No. 612,702. Patented Oct. 18, 1898.

R. V. CHEATHAM.

AUTOMATIC ELECTRICALLY CONTROLLED RAILWAY SWITCH.

(Application filed Mar. 12, 1898.)

(No Model.) 2 Sheets—Sheet 1.

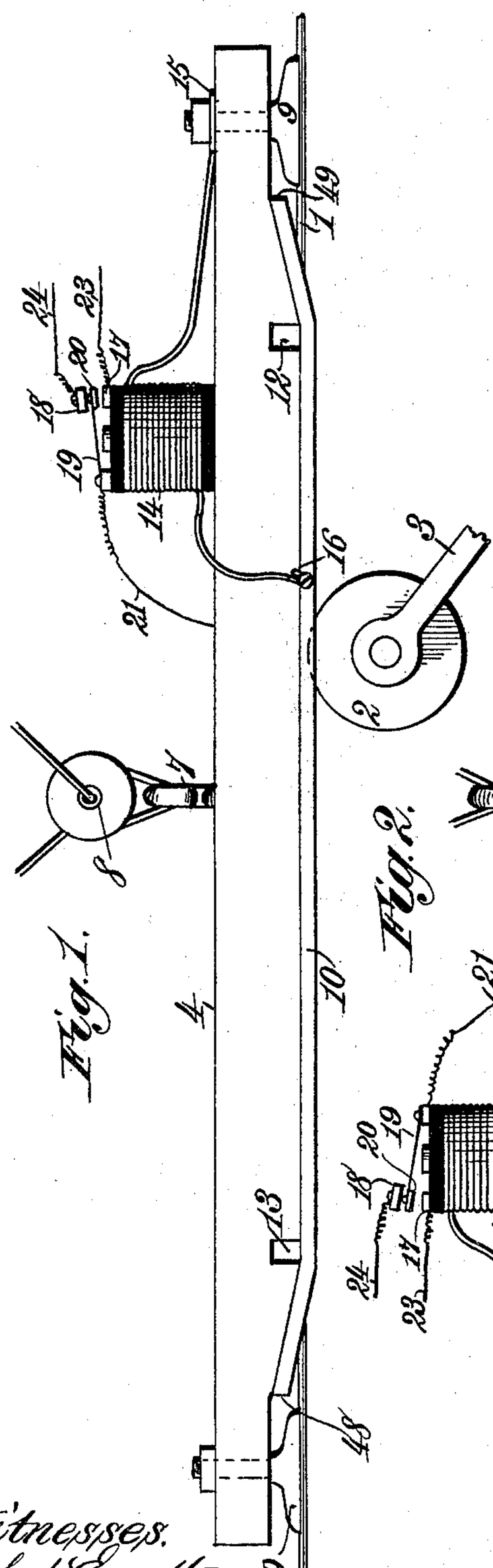

Fig. 1.

