No. 748,557. PATENTED DEC. 29, 1903.

F. T. KITT.

ELECTRICALLY CONTROLLED RAILWAY SWITCH.

APPLICATION FILED MAR. 4, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

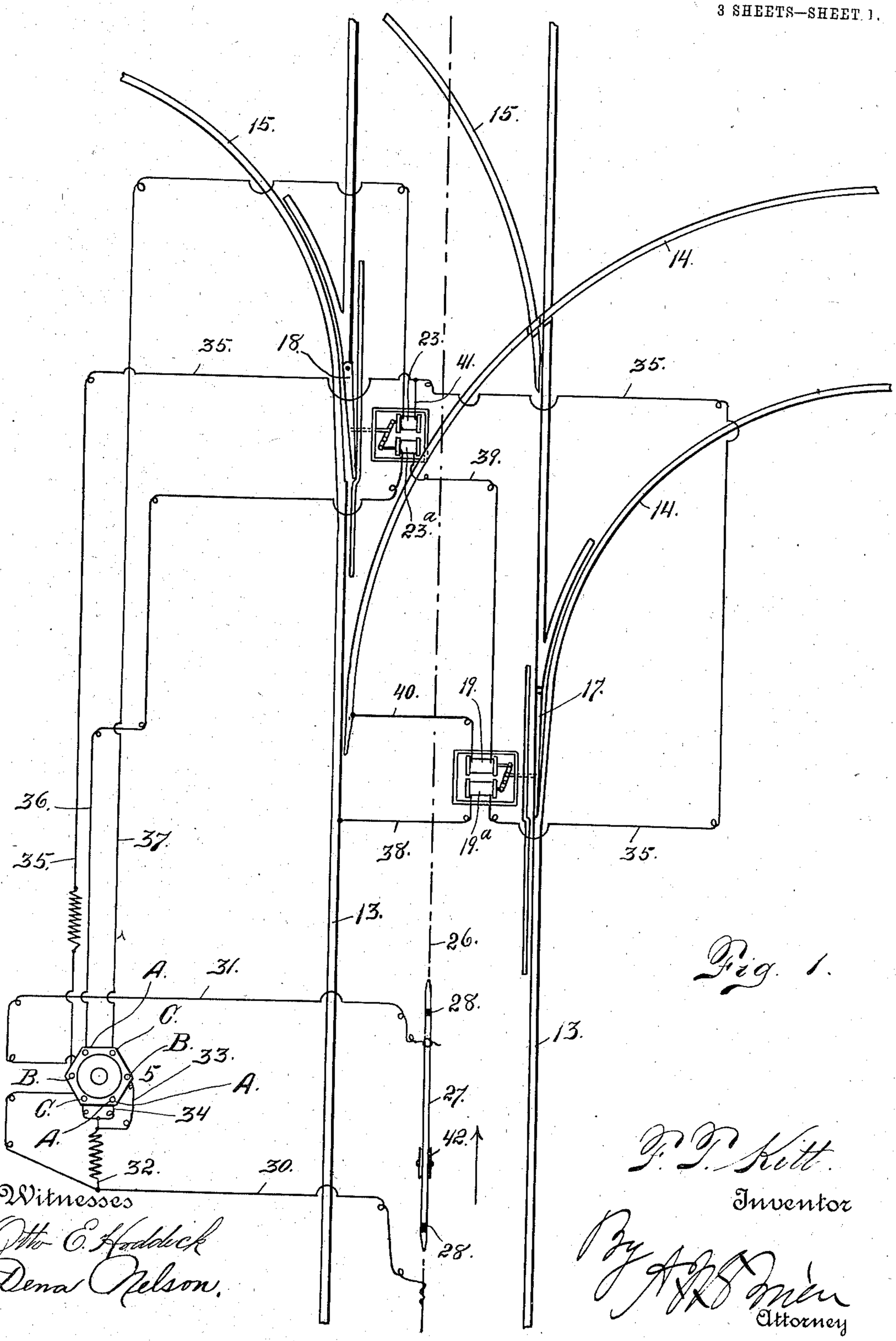

Fig. 1.

Witnesses
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NO MODEL. 3 SHEETS—SHEET 2.

