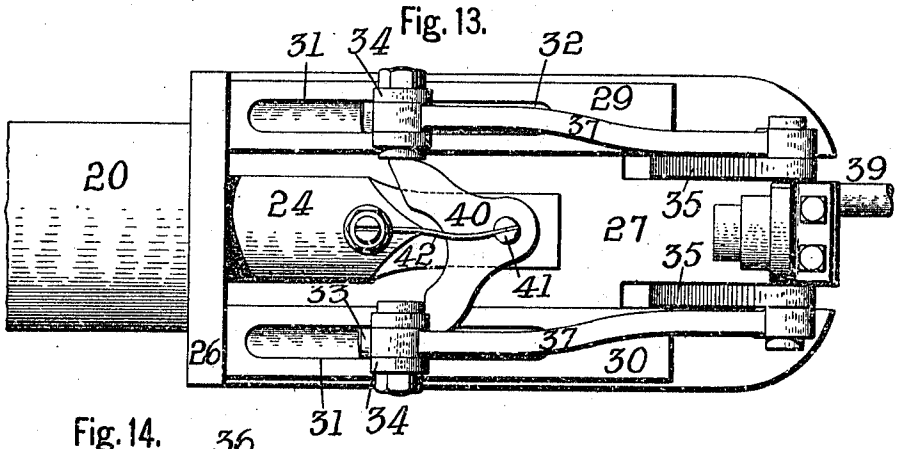
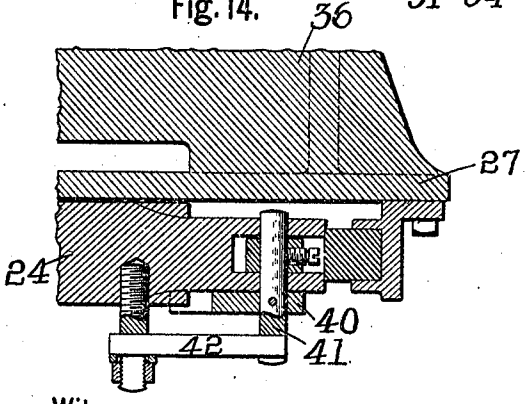


Fig. 14.



Witnesses.

L. M. Langston.

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UNITED STATES PATENT OFFICE.

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TRANSPORTATION SYSTEM.

956,040. Specification of Letters Patent. Patented Apr. 26, 1910.

Application filed February 13, 1909. Serial No. 477,660.

To all whom it may concern:

Be it known that I, WILLIAM C. CARR, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented a certain new and useful Improvement in Transportation Systems, of which the following is a specification.

This invention relates to improvements in transportation systems and principally to electric mechanism for operating a switch.

The object of the invention is to produce a comparatively cheap, durable and reliable electric switch operating mechanism which is automatically controlled from a car.

The invention also relates to certain details of construction which will be hereinafter described and claimed reference being had to the accompanying drawings in which:—

Figure 1 is a fragmentary plan view of that portion of the track of the improved transportation system at the intersection of the main line and the branch line or siding, showing the switch. Fig. 2 is a plan view of that portion of the main line track lying at the right of the portion shown in Fig. 1. Fig. 3 is an enlarged sectional plan view of one of the rails and the switch rail showing the locking device for locking the switch rail. Fig. 4 is a side elevation of that portion of the track shown in Fig. 1. Fig. 5 is a side elevation of that portion of the track shown in Fig. 2. Fig. 6 is an enlarged fragmentary side view of one of the rails showing the switch mechanism for closing and breaking the electric circuit, a vertical section being shown through the inclosing boxes. Fig. 7 is an enlarged transverse vertical section through the track on line *a a*, Fig. 1, showing a front elevation of the mechanism for shifting the switch rail. Fig. 8 is a transverse horizontal section on line *b b*, Fig. 7, showing a plan view of the mechanism. Fig. 9 is an enlarged detached front elevation partially in section of the solenoid and the mechanism operated thereby for shifting the switch rail. Fig. 10 is a bottom plan view of the same, the solenoid being shown partially in section. Fig. 11 is an end elevation of the mechanism shown in Figs. 9 and 10. Fig. 12 is a view similar to Fig. 11, with the levers, connecting rods and buffer block removed. Fig. 13 is a fragmentary bottom plan view of the solenoid showing the central plunger partially drawn back and the outer plungers passing each other. Fig. 14 is a section on line *c c*, Fig. 10.

In referring to the drawings in detail like numerals designate like parts.

In the adaptation illustrated in the accompanying drawings the invention is shown in connection with an elevated track although it is equally adapted to surface or underground tracks, the location or manner of support of the track being immaterial with regard to the working of the invention.

