No. 609,292. Patented Aug. 16, 1898.

J. P. ORR & G. H. FUGH.

SWITCH AND SWITCH OPERATING MECHANISM.

(Application filed Nov. 9, 1897.)

(No Model.) 4 Sheets—Sheet I.

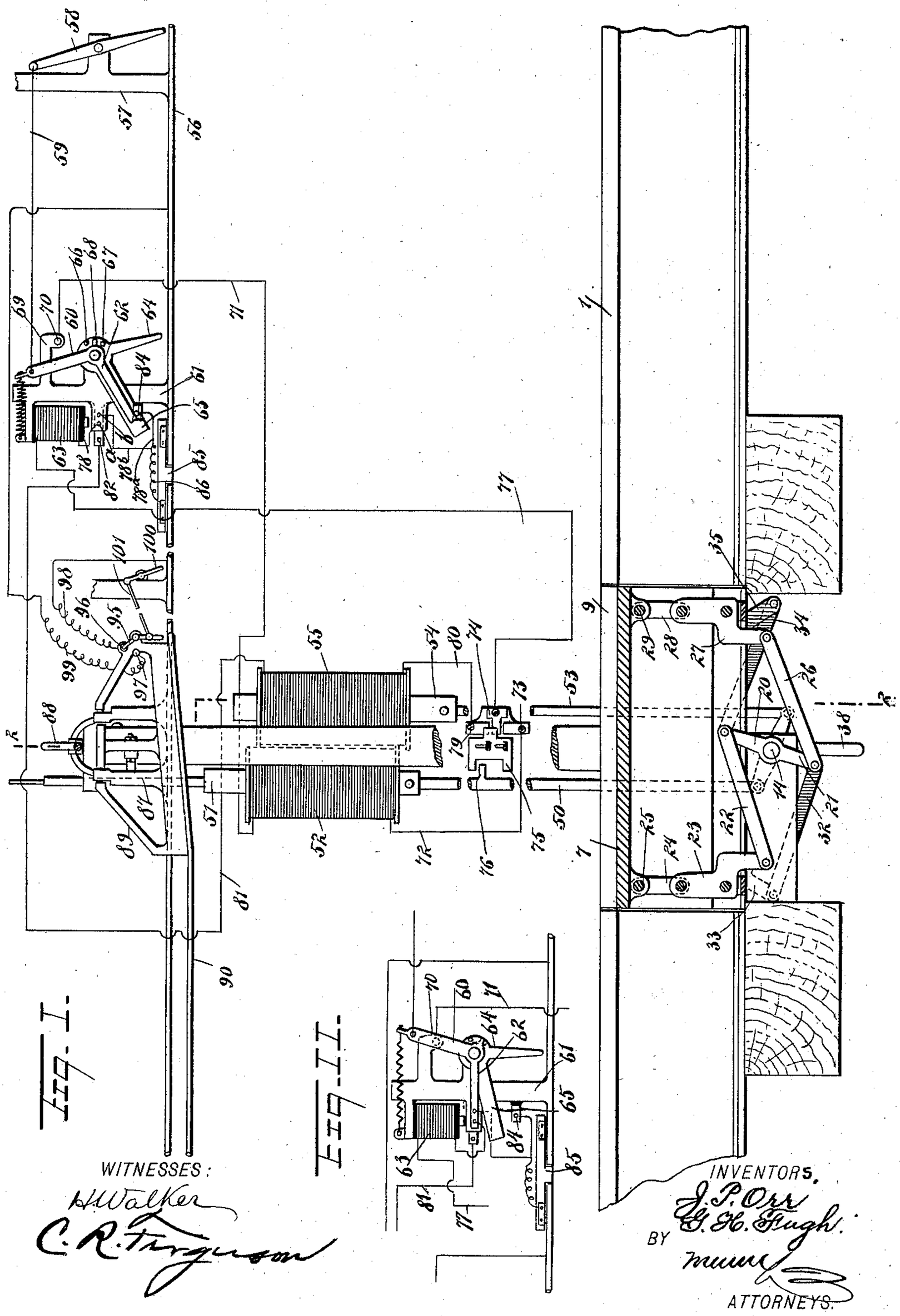

FIG. I.

FIG. II.