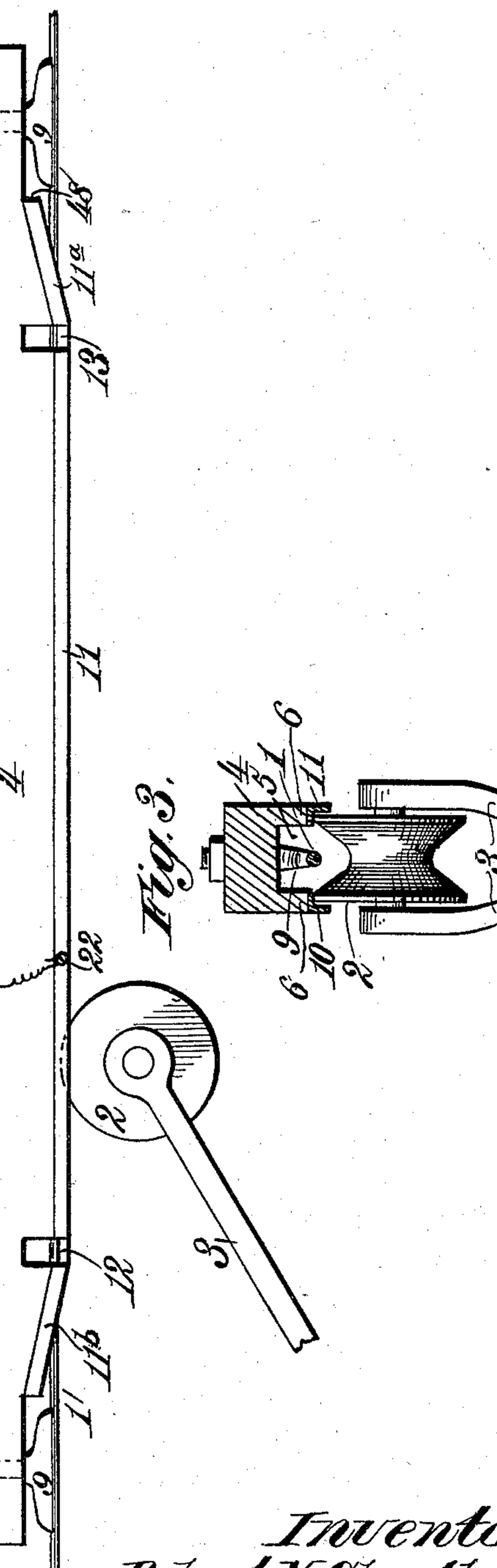

Fig. 2.

Fig. 3.

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(No Model.) 2 Sheets—Sheet 2.

Fig. 4.

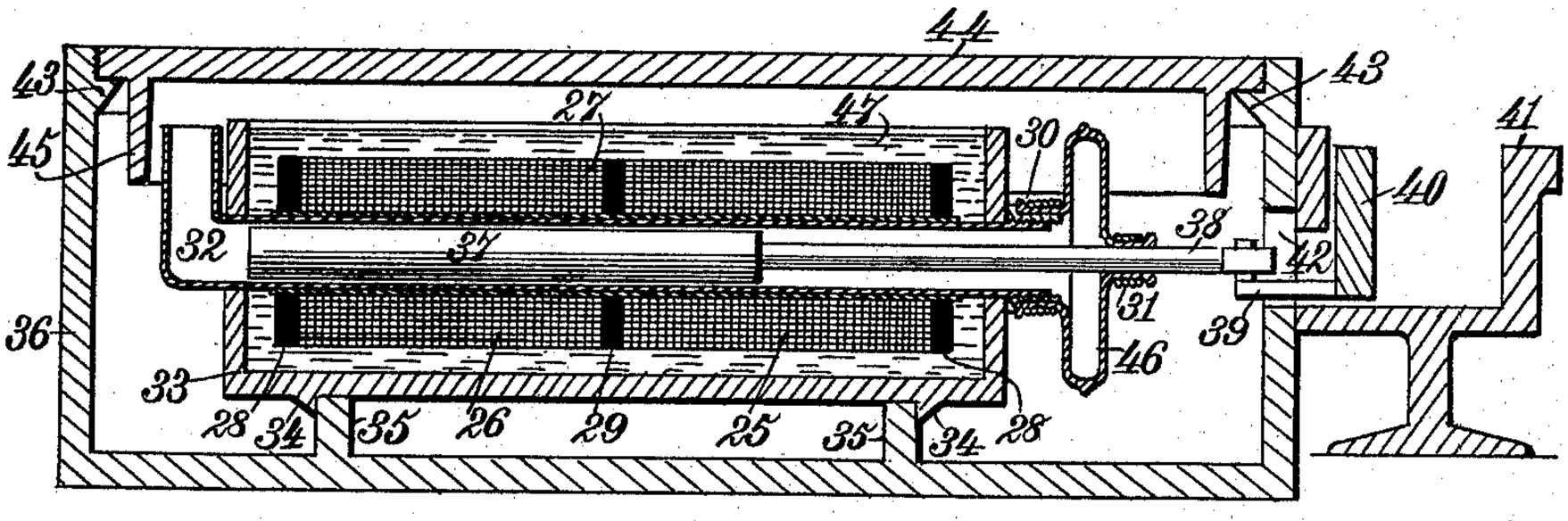

Fig. 5.