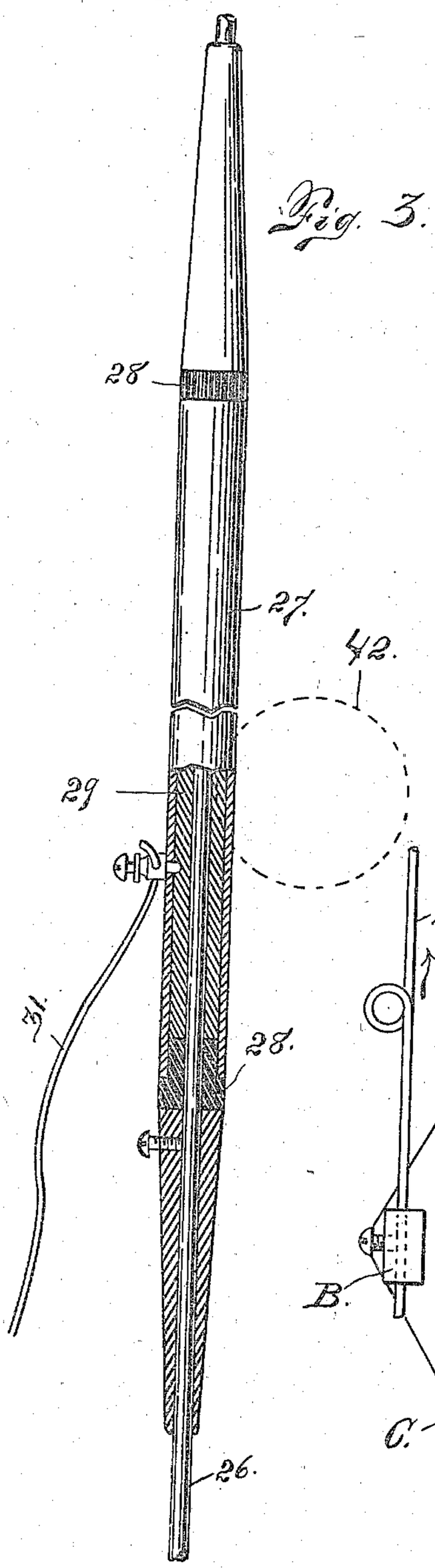
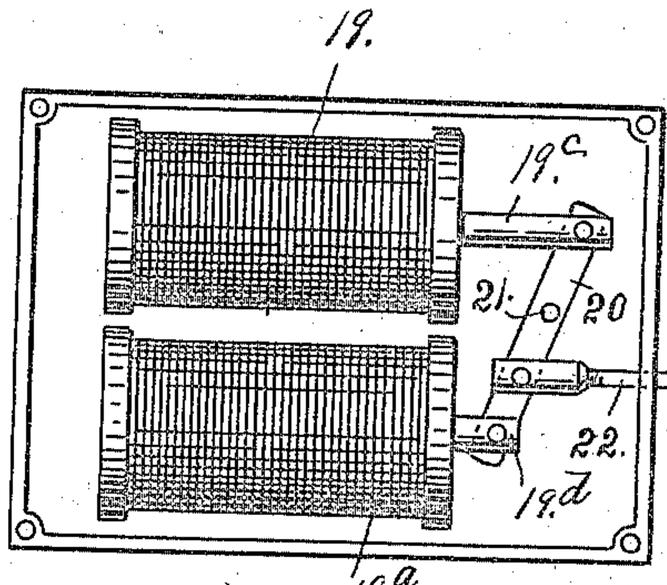


Fig. 3.



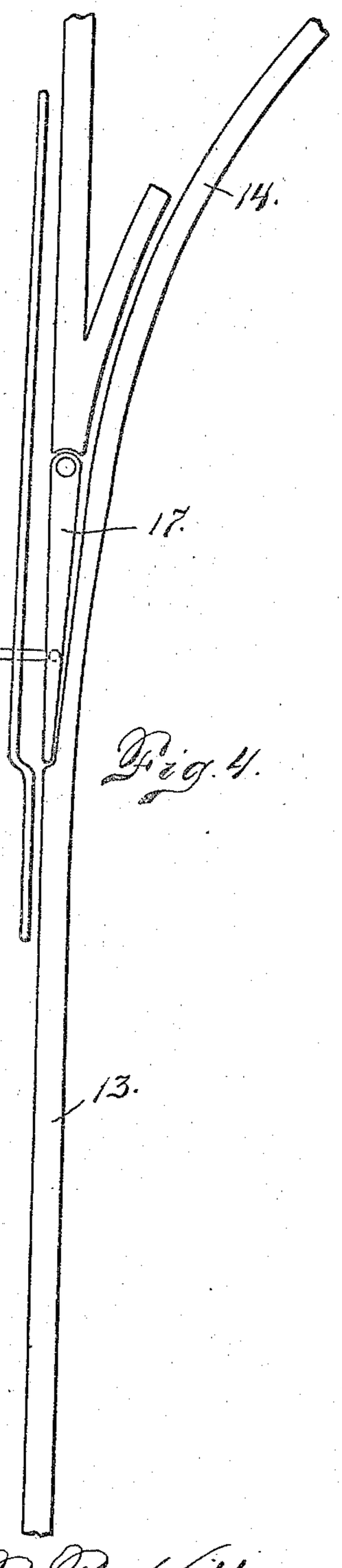


Fig. 4.