The main track where it extends singly or without a side track consists of the rails 1 and 2 which are mounted on transverse brackets 3 supported on the upper extremities of vertical posts 4. These two rails 1 and 2 of the main track bend or spread gradually from each other from the beginning of the side track as shown in Fig. 1 and one of the rails forms the outside rail of the main track and the other the outside rail of the side track.

The inner rails 5 and 6 respectively, of the main and side tracks extend gradually toward each other in the direction of the switch rail 7.

The switch rail 7 is secured at its inner extremity to a depending block 8 attached to a switch rail bracket 9 by a vertical pin or rock shaft 10 which is rigid with the switch rail and journaled in the rail bracket, so that the switch rail may swing in either direction to open either the main or side track.

The switch rail 7 is of an inverted T shape in cross section see Figs. 3 and 7 so that the flange of the car wheel may travel on either side and its outer end is tapered from each side toward the center to enable it to fit perfectly against the side of the rail toward which it may be swung.

The switch rail is swung in either direction by mechanism which is operated electrically from the car as it passes. This mechanism consists of a solenoid, connections between the solenoid and switch and mechanism operated from the car to electrically energize the solenoid and throw the switch.

The connections between the solenoid and switch include two extensible spring tensioned multi-membered connections 11 and 12 which are pivoted at their inner ends to a crank 13 attached to the shaft 10, see Figs. 7 and 8 and extend in opposite direc-

tions. These connections are preferably constructed in the manner set forth in my companion application filed October 31st 1908, Serial No. 460,515.

The outer end of the connection 11 is pivoted to one end of a double crank or lever 14 which is pivoted in a bracket 15 attached to one arm 16 of one of the supporting standards of the system and the outer end of the other connection 12 is pivoted to a crank arm 17 which is pivoted at its opposite end in a bracket 18, attached to the opposite arm 19, of the supporting standard, see Figs. 7 and 8.

The solenoid consists of an electromagnet 20, of tubular form which surrounds a tube 21, having an end closed by a screw cap 22, a spiral return spring 23 within the tube 21, and a main or central plunger 24 slidably fitted in the tube and adapted to be drawn into the tube when the magnet is energized by the completion of an electric circuit and to be forced outward by pressure of the spring 23 when the circuit is broken.

Each end of the magnet is flanged, as shown at 25 and 26 in Figs. 9 and 10, and a longitudinal bracket 27 is secured by bolts 28 to the flange at one end thereof and extends above the plunger 24. Tubular slideways 29 and 30 are secured to the bracket 27 and are provided with longitudinal bottom slots 31. Side plungers 32 and 33 are slidably mounted in the tubular slideways and have lateral projections 34 extending through the slots 31, see Fig. 9.

Two levers 35 are pivoted by a bolt to a central enlargement 36 of the bracket 27, one lever being located on each side of said enlargement. The lower ends of the levers pass through and are adapted to operate in slots in the bracket 27 and each lever is connected by a rod 37 to the projection 34 extending from the plunger located between the bracket to which said lever is pivoted.

The upper end of one lever 35 is connected to the double crank or lever 14 by a connecting rod 38 and the upper end of the other lever 35 is connected to the crank arm 17 by a connecting rod 39.

The outer end of the plunger 24 is reduced in size and a double dog or pawl 40, is pivotally attached thereto by a pivot 41. The dog is maintained in central position by a flat spring 42.

The operation of this portion of the mechanism is as follows,—The solenoid being electrically energized the main plunger 24 is drawn inwardly moving the dog so that one of its lateral enlargements strikes the projection 34 of the side plunger in withdrawn position moving it inwardly and through the connecting levers, cranks and rods, turning the switch. It will be noted that the two side plungers are so connected that the movement of one inwardly will move the other outwardly. By this means the plunger necessary to throw the switch in the required position is always in its outer or operative position. The pressure necessary to force one of the side plungers inwardly turns the dog 40, on its pivot against the tension of its centering spring 42 sufficiently to clear the other side plunger as it returns as shown in Fig. 13.

The electric circuit is completed or closed to energize the solenoid by a circuit closing mechanism which is arranged in a box 43 of insulating material fastened to one of the rails and consists of a metal block 44, within the box and having an exterior binding post 45 which is connected by a wire 46 to the solenoid, a pivoting pin or bolt 47 having a contact arm 48 adapted to contact with the block 44 to complete the circuit and a lever 49 on the shaft having its upper end extending through a top slot 50 in the box and on the side of and above the horizontal plane of the rail. The lever 49 is moved from the position shown in full lines in Fig. 6 to the position shown in dotted lines to elevate the head of the contact arm 48 into contact with the block 44 by a roller 51 carried by an arm 52 attached to the side of a car 53. The car 53 may be of any well known type, a dumping car being shown in Fig. 5 of the accompanying drawings. The circuit is automatically closed by the passage of the car which moves the lever and brings the necessary parts in contact and remains in that condition for a certain length of time or until the car reaches and passes a circuit breaking mechanism which is located a suitable distance from the circuit closing mechanism.