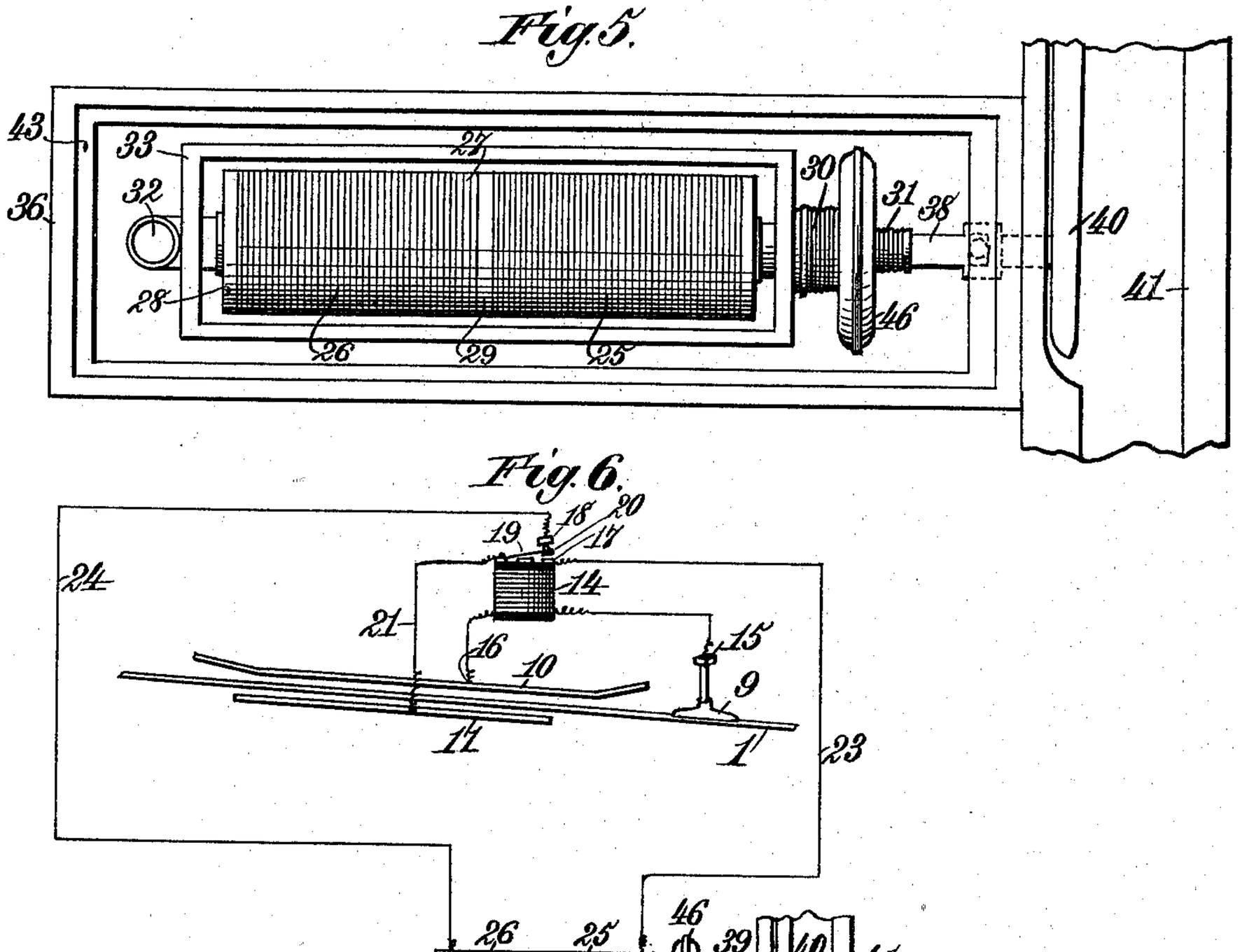

Fig. 6.

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ROBERT V. CHEATHAM, OF LOUISVILLE, KENTUCKY.

AUTOMATIC ELECTRICALLY-CONTROLLED RAILWAY-SWITCH.

SPECIFICATION forming part of Letters Patent No. 612,702, dated October 18, 1898.

Application filed March 12, 1898. Serial No. 673,626. (No model.)

To all whom it may concern:

Be it known that I, ROBERT V. CHEATHAM, a citizen of the United States, residing at Louisville, in the county of Jefferson and State of Kentucky, have invented new and useful Improvements in Automatic Electrically-Controlled Railway-Switches, of which the following is a specification.