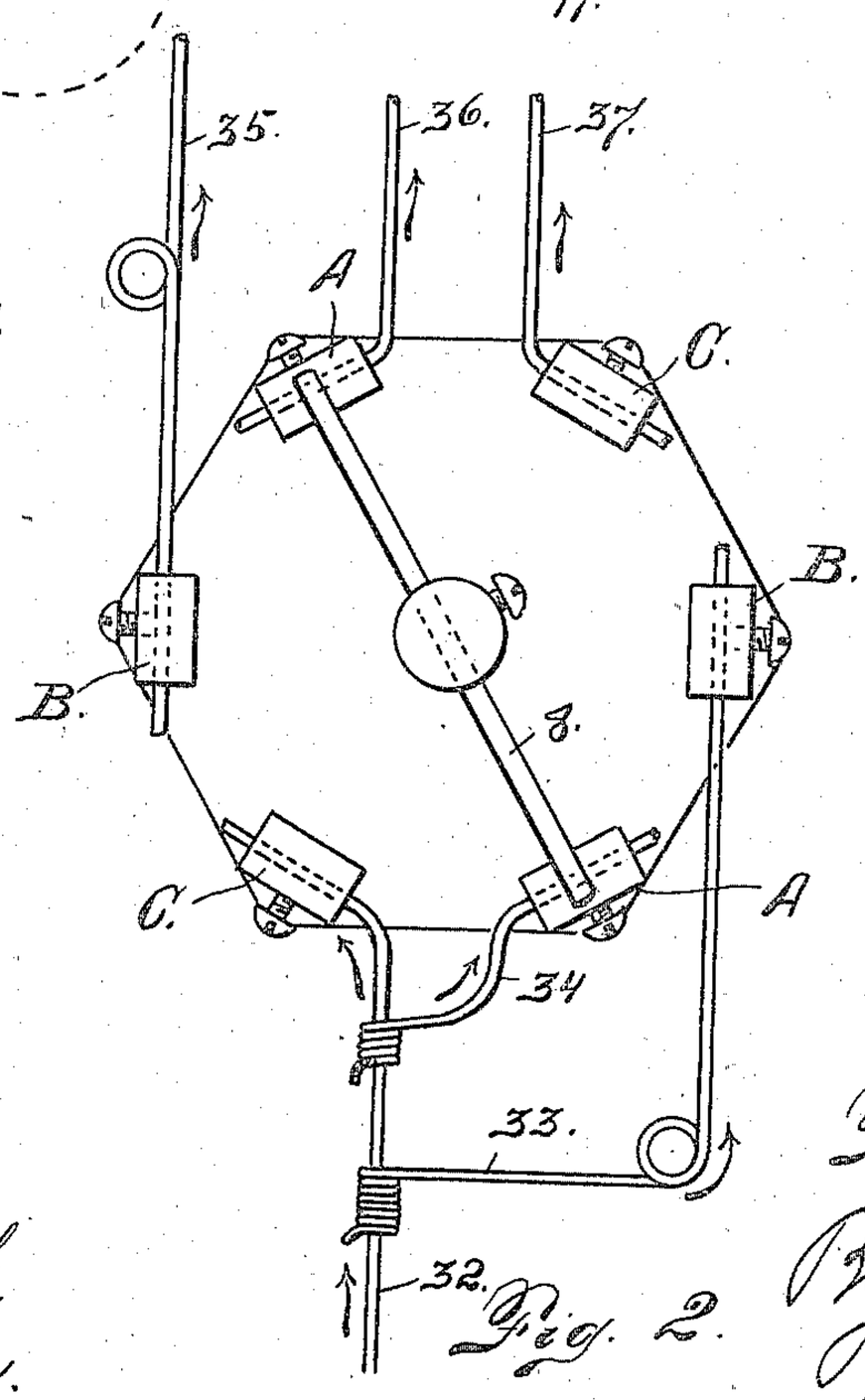


Fig. 2.

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NO MODEL. 3 SHEETS—SHEET 3.