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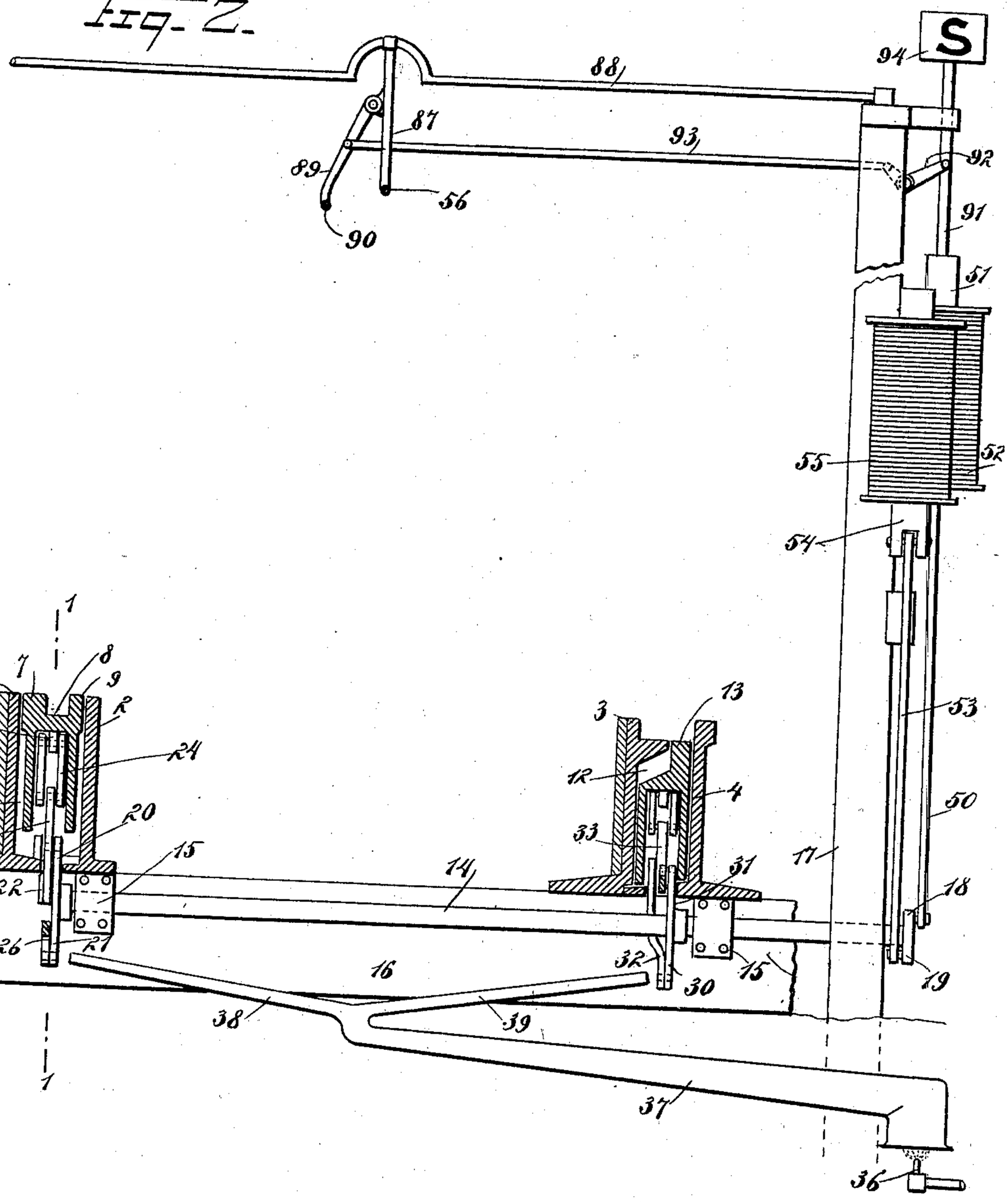
4 Sheets—Sheet 2.

Fig. 2.



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(No Model.) 4 Sheets—Sheet 3.

Fig. 3.

