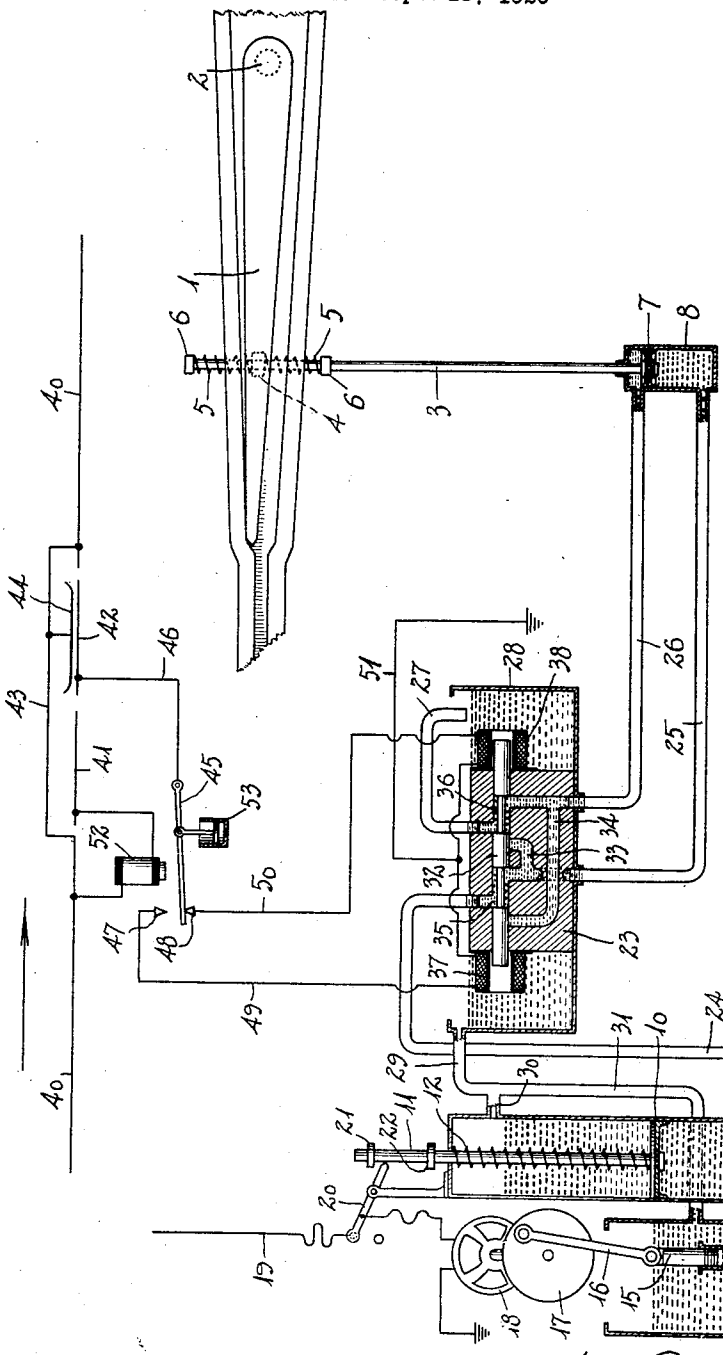
April 9, 1929. L. W. VAN BUSKIRK 1,708,245

AUTOMATIC SWITCH OPERATOR

Filed Sept. 18, 1926



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Patented Apr. 9, 1929. 1,708,245

UNITED STATES PATENT OFFICE.

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AUTOMATIC SWITCH OPERATOR.

Application filed September 18, 1926. Serial No. 136,296.

The present invention relates to automatic switch operators for electric railroads, and aims to provide a novel and improved apparatus for automatically throwing or moving the switch to either position as the car approaches the switch.

Another object is the provision of a novel and improved hydraulic mechanism for operating the switch.

A further object is the provision of novel electrical control means associated with the trolley wire or third rail in order to control the movement of the switch to either position according to the position of the controller handle of the car.

The invention also has for an object to provide an apparatus of the character indicated which is improved generally in its construction to provide for practical and efficient operation.

With the foregoing and other objects in view, which will be apparent as the description proceeds, the invention resides in the construction and arrangement of parts, as hereinafter described and claimed, it being understood that changes can be made within the scope of what is claimed, without departing from the spirit of the invention.

The invention is illustrated in the accompanying drawing, wherein the apparatus is illustrated diagrammatically, portions being shown in section and portions in elevation.

The switch or switch point is indicated at 1, being pivoted, as at 2, to swing to opposite positions for directing the car wheels in either of two directions.