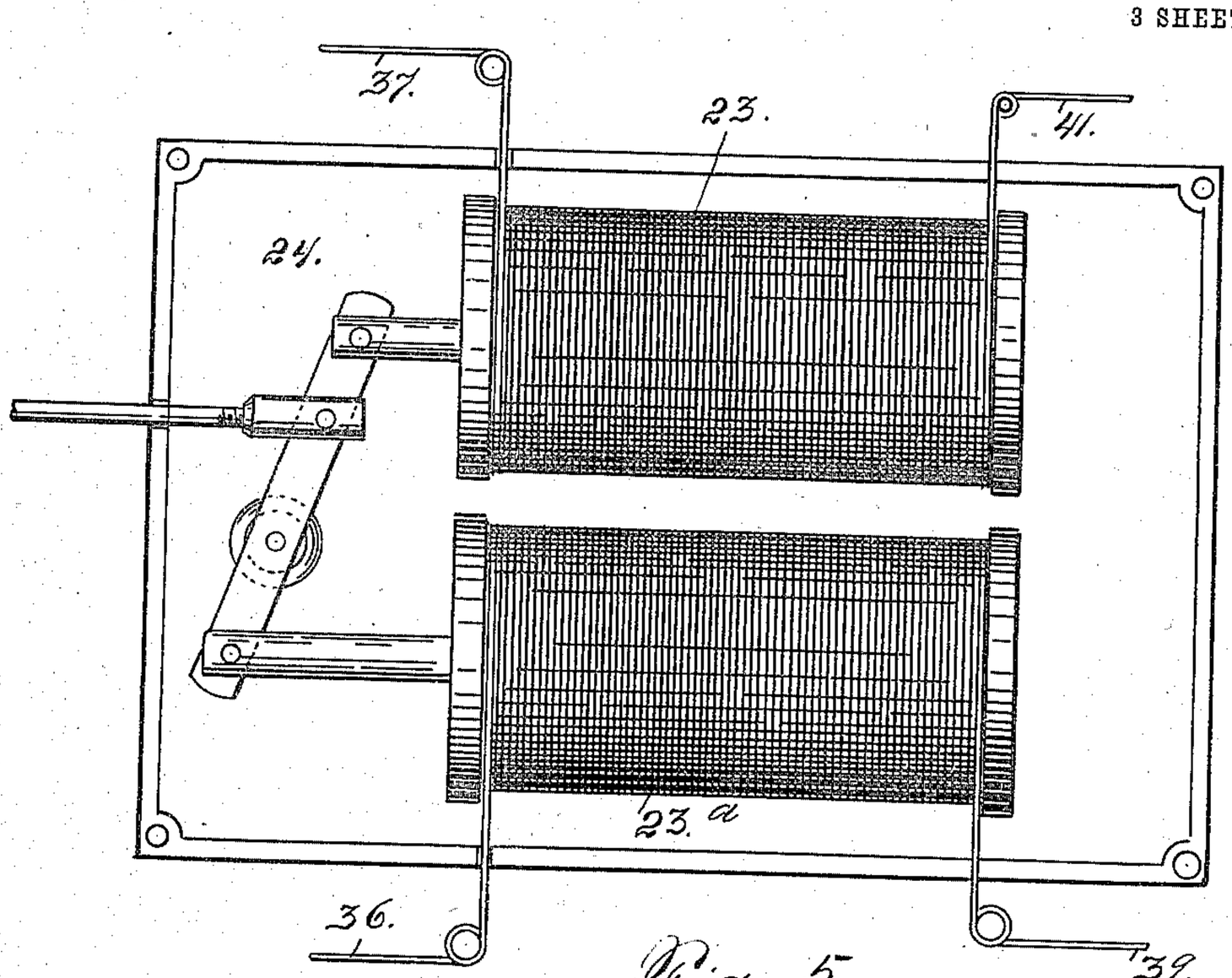

Fig. 5

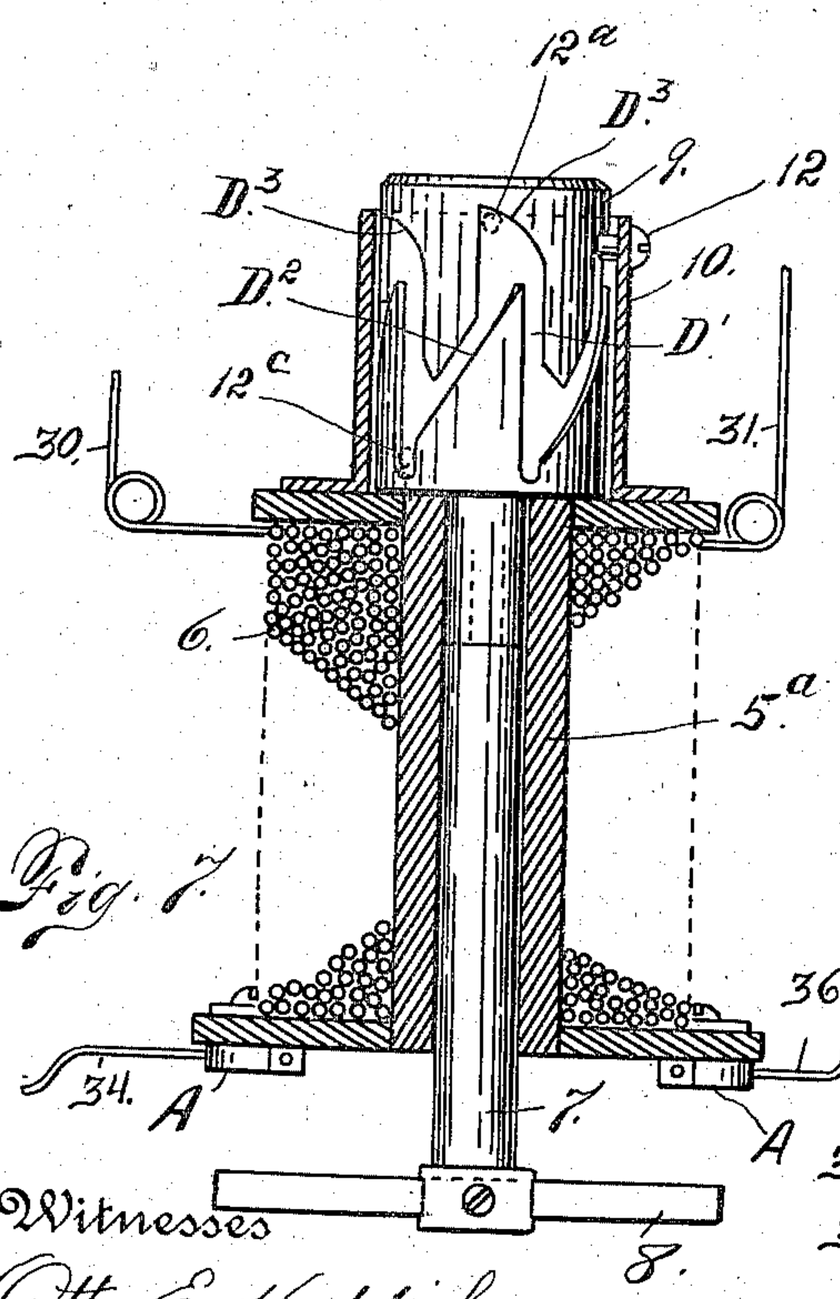

Fig. 7.

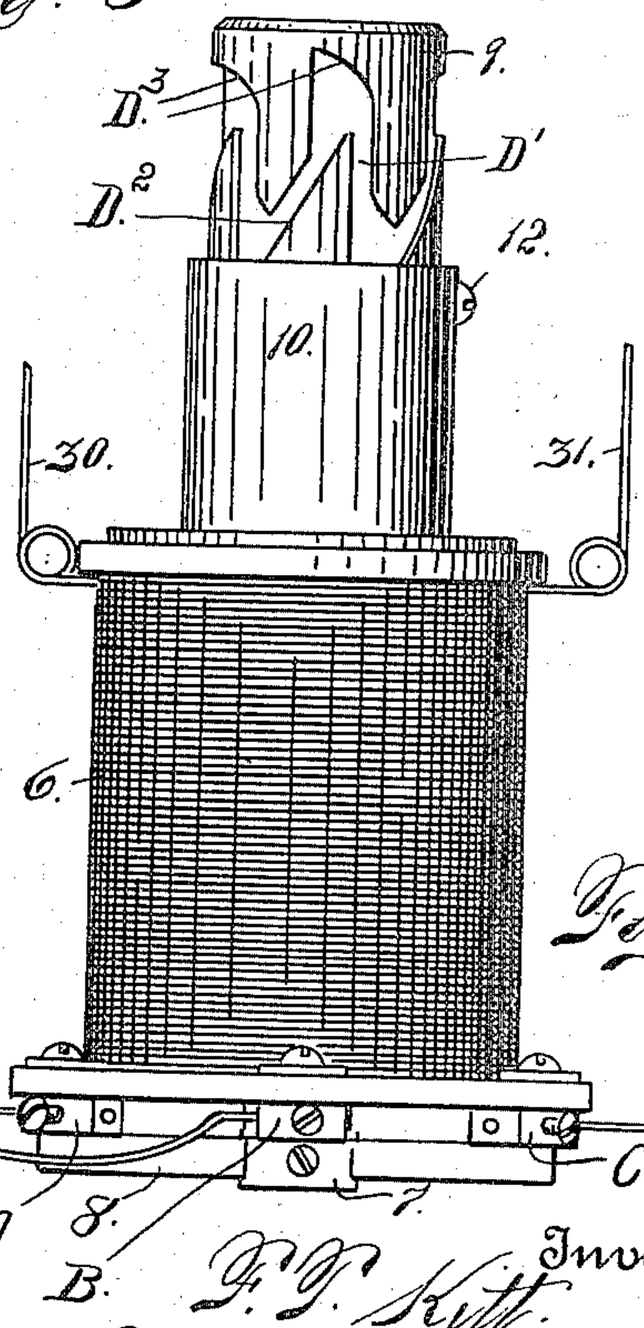

Fig. 6.

Witnesses
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No. 748,557. Patented December 29, 1903.

UNITED STATES PATENT OFFICE.

FREDERICK T. KITT, OF DENVER, COLORADO.

ELECTRICALLY-CONTROLLED RAILWAY-SWITCH.

SPECIFICATION forming part of Letters Patent No. 748,557, dated December 29, 1903.

Application filed March 4, 1903. Serial No. 146,243. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK T. KITT, a citizen of the United States of America, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Electrically-Controlled Railway-Switches; and I do 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, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in switches for electric railways, my object being to provide means whereby the motorman may by simple manipulation of the controller of the car throw the switch tongue or tongues to allow his car to continue on the main line or pass to a branch line turning in either direction from the main line, as may be desired.