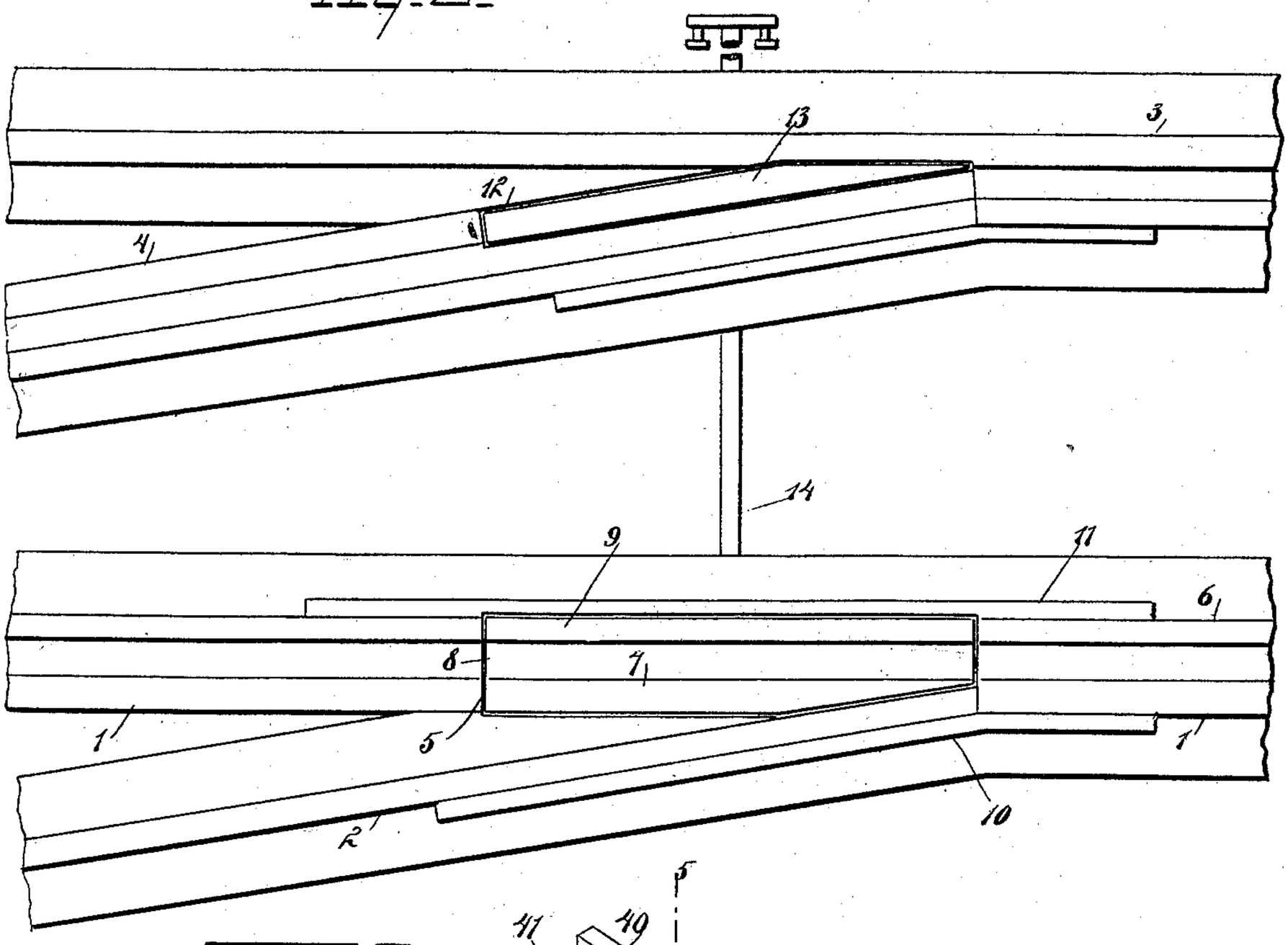
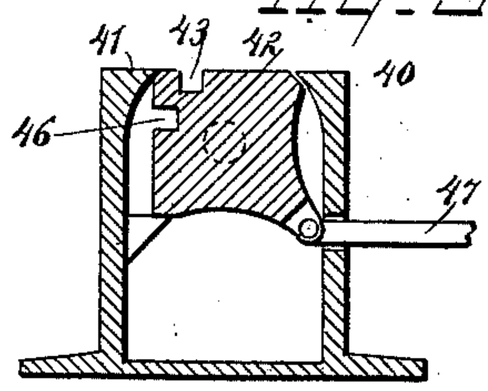


Fig. 5.



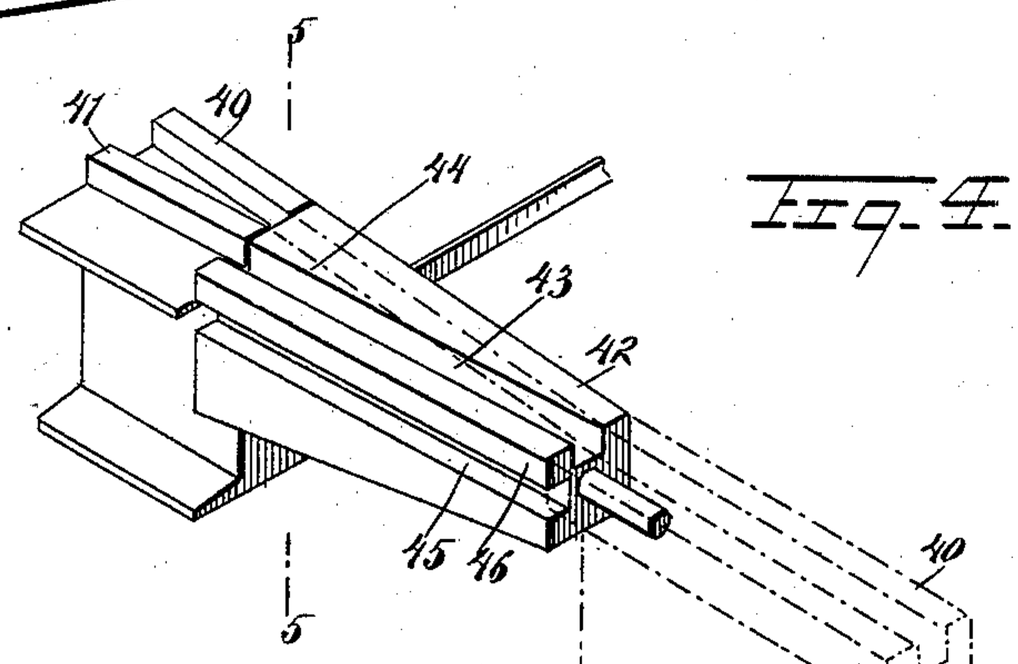


Fig. 4.