This invention relates to automatic electrically-controlled railway-switches, and it has for some of its objects to simplify the circuits and to provide for operating the switching mechanism both with and without the current being on the car and in such manner that the motorman does not have to know which way the switch-point is turned. This is a great advantage on a dark night and when the frog is covered with water, as during a heavy rain.

Other objects and advantages of my invention will hereinafter appear in connection with the peculiar features of construction and novel combinations of devices in an electrically-operated railway-switch mechanism, as hereinafter more particularly described and claimed.

In the annexed drawings, illustrating the invention, Figure 1 is a side elevation of a trolley-wire attachment comprising two parallel contact-strips and an electromagnet mounted on the support for said strips. Fig. 2 is an elevation of the opposite side of said trolley-wire attachment, showing the other contact-strip. Fig. 3 is an end elevation of the trolley attachment. Fig. 4 is a vertical longitudinal section of solenoid or ground magnet and its housing, showing the connection of the solenoid-core with the movable switch-point and also improved means for excluding water. Fig. 5 is a plan of the same with the cover of the outer box removed. Fig. 6 is a diagram showing the circuit connections.

In the drawings the reference-numeral 1 designates a trolley-wire, and 2 is a trolley-wheel carried by the trolley-arm 3 of an electric car. Above the trolley-wire 1, at a point adjacent to a railway-switch, there is a wooden strip 4, that is provided in its under side with a longitudinal channel 5, having depending flanges 6 on each side. These flanges 6 are extended the greater part of the length of said wooden strip, its ends being unflanged and simply reduced in vertical thickness. The wooden strip 4 may be supported by means of a hook 7, suspended in any convenient manner from a span-wire 8, having any suitable supports. The ends of the wooden strip 4 will be provided with two depending supports 9 for the trolley-wire, which is extended longitudinally in the channel 5 on the under side of said wooden strip.

To the flanges 6 of the wooden strip 4 there are secured two parallel metallic contact-strips 10 and 11, composed, preferably, of angle-iron, attached by means of bolts or screws, as shown. The metallic contact-strip 10 is formed with integral upward-inclined ends, as shown in Fig. 1; but the opposite metallic contact-strip 11, Fig. 2, is straight and is extended along one of the flanges 6 between two slots 12 and 13, formed transversely in the under side of the wooden strip 4. Beyond these slots the contact-strip 11 is supplemented by upward-inclined strips 11^a 11^b, Fig. 2, which are also made from angle-iron. The space or extent of surface covered by the straight strip 11, supplemental inclined strips 11^a 11^b, and intervening slots 12 13 is equal to the full length of the opposite metallic strip 10 with its integral upward-inclined ends.

As shown in Fig. 3, the trolley-wheel 2 is circumferentially grooved for contact with the under side of the trolley-wire 1 when the said wheel is raised to its full extent, and it has a width that enables it to run along on the two parallel metallic contact-strips 10 11 and between their flanges when the said wheel reaches the said strips and leaves the trolley-wire.

On the top of the wooden strip 4 there is secured an electromagnet 14, that is wound with heavy wire. One end of the magnet-coil is connected with the trolley-wire by means of a holder 15 at one of the trolley-wire supports 9, and the other terminal is fastened, as at 16, to the undivided contact-strip 10, Fig. 1. On top of the electromagnet 14 there are two slightly-separated metal plates 17 and 18, one above the other and rigidly fastened to the upper flange of the magnet-spool. To the top flange of the spool there is also attached one end of a spring-armature 19, carrying at its free end a brass lug or contact 20 to oscillate between the contact-plates 17 and

18, as presently explained. This contact 20 normally rests upward against the upper plate 18; but when the magnet 14 is energized the spring-armature 19 is drawn down until its contact 20 rests on the contact 17. The stationary end of the spring-armature 19 is connected by a wire 21 to the middle section 11 of the divided contact-strip, as at 22, Fig. 2. Plates 17 and 18 are respectively connected by wires 23 24 to the magnet-coils 25 and 26 of a double solenoid 27, that is located adjacent to the railway-switch to be controlled.