In carrying out my invention I employ an automatic circuit-changer consisting of a solenoid and a vertically-movable bar or plunger provided at one extremity with a cross-arm, its opposite extremity being spirally grooved in a peculiar manner, so that every time the solenoid is energized and the bar or plunger actuated its cross-arm closes a circuit by engaging two contacts mounted on the frame of the solenoid, whereby a circuit is closed in which one or more other solenoids are located and one or more switch-tongues controlled by the last-named solenoids are actuated, as may be desired, while as soon as the circuit-changer solenoid is deënergized the plunger-bar drops by gravity and when raised again by the magnetism induced by the passage of the current through its solenoid the cross-arm engages another pair of contacts, closing another circuit in which are located one or more solenoids for actuating a switch tongue or tongues. Every time the plunger bar or core of the circuit-changer makes a reciprocation the plunger is given a partial rotation, whereby its cross-arm is made to successively engage a number of pairs of contacts, each pair lying in a different circuit. The rotary movement of the plunger is imparted by the engagement of a stationary projection with the aforesaid grooves of the plunger. In the vicinity of the switch the trolley-wire is surrounded by a sleeve insulated from the wire. This sleeve is composed of metal or other material forming a conductor of electricity, and from it leads a wire to one terminal of the solenoid of the circuit-changer, while the other solenoid terminal is connected by a wire with the trolley-wire. Hence when the trolley-wheel of the car is in engagement with the insulated sleeve and the car is using current the latter will pass through the solenoid of the circuit-changer and actuate the plunger of the latter, and as soon as the trolley-wheel leaves the insulated sleeve or ceases to use current the bar or plunger will fall. In this way the motorman has complete control of the switch, since by making and breaking the circuit through the medium of the controller he may change the circuit controlling the switch-tongues as often as desired or until said tongues are in the desired position.

Having briefly outlined my improved construction, I will proceed to describe the same in detail, reference being made to the accompanying drawings, in which is illustrated an embodiment thereof.

In the drawings, Figure 1 is a view illustrating my improvement applied to a main line of track having two branch lines turning in opposite directions. Fig. 2 is an underneath detail view of the circuit-changer, shown on a larger scale. Fig. 3 is a detail view, partly in section, illustrating the construction of the trolley-wire in the vicinity of the switch, shown on a larger scale. Fig. 4 illustrates a pair of solenoids arranged to operate a lever connected with a switch-tongue for shifting the latter. Fig. 5 shows a number of solenoids on a larger scale. Fig. 6 is a side elevation of the circuit-changer. Fig. 7 is a section taken through the same.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate the circuit-changer as a whole or in its entirety, 5^a the spool, and 6 the coils of the solenoid. Upon the insulating-base or lower extremity of this spool are mounted six metal contacts arranged in pairs A, B, and C, the contacts of

one pair being designated A A and the contacts of the other pairs B B and C C, respectively. In the central opening of the spool is located a plunger 7, composed of magnetic material, preferably soft iron. To the lower extremity of this plunger is attached a cross-arm 8, preferably composed of metal and adapted when the coils are energized to engage two of the contacts. (See Fig. 6.) To the upper extremity of the plunger 7 is attached a cylindrical part 9, composed of non-magnetic material, preferably brass. This part 9 is larger than the plunger proper and forms a shoulder which engages the top of the spool and limits the downward movement of the plunger when the coils of the solenoid are deënergized. Attached to the top of the spool and surrounding the part 9 of the plunger is a brass sleeve 10. The part 9 is provided with a number of grooves D', from each of which lead downwardly-extending branch grooves D' and D^2. The wall of the upper part of the groove D is curved or inclined, as shown at D^3. There are as many grooves D in the part 9 as there are contacts A, B, and C. If there are six contacts, as shown in Fig. 2, there are six grooves D and six pairs of grooves D' and D^2. A screw 12 is threaded in the upper part of the sleeve 10, and when the bar 7 is at its lowest limit of movement the inner extremity of this screw engages the upper extremity of a groove D.

The operation of the device will be better understood if it be assumed that the screw occupies the position shown by dotted lines in Fig. 7. Let this position be designated 12^a. Then if the plunger 7 is moved upwardly the screw will engage the branch groove D^2 and impart a partial rotation to the plunger 7, whereby the cross-arm 8 is made to engage two contacts A A, B B, or C C. The screw then may be said to engage the lower extremity of a groove D' or occupy the position 12^c. (Shown by dotted lines in Fig. 7.) Then as the plunger 7 drops the latter moves practically in a straight line until it engages the wall D^3 of the groove D, when the rod is given another partial rotation. Then as the plunger is raised again the operation is repeated, the two strokes of each reciprocation giving the rod a partial rotary movement of sufficient degree to cause the arms 8 to travel around from one pair of contacts to the next pair of contacts.

Referring now to Fig. 1 of the drawings, let the numeral 13 designate the rails of the main track of an electric-car line; 14, the rails of one branch line; 15, the rails of another branch line; 17 and 18, the switch-tongues for directing the cars to the branch lines, respectively; 19 and 19^a, the solenoids of one pair; 20, the lever connected with the cores 19^c and 19^d of the solenoids 19 and 19^a; 21, the lever-fulcrum; 22, the rod connecting the switch-tongue 17 with the lever 20; 23 and 23^a, the individual coils of the other pair of solenoids; 24, the lever connected with the cores 23^c and 23^d of the coils 23 and 23^a, and 25 the rod connecting the lever 24 with the switch-tongue 18.