Fig. 6.

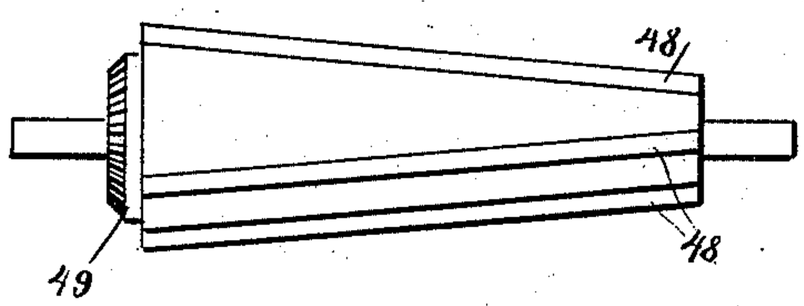


Fig. 7.

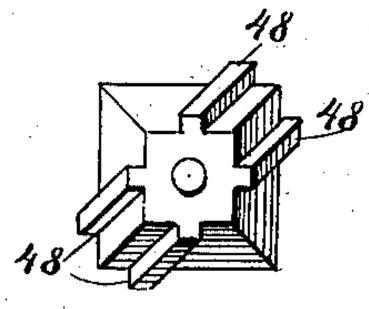


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Fig. 8.

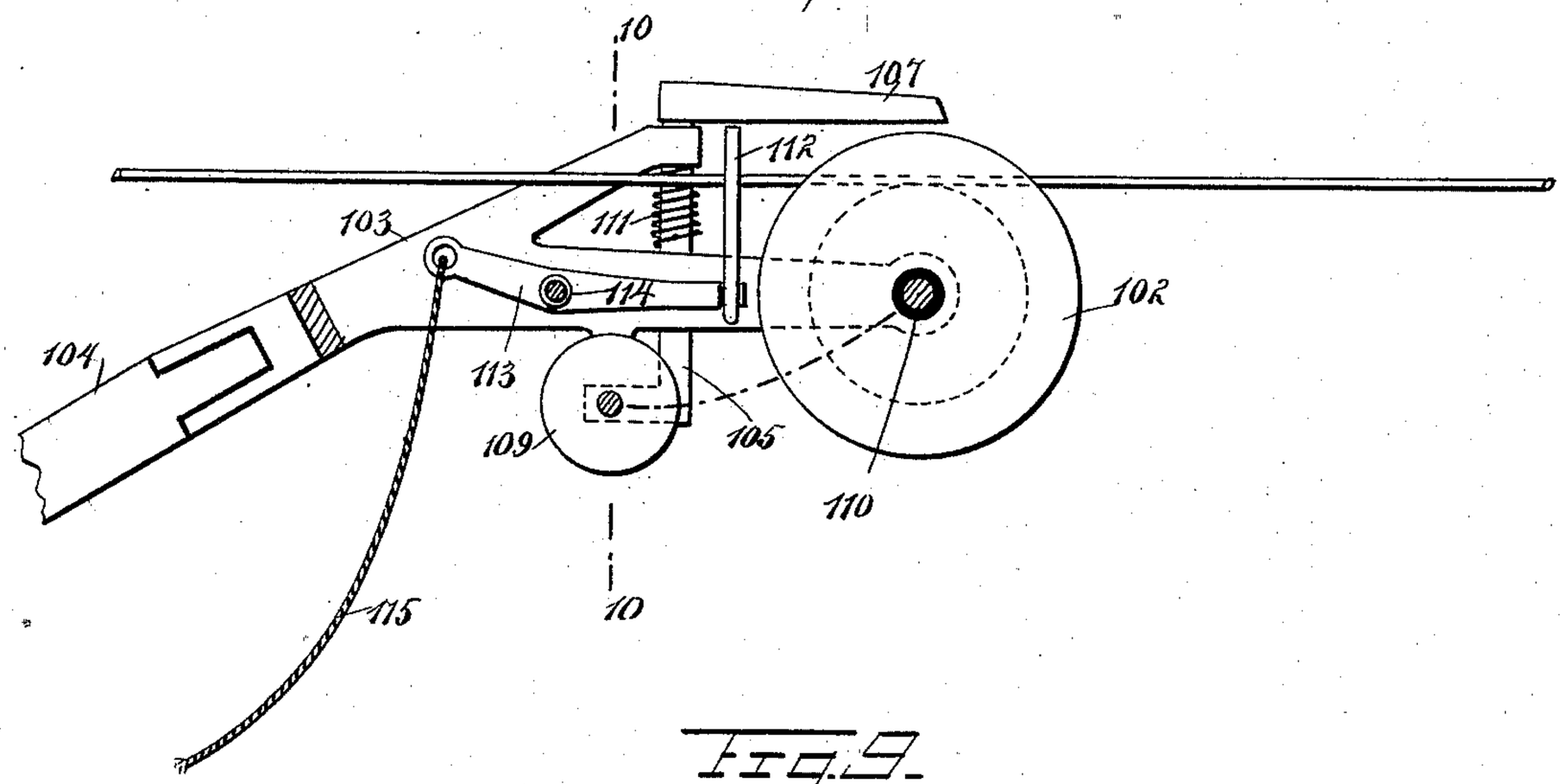


Fig. 9.