The double solenoid 27 comprises a duplex spool having flanged ends 28 and an intermediate annular flange 29, Fig. 4, the said spool being wound with two coils 25 and 26, that are separated by the said central flange. Through the axis of the solenoid-spool there is loosely passed a brass tube 32, that is extended through both ends of a box or inner housing 33, in which the solenoid is located. The housing 33 is preferably of brass and is provided on its under side with lugs 34, engaging with ribs 35 in the bottom of an outer box 36, that is preferably constructed of cast-iron. This manner of supporting the solenoid-housing is designed to prevent longitudinal movement. The brass tube 32 is soldered tight to the ends of the housing or inner box 33, where it projects through the same. Within the brass tube 32 there is placed a core-armature 37 of such length as to permit a suitable longitudinal movement. To one end of this armature-core 37 there is secured a connecting-bar 38, that projects through one end of the brass tube 32 and is attached by suitable means to an arm 39 of the point-rail 40 in a railway-switch. The box 36 is placed transversely to the railway-track, preferably adjacent to a guard-rail 41, and one end of said box has an opening 42 for passage of the arm 39 of the point-rail. In the upper part of this outer box 36 there is a ledge 43 to support a cover 44, which is provided with a deep depending flange 45, extending all around and projecting into said box outside the inner solenoid-housing.

To one projecting end of the brass tube 32 there is secured the larger tubular end portion 30 of an elastic rubber bulb 46, that has at its other end a smaller tubular portion 31, secured to the bar 38, that connects with the arm 39 of the point-rail. One portion of this rubber bulb being secured to the fixed brass tube 32 and the other portion of said bulb being secured around the bar 38, it is obvious that it will prevent access of water to the solenoid-coils, and yet it does not interfere with the movements of the core-armature. The other end of the brass tube 32 is curved upward outside the inner box 33 and within the depending flange 45 on the cover 44 of the outer box. When all the necessary connections have been made and before the cover 44 of the outer box 36 is put in place, the inner box 33 is to be filled with paraffin 47, so as to exclude all moisture from the solenoid-coils. The upturned portion of the brass tube 32 within the flange 45 of the outer box-cover is of great importance in preventing the access of water through said tube and into the inner box.

In the operation of the railway-switch a motorman wishing to keep the main track will shut off the current to his motor and allow the car to run by momentum while passing under the trolley-wire attachment; but a motorman desiring to take the shunt-track will keep the current on his motor while passing under the said trolley-wire attachment. Now in the first instance where the car is run under the trolley-wire attachment with the current shut off from the motor let it be supposed that the trolley-wheel strikes the upward-inclined portions of the parallel metallic contact-strips at 48, so that by running on these inclines toward the slot 13 the trolley-wheel is brought down away from contact with the trolley-wire. When the trolley-wheel crosses the slot 13, it is in contact with both parallel metallic strips 10 and 11, which closes the circuit of one solenoid-coil 26, because the strip 11 is grounded through this coil. The circuit is through the trolley-wire 1, holder 15, electromagnet 14, strip 10 at 16, thence through trolley-wheel 2 into strip 11, wire 21, spring-armature 19, plates 20 and 18, and through wire 24, across the street and down a pole and under ground to the solenoid-coil 26, through which the core-armature 37 is attracted in the proper direction to set the point-rail 40 in position for passage of the car over the main track. This current is only about three amperes and is not sufficient to pull the spring-armature 19 down from its normally elevated position. Now to throw the point-rail 40 in the opposite direction, as for causing the car to pass over the shunt-track, the motorman keeps the current on his car while passing under the strips 10 and 11 of the trolley-wire attachment, and thus as soon as the trolley-wheel strikes the strip 10 at 48, Fig. 1, a heavy current is taken from that strip, it being connected to the trolley-wire through the electromagnet 14. This heavy current passing through the magnet 14 pulls down the spring-armature 19 from its contact with the plate 18 and into contact with plate 17, so that when the trolley-wheel proceeds far enough to touch the middle section 11 of the divided strip a current will pass from strip 10 through trolley-wheel 2 into this strip-section 11, thence through wire 21 to spring-armature 19, plates 20 and 17, and wire 23 to solenoid-coil 25, thereby causing the core-armature 37 to be moved in the proper direction to shift the point-rail 40 to the required position for passing the car onto the shunt-track. When the trolley-wheel passes the slot 12, the circuit is broken between the strips 10 and 11 and the trolley-wheel rises to the trolley-wire along the upward inclines, so that when the wheel leaves the end of strip 10 at 49, Fig. 1, the car ceases to take cur-

rent through the electromagnet 14, and the spring-armature 19 returns to its normally elevated position.