The trolley-wire 26 in the vicinity of the switch-tongues is surrounded by a metal tube 27, insulated from the wire, as shown at 28 and 29. At the extremities of the sleeve or tube 27 the trolley-wire is tapered to give the trolley-wheel an easy movement from the body of the trolley-wire to the tube or sleeve 27, the latter being of considerable size necessarily in order to thoroughly insulate it from the trolley-wire proper. The circuit-changer 5 is located at one side of the track, as shown in the drawings, and conveniently near the insulated part 27, mounted on the trolley-wire. From the trolley-wire a conductor 30 leads to one terminal of the coil 6 of the circuit-changer, while from the other terminal of the coil leads a wire 31 to the insulated trolley-wire part 27. Three of the contacts A, B, and C (one of each pair) are connected with the wire 30 by wires 32, 33, and 34, while from each of the other contacts A B C lead wires 35, 36, and 37, respectively. The wire 35 leads to one terminal of the solenoid 19^a, and a wire 38 leads from the other terminal of the said solenoid to one of the track-rails 13, where the current is grounded. The wire 36 leads to one terminal of the solenoid 23^a, while a wire 39 leads from the other terminal of the solenoid 23^a to one terminal of the solenoid 19. From the other terminal of the solenoid 19 leads a wire 40 to a track-rail 14, grounding the circuit. The wire 37 leads to one terminal of the solenoid 23, while a branch wire 41 leads from the other terminal of the solenoid 23 to the wire 35.

In describing the operation of my improvement I will assume that the car is in the position indicated by the trolley-wheel 42 in Fig. 1 and that the switch-tongues 17 and 18 are in the position shown in the same figure. In this event the tongues 17 and 18 are in position to guide the car upon the branch track 15. Now if it is desired to cause the car to run on the branch track 14 the motorman by turning on the current through the medium of the controller on the car causes the trolley-current to pass through the coil 6 of the circuit-changer, which causes the rod 16 to move upwardly, bringing the arm 8 into engagement with two contacts A A, B B, C C. If the arm 8 does not engage the contacts A the next time the current is turned on, the motorman shuts off the current, when the rod 7 will drop. The motorman then immediately turns the current on again, when the bar 7 will be raised, and this time it must engage the contacts A A, since the bar can only be in three positions, and it is assumed that before beginning operations it had just occupied one of these positions, consequently there are only two other positions to be occupied. A portion of the current will then be shunted through the arm 8 and will pass by way of the wire 36 to and through the

coils of the solenoids 23ª and 19, with the result that the lever 20 will be actuated to shift the switch-tongue 17 to guide the car upon the track 14. At the same time the tongue 18 will be set for the main line. Now if the next car that comes along must go upon the branch track 15 the motorman will operate his controller until the arm 8 of the circuit-changer engages the contacts C C, when the current will pass through the wire 37 and through the solenoid 23 and thence by way of wires 41 and 35 to and through the solenoid 19ª, shifting the tongue 18 for the branch track 15 and the tongue 17 for the main line, when the tongues will be again in the position shown in Fig. 1. Then if it is desired that the next car should go through on the main line the motorman, through the instrumentality of the controller, will operate the circuit-changer to pass the current first through the wire 36, solenoid 23ª, wire 29, solenoid 19, and wire 40, which will throw the tongue 18 in position for the main line and the tongue 17 in position for the branch track 14. Then by operating the controller again to pass the current through the wire 35, solenoid 19ª, and wire 38 the switch-tongue 17 will be thrown into position for the main line and the car may proceed.

Having thus described my invention, what I claim is—

1. In a railway-switch, the combination with a main line, a branch line and a switch-tongue, of two solenoids connected with the switch-tongue to move it in opposite directions when the solenoids are separately energized, an electrical conductor mounted on the trolley-wire but insulated therefrom, an electromagnetic circuit-changer interposed between the switch-tongue solenoids and the said insulated conductor, a circuit in which the coils of the circuit-changer lie, one branch of said circuit being connected with the trolley-wire, and the other branch with the insulated conductor, whereby when the trolley-wheel of the car engages said conductor and the car is using current, the circuit-changer will be energized; distinct circuits in which the switch-tongue solenoids are located, the circuit-changer being provided with a number of pairs of separated contacts, one contact of each pair being connected with each solenoid of the switch-tongue and the other contacts being connected with the trolley-wire, the circuit-changer being provided with means for successively bridging the several pairs of contacts when the circuit-changer is energized whereby the solenoids of the switch-tongues are alternately energized.

2. In a railway-switch, the combination with the main line of track, two branch tracks turning in opposite directions from the main line, and a switch-tongue for each branch track, of a pair of solenoids connected with each tongue to move it in opposite directions when the solenoids are separately energized, circuits in which two solenoids one of each pair are located, another circuit in which one solenoid is located, and means for successively closing the several circuits whereby the two switch-tongues may be simultaneously actuated, or the one switch-tongue alone actuated as may be desired.

3. In an electric-railway switch, the combination with a main line of track, two branch tracks, and a switch-tongue for each branch track, of a pair of solenoids connected with each tongue to move it in opposite directions when the solenoids are separately energized, circuits in which two solenoids one of each pair are located, another circuit in which one solenoid is located and an electromagnetic circuit-changer controlled from the car for successively closing the several solenoid-circuits.