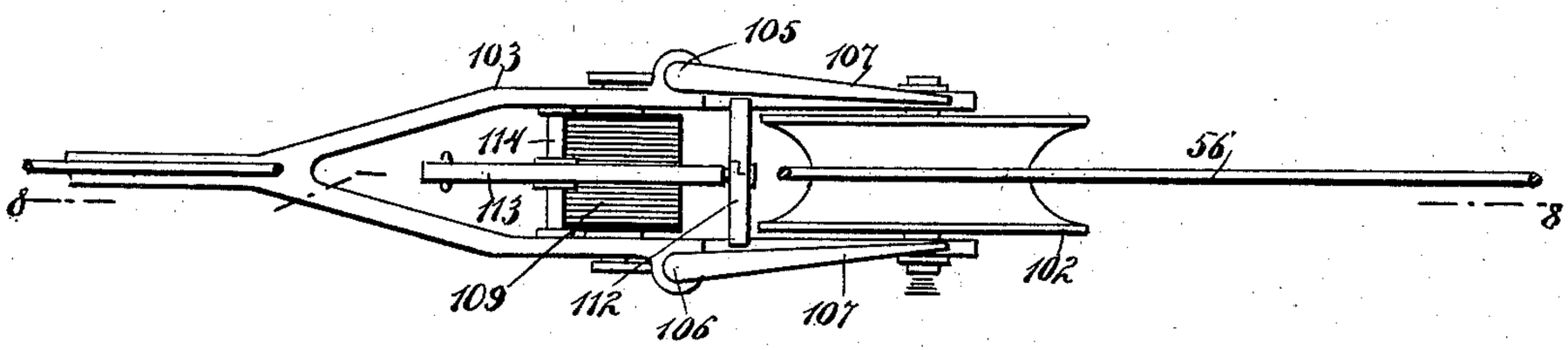
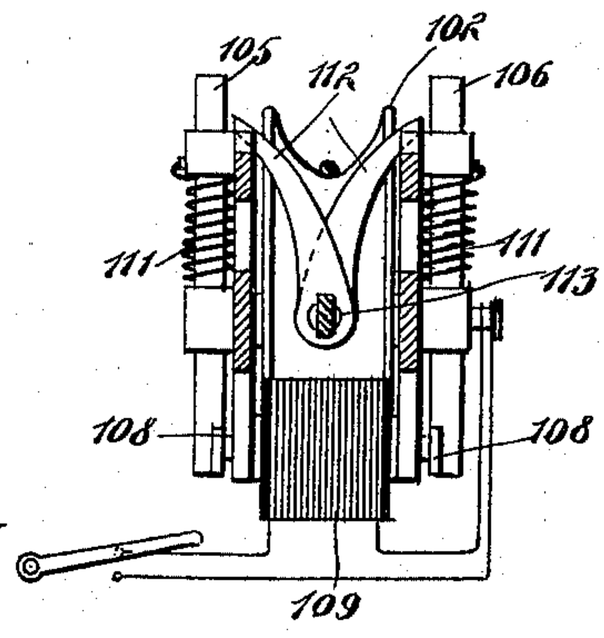


Fig. 10.



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UNITED STATES PATENT OFFICE.

JAMES P. ORR AND GEORGE H. FUGH, OF PITTSBURG, PENNSYLVANIA.

SWITCH AND SWITCH-OPERATING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 609,292, dated August 16, 1898.

Application filed November 9, 1897. Serial No. 657,963. (No model.)

To all whom it may concern:

Be it known that we, JAMES P. ORR and GEORGE H. FUGH, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and Improved Switch and Switch-Operating Mechanism, of which the following is a full, clear, and exact description.

This invention relates to switches for railway-lines and to an electrical means for operating the same.

The object of our invention is to provide a practically continuous rail and trolley line with means to enable a motorman to switch his car from a main line without materially checking the speed of the car.

Another object is to so arrange the switch that it may be moved vertically instead of laterally, as is the usual method; and another object is to provide a simple means to prevent the locking of the switch by ice that might form around the switch in cold weather.

We will describe a switch and switch-operating mechanism embodying our invention, and then point out the novel features in the appended claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a partial elevation and partial section, on the line 1 1 of Fig. 2, of a switch and switch-operating mechanism embodying our invention. Fig. 2 is a partial elevation and partial section on the line 2 2 of Fig. 1. Fig. 3 is a plan view of a main and switch track, showing our switch as applied thereto. Fig. 4 is a perspective view of a modified form of switch. Fig. 5 is a section on the line 5 5 of Fig. 4. Fig. 6 is a plan view showing another modified form of switch. Fig. 7 is an end view thereof. Fig. 8 is a partial side elevation and partial section through the line 8 8 of Fig. 9, showing a trolley mechanism adapted to be employed with our invention. Fig. 9 is a plan view thereof. Fig. 10 is a section through the line 10 10 of Fig. 8; and Fig. 11 is an elevation of a portion of the device illustrated in Fig. 1, showing the parts in a different position.