It will be noticed that where the motorman has the current on while passing under the parallel strips 10 and 11 of the trolley-wire attachment two currents flow from the strip 10—a heavy one through the car and one of only three amperes crossing through the trolley-wheel into the strip 11, and thence through the solenoid-coil 25, the spring-armature 19 being down. If it were not for this heavy current which the car-motor draws, the spring-armature 19 would not be drawn sufficiently hard to cause it to come down.

It will be observed that the metallic contact-strips 10 and 11 are insulated from each other by reason of being attached to opposite sides of the longitudinally-channeled wooden strip 4, and they are also normally insulated from the trolley-wire. The strip 11 is insulated from its several inclined ends 11^a 11^b at the transverse slots 12 and 13, which are of the same depth as the longitudinal channel 5 in the under side of the wood strip 4. The inclined ends 11^a 11^b serve only as guide-bearings for the trolley-wheel, and being without electrical connections they are not actively concerned in the operation of the switch.

With this automatic electrically-controlled railway-switch mechanism the motorman does not have to know which way the point-rail 40 is turned. If desiring to keep the main track, it is only necessary that he shut off the motor-current until after passing under the trolley-wire attachment; but if he wishes to take the shunt-track he will leave the current on. Every time the trolley-wheel of a car passes along the contact-strips 10 and 11 of my trolley-wire attachment one solenoid-coil or the other will be energized—which one will depend upon whether the motorman has his current on or off. If the switch or point rail is already set right for him, the same solenoid-coil 25 or 26 will be energized as would be required in case the switch was not set properly, thus pulling on the core-armature 37 whether it can move or not.

Only two small wires 23 and 24 of but three amperes capacity are required to run from the plates 17 18 and under ground, while other methods employing ground-magnets in series with car-motor require much heavier wires, as well as a larger number.

With this form of electric switch-controlling mechanism there is no arc drawn from the main line to risk the burning away of trolley-wire as with certain insulated sections of conductors. My trolley-wheel is always on a metallic contact and does not have to cross dead-blocks that are liable to wear and burn out very soon, and there is no difficulty as to leakage of current.

What I claim as my invention is—

1. In an electrically-controlled switch-operating mechanism, the combination with a trolley-wire, trolley-wheel, and a solenoid having its core-armature connected with the switch point-rail, of parallel contact-strips supported at opposite sides of the trolley-wire, one of said strips being provided with integral upward-inclined ends and the other composed of a middle section and several upward-inclined end portions, and circuits which are completed by engagement of the trolley-wheel with the integral contact-strip and middle section of divided contact-strip, substantially as described.

2. In an electrically-controlled switch-operating mechanism, the combination with a trolley-wire, trolley-wheel, and a solenoid having its core-armature connected with the switch point-rail, of parallel contact-strips on opposite sides of the trolley-wire and normally insulated therefrom, a transversely-slotted and longitudinally-channeled wood strip supported over the trolley-wire and to which the said parallel contact-strips are attached, one of said contact-strips being provided with integral upward-inclined ends and the other composed of a middle section extended between the transverse slots of the wood strip and supplemental upward-inclined portions at the outer sides of said slots, and circuits which are completed by engagement of the trolley-wheel with the integral contact-strip and middle section of said divided strip, substantially as described.

3. In an electrically-controlled switch-operating mechanism, the combination with a trolley-wire, and trolley-wheel, and a double solenoid having a core-armature connected with the switch point-rail, of parallel contact-strips supported at opposite sides of the trolley-wire and having upward-inclined ends, one of said strips being integral throughout and the other being divided into three sections, an electromagnet having a spring-armature and two contact-plates for said armature, the winding of said electromagnet being connected with the trolley-wire and with the integral contact-strip, a wire connecting the spring-armature with the middle section of the divided contact-strip, and wires connecting the contact-plates of said spring-armature with the windings of the double solenoid, substantially as described.