4. In an electric-railway switch, the combination with a main line of track, two branch tracks and a switch-tongue for each branch track, of a pair of solenoids connected with each tongue to move it in opposite directions when the solenoids are separately energized, circuits in which the two solenoids of each pair are located, another circuit in which one solenoid is located, an electromagnetic circuit-changer comprising a coil, a plunger, a bridge-piece connected with the plunger, three pairs of contacts, and means for imparting a partial rotation to the plunger every time the coils are energized, whereby the several pairs of contacts are successively connected by the bridge-piece, a conductor-section mounted on the trolley-wire and insulated therefrom, a circuit in which the coil of the circuit-changer lies, one terminal of the coil being connected with the trolley-wire, and the other terminal with the said insulated conductor, whereby when the trolley-wheel engages the said conductor, the circuit-changer will be energized if the car is using current, an electrical connection between three of the circuit-changer contacts, one of each pair, and the trolley-wire, and circuits in which the other three contacts are severally located, two of the switch-tongue solenoids one of each pair, being located in one circuit, the other two switch-solenoids in the other circuit, and one solenoid in the third circuit.

5. In an electric-railway switch, the combination with a main line of track, a number of branch lines, and a switch-tongue for each branch line, of a pair of solenoids connected with each tongue to move the latter in opposite directions when the solenoids are separately energized, circuits in which a number of solenoids composed of one solenoid of each pair of a plurality of pairs, is located, a circuit in which one solenoid alone is located, and a circuit-changer connected to be automatically operated from the car when using current, whereby the aforesaid various circuits are successively closed to the current for operating the car.

6. An electromagnetic circuit-changer com-

prising a coil, a plunger and bridge-piece connected with the plunger, a number of pairs of contacts, and means for imparting a partial rotation to the plunger every time the coils are energized whereby the several pairs of contacts are successively connected with the bridge-piece, said means comprising a part connected with the plunger and provided with spiral grooves, and means adapted to engage said grooves for imparting partial rotation to the plunger every time the latter is actuated.

7. An electromagnetic circuit-changer comprising a coil, a vertically-disposed plunger, a bridge-piece connected with the plunger, a number of pairs of contacts which the bridge-piece is adapted to span, a circuit in which each pair of contacts lies, a circuit in which the coil is located, and means for imparting a partial rotation to the plunger every time it is actuated by the energized coil, said means comprising a part connected with the plunger and provided with spiral grooves, and a projection adapted to engage the grooves for imparting a partial rotation to the plunger every time the latter is actuated.

8. An electromagnetic circuit-changer comprising a coil, a vertically-disposed plunger, a bridge-piece connected with the plunger, a number of pairs of contacts which the bridge-piece is adapted to span, a circuit in which each pair of contacts lies, a circuit in which the coil is located, a part connected with the plunger and provided with spiral grooves, and a projection adapted to engage said grooves for imparting a partial rotation to the plunger every time the latter is actuated.

9. In an electric-railway switch, the combination with a main line of track, a branch track and a switch-tongue therefor, of a pair of solenoids connected with the switch-tongue to move it in opposite directions when the solenoids are separately energized, circuits in which the two solenoids are located, a conductor-section mounted on the main conductor from which the car receives its current, the conductor-section being insulated from the main conductor, and an electromagnetic circuit-changer interposed between the conductor-section and the switch-tongue solenoids and controlled from the car whereby the switch-tongue solenoids may be alternately energized, said circuit-changer comprising a plunger, a bridge-piece connected with the plunger, a number of pairs of contacts which the bridge-piece is adapted to engage, one contact of each pair being in each solenoid-circuit, and the other contacts being connected with the trolley-wire, a circuit in which the circuit-changer coil is located, one branch of said circuit being connected with the trolley-wire and the other branch with the insulated conductor, the circuit-changer being further provided with a part connected with the plunger and provided with spiral grooves, and a projection adapted to engage said grooves for imparting a partial rotation to the plunger every time the latter is actuated.

10. The combination with the trolley-wire, of a tube forming an electrical conductor and surrounding a portion of the wire, an insulating-tube interposed between the conducting-tube and the wire, an insulating-plug located at each end of the conducting-tube, and a tapered stop mounted on the wire and engaging each insulating-plug at the end of the conducting-tube, substantially as shown and described.

11. In a railway-switch, the combination with the main line of track, two branch tracks turning from the main line, and a switch-tongue for each branch track, of electromagnetic means connected with each switch-tongue, circuits in which the said electromagnetic means are located, and means for closing the circuits, the arrangement being such that the two switch-tongues may be actuated simultaneously or separately as may be desired.

12. In a railway-switch, the combination with the main line of track, two branch tracks turning from the main line, and a switch-tongue for each branch track, of a solenoid connected with each switch-tongue, circuits in which the solenoids are located, another circuit in which one solenoid is located, and means for successively closing the several circuits, whereby the two switch-tongues may be simultaneously actuated, or the one switch-tongue alone actuated as may be desired.

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

FRED. T. KITT.

Witnesses:
A. J. O'BRIEN,
DENA NELSON.