The circuit breaking mechanism is inclosed in a box 54 of insulating material which is fastened to the side of the rail, and consists of an arm 55 pivoted at its lower end in the box and projecting through a top slot 56 in the box at one side of and above the horizontal plane of the rail and a connecting rod 57 which is connected at its respective ends to the lever 49 of the circuit closing mechanism and the arm 55 of the circuit breaking mechanism. The rod 57 is inclosed and protected in a tubular housing 58 which extends between the boxes 43 and 54. The movement of the lever 49 from right to left to complete the circuit moves the arm 55 from left to right and into position to be moved forward by the roller 51 as the car passes the box 54 to break the circuit.

A device for locking the switch rail in either of its switching positions is provided which consists of a latch 59 slidably mounted in a frame 60 attached to the rail and having a beveled end adapted to engage in a recess 61 in the outer end of the switch rail,

see Fig. 3. A bell crank 62 is pivoted to the side of the rail in the rear of the box 43 of the circuit closing mechanism and has its shorter arm connected by rods 63 and 64 to the latch 59 and its longer arm is provided with a roller 65. An angular bar 66 is attached to the side of the car 53, see Fig. 5, and is so located and arranged that the car in passing causes the inclined surface of the bar to engage the roller 65 and depress the longer arm of the bell crank 62 thereby retracting the latch 59 and unlocking the switch rail.

The solenoid is preferably located slightly below and to one side of one of the transverse brackets 3, being supported by a lateral bracket 67 which is attached to one of the vertical posts 4.

The general operation of the switch apparatus is as follows,—The car in its travel upon the track first arrives in operative proximity to the longer arm of the bell crank 62, depresses the same and unlocks the switch, then travels to and automatically operates the circuit closing mechanism which energizes the solenoid and throws the switch rail and finally travels to and operates the circuit breaking mechanism which breaks the circuit and also automatically restores the circuit closing mechanism to its inoperative non-closing position.

To provide a source of electric power for operating the solenoid, one of the circuit closing elements of the circuit closing mechanism is connected to an energized rail of the system or to any other convenient and suitable means for supplying electricity.

The main advantages of the invention reside in the simplicity, durability and reliability of the switch operating mechanism.

I claim.

1. In a transportation system, a main track, a side track, a switch rail and electric mechanism for moving the switch rail including an electromagnet, a main and two side plungers, said side plungers being mechanically connected to the main plunger to move in a direction opposite to said main plunger, and devices operatively connecting the side plungers to the switch rail.

2. In a transportation system, a main track, a side track, a switch rail and electric mechanism for moving the switch rail including an electromagnet, a main plunger adapted to be moved by the energization of said electromagnet, side plungers, devices mechanically connecting the side plungers to the main plunger to move said side plungers in a direction opposite to the movement of the main plunger, and devices operatively connecting the side plungers to the switch rail.

3. In a transportation system, a main track, a side track, a switch rail, means for locking the switch rail in position, means operated mechanically from a car on the track for releasing said locking mechanism and electric mechanism controlled from a car for throwing the switch rail.

4. In a transportation system, a main track, a side track, a switch rail and electric mechanism for moving the switch rail including a solenoid having an electromagnet, a plurality of plungers arranged side by side; one plunger being adapted to be reciprocated by the electromagnet and the remaining plungers being mechanically connected to the first mentioned plunger for reciprocation in a direction opposite to the movement of the said plunger, and devices operatively connecting the said plungers to the switch rail and circuit closing and breaking mechanism for the solenoid.

5. In a transportation system, a main track, a side track, a switch rail and electric mechanism for moving the switch rail including a solenoid having a main plunger and side plungers operatively connected to the main plunger and adapted and arranged to move in a direction opposite to the movement of the main plunger, mechanical elements connecting the side plungers to the switch rail and means controlled from a car for electrically energizing the solenoid.

6. In a transportation system, a main track, a side track, a switch rail, in combination with a tubular electromagnet, a main plunger slidably mounted within the tubular electromagnet, side plungers, devices mechanically connecting the side plungers to the main plunger to move said side plungers in a direction opposite to the movement of the main plunger, mechanical elements connecting the side plungers to the switch rail, and means automatically controlled from a car for electrically energizing the electromagnet.

7. In a transportation system, a main track, a side track, a switch rail, in combination with a tubular electromagnet, a main plunger slidably mounted within the tubular electromagnet, a bracket secured to the electromagnet and having a slideway, a side plunger slidably supported in said slideway and operatively controlled by the main plunger, mechanical elements connecting the side plunger to the switch rail, and means automatically operated by the passage of a car for electrically energizing the electromagnet.