We will first describe the switch mechanism embodied in our invention.

Referring to the drawings, 1 designates a main-track rail having connection with a switch-rail 2, and 3 designates the other main-track rail, designed to be connected with a switch-rail 4. There is a space 5 between the main-track rail 1 and a flange 6 at the inner side thereof. This space 5 is substantially rectangular, and movable therein is a switch-rail 7, which when in its upper position makes the rail 1 practically continuous. The switch-rail 7 is mounted on a block 8, and at the opposite side of this block is a flange 9, which will connect to portions of the flange 6 when the switch-rail is in its upper position, as indicated in the drawings. The rails 1 and 2 may be connected by a fish-plate 10, and a similar plate 11 will connect the two main parts of the flange 6.

Between the rails 3 and 4 is an opening 12, in which a switch-tongue 13 is movable vertically. This opening 12 is in line with the switch-rail 4. The switch-tongue 13 is beveled at one side to engage closely with said main rail 3 when the switch-tongue is in its upper position. These switching devices 7 and 13 are designed to be moved vertically, one being in its upper position while the other is in its lower position—that is, when the switch portion 7 is in its upper position and the switch-tongue 13 in its lower position the main line or track will be open. When, however, it is desired to switch a car from the main track onto the switch-tracks, the tongue 13 must be raised and the switch-rail 7 be in its lower position. The normal position, however, will be with the main line open.

Extended below and transversely of the track is a shaft 14, here shown as having bearings in boxes 15, secured to a beam 16, and one end of said shaft 14 is extended outward through a pole 17, and to the extreme outer end are attached oppositely-extending arms 18 and 19. Secured to the inner end of the shaft 14 are oppositely-extended arms 20 and 21. From the end of the arm 20 a link 22 extends to a pivotal connection with an angle-lever 23, which at its opposite end has a link connection 24 with a lug 25 on the under side of the switch-rail 7 and at one end thereof. From the arm 21 a link 26 extends to a pivotal connection with an angle-lever 27, from the upper end of which a link 28 extends to a pivotal connection with a lug 29,

connected to the rail 7 at its opposite end. The switch-tongue 13 has similar connections with the shaft 14, excepting that the leverage action is reversed—that is, extended from the shaft 14 are the arms 30 31, parallel with the arms 20 and 21. From the arm 30 a link 32 extends to a crank-lever 33, which has a link connection with a lug on the lower side of the switch-tongue 13, and from the arm 31 a link 34 extends to a connection with an angle-lever 35, having link connections with the under side of said switch-tongue.

As a means for preventing the formation of ice around the parts just described we employ a suitable heating device. As here shown, this heating device consists of a gas-jet 36, located beneath the surface of the ground in a suitable boxing and arranged to discharge its heat into a pipe 37, which has branches 38 39, the open ends of which discharge adjacent to the lever mechanism for operating the switch parts, as plainly indicated in Fig. 2. Of course the gas-jet will heat the air in the pipe 37, and this heated air will be discharged through the branches 38 and 39.

In the modified form of switch-tongue shown in Figs. 4 and 5, 40 indicates a rail of the main track, and 41 indicates a branch track. There is a space between one end of the track 40 and another end of said track 40 and the branch track 41, and mounted to rotate in this space is a block 42, which is tapered longitudinally, the smaller end being toward the main section of the main track 40. This block 42 has trunnion-bearings in suitable supports, and in one of its faces it has a longitudinal channel 43, at one side of which is a track-section 44. On its other face, at right angles to the face having the channel 43, it is provided with a similar channel 45 and a track-section 46. These channels of course are designed to receive the flanges of the car-wheels. An oscillating rotary motion is imparted to the block 42 through the medium of an operating-rod 47. In Fig. 4 this block is shown in its switching position, and to put it in position to connect the main line it must be rotated to bring the track portion 46 in line with the main track 40.

The device shown in Figs. 6 and 7 is quite similar to the device shown in Figs. 4 and 5, excepting that it is designed to have a complete rotation, or, in other words, to be rotated in one direction only when it is desired to place it in connection with a switch or with a main line. Therefore it is provided with track-surfaces 48 on each of its faces, and at its larger end it is provided with a miter-gear 49, designed to be engaged by a miter-gear on an operating-rod.