4. In an electrically-controlled switch-operating mechanism, the combination with a trolley-wire, trolley-wheel, and a double solenoid having its core-armature connected with the switch point-rail, of a wooden strip supported above and along the trolley-wire, parallel contact-strips attached to said wooden strip on opposite sides of the trolley-wire, one of said contact-strips being provided with integral upward-inclined ends and the other contact-strip being divided and comprising a straight middle section and severed upward-inclined ends, an electromagnet mounted on the said wooden strip and having a spring-armature and two separated contact-plates for the free end of said armature, the winding of said electromagnet being connected

with the trolley-wire and with the integral contact-strip, a wire connecting the spring-armature with the middle section of the divided contact-strip, and wires connecting the contact-plates of said spring-armature with the windings of the double solenoid, substantially as described.

5. In an electrically-controlled switch-operating mechanism, the combination of an outer closed box or casing, a solenoid-spool having two independent windings, an inner box or housing for the solenoid, a metal tube extended through the axial opening of the spool and projected beyond the ends of the said inner box and secured thereto, a core-armature movable in said tube, a bar connecting said core-armature to an arm of the switch point-rail, an elastic bulb through which said connecting-bar passes, said bulb being secured on one side to the tube in which the core-armature is placed and on the other side to said connecting-bar, and means for supplying electric energy to the solenoid-windings alternately, substantially as described.

6. In an electrically-controlled switch-operating mechanism, the combination of an outer box or casing having a cover provided with a bell-flange depending within said box, a solenoid-spool having two independent windings, an inner box or housing for the solenoid, a metal tube extended through the axial opening of the spool and projected beyond the ends of the inner box and secured thereto, one of the projecting ends of said tube being turned upward within the bell-flange of the outer-box cover, a core-armature movable in said tube, a connecting-bar between the core-armature and the arm of the switch point-rail, an elastic bulb through which said connecting-bar passes, said bulb being secured on one side to the tube in which the core-armature is placed and on the other side to said connecting-bar, and means for controlling the supply of electric energy to the solenoid-windings alternately, substantially as described.

7. In an electrically-controlled switch-operating mechanism, the combination of an outer box or casing having a cover provided with a bell-flange depending within said box, a solenoid-spool having two independent windings, an inner box or housing for the solenoid, a metal tube extended through the axial opening of the spool and projecting beyond the ends of said inner box and secured thereto, one of the ends of said tube being turned upward within the bell-flange of the outer-box cover, a core-armature movable in said tube, a connecting-bar between the core-armature and the arm of the switch point-rail, an elastic bulb through which said connecting-bar passes, said bulb being secured on one side to said connecting-bar and on the other side to the tube in which the core-armature operates, a filling of paraffin in the inner box or solenoid-housing, and means for controlling the supply of electric energy to the solenoid-windings alternately, substantially as described.

8. In an electrically-controlled switch-operating mechanism, the combination with a switch point-rail, trolley-wire, and trolley-wheel, of a double solenoid having a core-armature connected with the said point-rail, a solenoid-housing comprising an inner box and an outer box, a filling of paraffin in the said inner box, parallel contact-strips supported at opposite sides of the trolley-wire and having upward-inclined ends, one of said contact-strips being integral throughout and the other divided into several sections, and circuits which are completed by engagement of the trolley-wheel with the integral contact-strip and a section of the divided contact-strip, substantially as described.

9. In an electrically-controlled switch-operating mechanism, the combination with a switch point-rail, trolley-wire and trolley-wheel, of a double solenoid having a housing composed of an inner box and an outer box, an outer-box cover having a bell-flange depending within said box, a fixed metal tube extended through the solenoid-spool and having its ends projecting beyond and through the ends of the inner box, one end of said tube being turned upward within the bell-flange of the outer-box cover, a core-armature movable in said tube, a connecting-bar from said core-armature to an arm of the point-rail, an elastic bulb connected with said tube and connecting-bar, parallel contact-strips supported at opposite sides of the trolley-wire, an electromagnet, and circuits completed by engagement of the trolley-wheel with said contact-strips, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

ROBERT V. CHEATHAM.

Witnesses:
G. B. WEBB,
R. H. YATES.