8. In a transportation system, a main track, a side track, a switch rail and electric mechanism for moving the switch rail including a solenoid having a plurality of operatively connected plungers, mechanical elements connecting at least one of the plungers to the switch rail and means for electrically energizing the solenoid including a circuit closing mechanism located in proximity to the track and having a movable element adapted to be struck by a car.

9. In a transportation system, a main track, a side track, a switch rail and electric mechanism for operating the switch rail including a solenoid, mechanical elements connecting the solenoid to the switch rail and means for electrically energizing the solenoid including a circuit closing mechanism located in proximity to the track and having a movable element extending above the track and adapted to be struck by a car, a movable terminal operatively connected to the movable element, and a fixed terminal connected by wire to the solenoid.

10. In a transportation system, a main track, a side track, a switch rail and electric mechanism for moving the switch rail including a solenoid having a plurality of operatively connected plungers and a tubular electromagnet within which one of the plungers is slidably mounted, a circuit mechanism arranged in operative proximity to the track and a circuit breaking mechanism also arranged in operative proximity and at a suitable distance from the circuit closing mechanism.

11. In a transportation system, a main track, a side track, a switch rail and electric mechanism for moving the switch rail including a solenoid and circuit closing and breaking mechanisms arranged in operative proximity to the track and including two boxes, circuit closing means in one box, circuit breaking means in the other box, electrical connections between both the circuit closing means and the circuit breaking means and independent mechanical connections between said circuit closing means and said circuit breaking means.

12. In a transportation system, a main track, a side track, a switch rail and electric mechanism for moving the switch rail including a solenoid and electric circuit closing and breaking mechanisms having separate operating arms mechanically connected to each other, said circuit closing and breaking mechanisms being separated from each other and located at different points along the track.

13. In a transportation system, a main track, a side track, a switch rail and electric mechanism for moving the switch rail including a solenoid having an electromagnet, a plurality of mechanically connected plungers; one of said plungers being operatively arranged relatively to the electromagnet, devices connecting another of said plungers to the switch rail and circuit closing and breaking mechanisms adapted to be independently operated from a car on the track.

14. In a transportation system, a main track, a side track, a switch rail and electric mechanism for moving the switch rail including a solenoid having an electromagnet, a main plunger operatively arranged relatively to the electromagnet, side plungers operatively controlled by the main plunger and connected to move in opposite directions, devices connecting the side plungers to the switch rail and circuit closing and breaking mechanisms adapted to be independently operated from a car on the track.

15. In a transportation system, a main track, a side track, a switch rail and electric mechanism for moving the switch rail including a solenoid having an electromagnet, a plurality of mechanically connected reciprocating elements, one at least of which moves oppositely to another and is operatively arranged relatively to the electromagnet, devices operatively connecting the switch rail to at least one of the reciprocating elements and circuit closing and breaking mechanisms for the solenoid.

16. In a transportation system, a main track, a side track, a switch rail, switch rail locking mechanism, electric switch rail operating mechanism, and means for independently and automatically operating both the switch rail locking mechanism and the electric switch rail operating mechanism.

17. In a transportation system, a main track, a side track, a switch rail, switch rail locking mechanism including a latch adapted to engage the switch rail, a solenoid, connections between the solenoid and switch rail whereby the energizing of the solenoid will move the switch rail, circuit closing mechanism, circuit breaking mechanism and means for first releasing the switch rail locking mechanism then operating the circuit closing mechanism and finally operating the circuit breaking mechanism.

18. In a transportation system, a main track, a side track, a switch rail, switch rail locking mechanism, electric switch rail operating mechanism, and a car on the track having means for independently and automatically operating both the switch rail locking mechanism and the electric switch rail operating mechanism.

19. In a transportation system, a main track, a side track, a switch rail, switch rail locking mechanism, electric switch rail operating mechanism, and a car on the track having means for first mechanically operating the switch rail locking mechanism to unlock the switch rail and then mechanically completing an electric current and thereby cause the electric switch rail operating mechanism to throw the switch.

20. In a transportation system, a main track, a side track, a switch rail, switch rail locking mechanism including a latch adapted to engage the switch rail, a solenoid, connections between the solenoid and switch rail whereby the energizing of the solenoid will move the switch rail, circuit closing mechanism, circuit breaking mechanism and a car on the track having means for first releasing the switch rail locking

mechanism then operating the circuit closing mechanism and finally operating the circuit breaking mechanism.

21. In a transportation system, the combination with a plurality of tracks and a switch rail, of switch rail locking mechanism, electric switch rail operating mechanism and a car adapted to travel on said tracks and having independent means for operating the switch rail locking mechanism and the electric switch rail operating mechanism.

22. In a transportation system, the combination with a plurality of tracks and a switch rail, of switch rail locking mechanism, electric switch rail operating mechanism an a car adapted to travel on said tracks and having independent means for automatically operating the switch rail locking mechanism and the electric switch rail operating mechanism.

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