We will now describe the electrical connections operating the switch: From the arm 18 on the shaft 14 a rod 50 extends to a pivotal connection with the core 51 of a solenoid 52, and from the opposite arm 19 a rod 53 extends to a pivotal connection with the core 54 of a solenoid 55. Mounted on the main trolley-wire 56 is an upright 57, upon which a trip-lever 58 is pivoted. The lower end of this trip-lever extends nearly to the line-wire 56. From the upper end of the trip-lever a wire 59 extends to a connection with the upright arm 60 of an angle-lever mounted to rock on a stud extended from a bracket 61. This bracket 61 will be connected at its upper end with a suitable support, like that 88, (shown at the left hand in Fig. 1,) and extended across the street. The other member 62 of this angle-lever serves as an armature and circuit-closer coacting with an electromagnet 63, as will be hereinafter described. This electromagnet 63 is supported on the bracket 61. Mounted also to swing on the stud with the angle-lever 60 62 is another angle-lever, comprising downwardly-diverging members 64 and 65. The member 64 is designated the "trip" member, and the member 65 is designated as a "circuit-closing" member. The member 65 is substantially parallel with the member 62 of the first-named angle-lever. Extended from the hub portion of the angle-lever 64 65 are lugs 66 and 67. These lugs are spaced apart and are designed to be engaged, as will be hereinafter described, by a pin 68, carried by the angle-lever 60 62.

Extended outward from the bracket 61 is an arm 69, on which is an insulated contact-point 70, from which a wire 71 extends to one end of the solenoid 52, and from the other end of this solenoid 52 a wire 72 extends to a connection with a contact-plate 73, adapted to be put in electrical connection with a contact-plate 74 by means of a circuit opener and changer, here shown in the form of a sliding plate 75, which is operated in both directions by means of a pin 76, extended from the rod 50, as will be hereinafter described. From the contact-plate 74 a wire 77 extends to the electromagnet 63, and from this electromagnet 63 a wire 78 extends to a connection with a contact-point *a*, designed to be put in connection with a contact-point *b*.

Arranged above the contact-plate 74 and in line with the contact-plate 73 is a similar contact-point 79, from which a wire 80 extends to one end of the solenoid 55. From the other end of this solenoid 55 a wire 81 extends to a connection with a contact 82, adapted to be put in connection with the bracket 61 by the circuit-closer 65, as will be described. From a contact 84, supported by the bracket 61, but insulated therefrom, a shunt-wire 78^a leads to a wire 86, and from the contact *b* a wire 78^b leads to the wire 86.

The angle-levers are not insulated from the bracket 61 or wire 56. The main trolley-wire 56 is separated at a point near the bracket 61, and the two ends are connected together by a block 85 of semi-insulating material, and the further section of the wire 56 is connected by the wire 86 to the contact 84, and as the wire 86 is in connection with the other section of the wire 56 when the parts 60 or 65

engage the contacts 70 or 82, respectively, it is obvious that the two sections will be electrically connected and a small portion only of the current will be shunted to the electromagnet 63, which is always in circuit with the solenoid 52 or 55, the larger portion of current passing through the block 85, as it has less resistance than the solenoid and helix.

The main wire 56 is supported by a hanger 87, depending from the cross-rod 88, and pivotally connected to this hanger 87 is a frame 89, to which the switch trolley-wire 90 is attached. The switch trolley-wire is designed to engage at its end with the main wire 56 to open the switch; but it is moved laterally out of engagement to close the switch, as will hereinafter appear, by a downward movement of the core 51 in the solenoid 52. This core 51 has an upwardly-extended rod 91 engaging with one arm of an angle-lever 92, pivoted on the post 17. The other arm of this angle-lever 92 has a rod connection 93 with the frame 89. The upper end of the rod 91 may be provided with a signal-plate 94 to indicate the position of the frame 89, the rail and trolley switches opening or closing simultaneously.

Mounted on the frame 89 is a circuit-changer, here shown in the form of a lever 95, adapted to be moved into engagement with either one of the contact-points 96 or 97 on said frame, but insulated therefrom, and from which contact-points wires 98 and 99 lead to a connection with the main trolley-wire. This mechanism, however, is only to be used where rail-switch mechanism is not available. The switch or circuit-changer 95 is operated by means of a lever 100, having a rod connection 101 with said circuit-changer. The normal short shunt-circuit is closed at 95, and the shunt-circuit through the operating-solenoid is closed at the contact-point 97.

We will now describe a trolley employed in connection with our present invention; but it is to be understood that said trolley is not to be broadly claimed herein, as it forms the subject-matter of another application.

A trolley 102 of any desired construction is mounted to rotate in a bifurcated head 103, but is insulated therefrom. The trolley-head 103 is also insulated from the trolley-pole 104. Mounted to rotate on opposite sides of the trolley-head are pintles 105 and 106. These pintles are each provided at their upper ends with an arm or projection 107, arranged in front of and extended rearward and normally parallel with the sides of the trolley 102. The lower ends of the pintles are provided with extensions 108, constituting armatures to be held normally parallel with the sides of the trolley by an electromagnet 109, supported by the head. The electromagnet 109 is energized by having one of its ends connected with the pintle 110 of the trolley and the other end connected to the trolley-pole below the trolley-head. As long as the trolley is in contact with the main wire 56 the armatures 108 will be held in engagement with the electromagnet 109; but as soon as the electromagnet is deënergized, which may be caused either by the trolley-wheel leaving the wire or the motorman changing his switch, the arms 107 will be forced together over the trolley by means of springs 111, mounted on the pintles 105 and 106, and secured at one end to said pintles and at the other end to the trolley-head. When the arms 107 are moved over the trolley, the said trolley will be prevented from downward motion, which would remove it from the wire 56.

In order to permit the trolley to be wholly disengaged from the main wire, two curved arms 112 are provided. These arms extend in opposite directions or diverge upward. The arms are connected with a lever 113, supported on a cross-bar 114 in the trolley-head. This lever 113 is designed to be rocked by a downward pull on a rope 115, so as to project the arms 112 upward between the arms 107, and thereby prevent their closing when the circuit is broken through the electromagnet 109. These arms 112 also serve as guides when raised to assist in returning the trolley into engagement with the wires.

The operation is as follows: It will be noted in all the examples of the switch that the motion is vertical. The examples shown in Figs. 4 and 6, however, have a rotary motion as well as a vertical motion. If a trolley-car is approaching from the right and the motorman desires to open the switch, the motorman will open the circuit through the electromagnet 109, carried by the trolley-head. This will allow the arms 107 to be moved by the spring to close above the wire 56 and engage with the trip-lever 58. The rocking of the trip-lever 58 will cause the lever comprising the parts 60 62 to move into connection with the contact-point 70, closing the circuit through the wire 77 and the solenoid 52, which will cause an upward movement of the core 51. At the completion of the movement the circuit will be opened by the pin 76 engaging with the plate 75, drawing it upward out of contact with the contact-plate 73, and putting it in contact with the parts 74 and 79. When in this position, the circuit will be closed through the solenoid 55 through the wire 81 to the contact 82. When the arms on the trolley engage with the trip member 64 of the angle-lever, the same will be caused to swing and cause the member 65 to close the circuit through the contact 82, and the parts will be held in this position by the magnet 63 until the switch is closed by the upward motion of the core in the solenoid 55, and the reciprocating motion of the core in the solenoid 52 will cause the circuit-controlling plate 75 to move downward again into engagement with the contact 73, opening the circuit through the solenoid 55 and closing it through the solenoid 52, and as the circuit is now open the electromagnet 63 will be deënergized and the angle-levers will be returned to their

normal position by a spiral spring attached at one end to the upper end of the lever member 60 and at the other end to the bracket. At this time the short circuit around the block 85 will be closed through the wire 86 by the member 65 connecting the bracket 61 with the contact-point 84, closing the normal shunt-circuit. Of course when the solenoid 55 is energized the switch mechanism in the track will be moved to a normal position. The cores 51 and 54 and circuit opener and changer 75 are all shown in the position of open switch, Fig. 1.

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

1. In a railway, a switch comprising a tongue, a track-section, electrical means for moving said tongue and track-section vertically, one section being moved downward as the other section is moved upward and means carried by a car for opening and closing the electrical current, substantially as specified.

2. In a railway, a switch comprising a vertically-movable switch-tongue, a vertically-movable switch-track section, a rocking shaft below the switch, arms extended from said shaft, angle-levers, link connections between said arms and said angle-levers, link connections between the angle-levers and the vertically-movable switch-sections, and electrically-operated means for rocking the shaft, substantially as specified.

3. In a railway, the combination with a vertically-movable switch, of solenoids, the cores of which have operative connection with the switch, circuit-controlling devices for throwing the current alternately through the solenoids and means carried by the car for operating the controlling devices, substantially as specified.

4. In a railway, the combination with a switch, of a pair of solenoids, the cores of which have operative connection with the switch, a circuit-changing device operated by the movement of one of the cores, a trip-lever arranged above the trolley-wire, an angle-lever comprising a circuit-closer and having a connection with the trip-lever, another angle-lever having a trip portion and a circuit-closing portion, both the said angled levers being mounted on the same pivot and movable one within the other, an electromagnet for holding the angle-levers in one position, and means carried by a car for moving the trip-lever and the angle-levers, substantially as specified.

5. A circuit-controlling device for an electrically-operated railway-switch, comprising an angle-lever, one portion of which forms a switch-closer and the other portion of which forms an armature, another angle-lever mounted on the same pivot with the first-named angle-lever, the last-named angle-lever having a circuit-closing section and a trip-section, an electromagnet for holding the angle-levers in one position, lugs extended from one of the angle-levers, a pin extended from the other angle-lever between the lugs, and a shunt-circuit from the trolley-wire adapted to be controlled by the levers, substantially as specified.

6. In an electrically-operated switch for a railway, the combination with an electric circuit, of controlling devices operated by a part carried by a car, a swinging frame, a switch trolley-wire connected to said swinging frame and normally not in engagement with the main trolley-wire, and means carried by the switch-operating mechanism for swinging said frame and its wire into connection with the main wire, substantially as specified.

7. The combination with a railway-switch, of a pipe arranged below the switch and having an open end, a gas-burner below said open end, and branch pipes extended in opposite directions from the first-named pipe, substantially as specified.

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