A switch throwing rod 3 extends transversely under the switch and passes slidably through a lug or ear 4 with which the switch is provided, and coiled springs 5 are disposed on said rod and are confined between the lug or ear 4 and nuts 6 threaded on the rod, whereby the switch is yieldingly moved with the rod 3 in either direction, thereby avoiding breakage of parts should the switch fail to move because of an obstruction, and also to allow car to trail through without bringing undue pressure on the cylinder 8 or other parts of the mechanism. The rod 3 is connected to a piston 7 working in a hydraulic cylinder 8, whereby the switch is operated by the hydraulic pressure of oil or other liquid.

The oil or other liquid is supplied under pressure, for operating the switch, from within a pressure tank or cylinder 9 which has a piston 10 working therein to force the liquid therefrom. The piston 10 has a piston rod 11 projecting through one end of the cylinder 9, and a suitable spring 12 is provided for moving the piston 10 to create the desired pressure on the liquid in the cylinder 9.

Surplus liquid is held in a surplus or return tank 13 from which the liquid is forced by a pump 14 into the cylinder 9, the plunger or piston 15 of the pump 14 being operated by suitable means. As shown, the plunger 15 is connected by a connecting rod 16 with a crank wheel 17 that is suitably operably connected with an electric motor 18 disposed in a circuit 19 connected to the power line or other suitable source of electrical energy.

The motor 18 is operated at intervals to keep the cylinder 9 supplied with liquid. Thus, a switch 20 is disposed in the circuit 19, being a lever, as shown, mounted on the cylinder 9, and collars 21 and 22 are mounted on the piston rod 11 to operate the switch 20. Thus, when the piston 10 is moved by the spring 12 to discharge the liquid from the cylinder 9 to a predetermined point, the collar 21 contacts with the switch 20 and swings said switch to closed position, thereby starting the motor 18 and driving the pump 14 to pump liquid from the tank 13 into the cylinder 9. This raises the piston 10, and when the cylinder 9 is filled up to a predetermined point, the collar 22 contacting with the switch 20 will swing said switch open, thereby stopping the motor 18 and pump 14. In this way, when the liquid in the cylinder 9 becomes low, the motor 18 is automatically started to recharge the cylinder or tank 9.

The flow of liquid from the cylinder 9 to the cylinder 8 is controlled by a reversing valve having the body 23. A pipe 24 connects the body 23 with the cylinder 9 below the piston 10, and pipes 25 and 26 connect the opposite ends of the cylinder 8 with the valve body 23. A pipe 27 leading from the body 23 discharges the liquid from the cylinder 8 into a tank or pan 28 in which the valve body 23 is disposed, and an overflow pipe 29 is connected to the rim of the tank 28 at a level above the valve body 23 and has a branch 30 connected to the cylinder 9 above the piston 10, and a second branch 31 connected to the tank 13.

A spool valve 32 is slidable in the body 23 and has the portions 35 and 36 for establishing communication between the pipes connected to the valve body. The valve body 23 has a passage 34 communicating with the pipe 36 and provided with two branches, and said body has a passage 33 communicating with the pipe 25 and provided with two branches. When the valve 32 moves to the right, as seen in the drawing, the portion 35 of the valve establishes communication between the pipe 24 and passage 33 so that liquid will flow under pressure from the cylinder 9 through the pipes 24 and 25 into the corresponding end portion of the cylinder 8, to move the piston 7 and switch 1 to the position shown in the drawing. At the same time, the portion 36 of the valve establishes communication between the passage 34 and pipe 27, so that the liquid in the upper portion of the cylinder 8 may discharge through the pipes 26 and 27 into the tank 28. When the valve 32 is reversed or moved to the left, the portion 35 now establishes communication between the pipe 24 and passage 34, while the portion 36 establishes communication between the passage 33 and pipe 27, so that the liquid will flow from the cylinder 9 through the pipes 24 and 26 into the upper end of the cylinder 8, to move the switch 1 to the opposite position, and the liquid in the lower portion of the cylinder 8 will flow through the pipes 25 and 27 into the tank 28.

The cylinder 9, tank 13, motor 18, tank 28 and corresponding parts may be mounted on a trolley pole near the switch, or may be mounted at any suitable position, and the parts may be protected from the elements. The pipes 25 and 26 may extend for any suitable distance from the cylinder 8 located near the switch 1 to the tank 28 and valve device located on the pole or elsewhere.

The valve 32 is operated by solenoids 37 and 38, as shown, which may be supported from the valve body 23, and the terminals of the valve 32 provide the cores for said solenoids. Thus, when the solenoid 37 is energized the valve 32 is moved to the left whereas when the solenoid 38 is energized the valve 32 is moved toward the right as shown in the drawing.

The solenoids 37 and 38 are controlled by the movement of the trolley wheel or shoe along the trolley wire or third rail 40, which is provided at a suitable distance from the switch, with the insulated sections 41 and 42 along which the trolley wheel or shoe moves. Said trolley wire or third rail has the jumper 43 bridging the sections 41 and 42, to render the wire or rail 40 electrically continuous, and a contact bar or plate 44 is disposed parallel with the trolley or rail section 42, and is electrically connected with the jumper 43, so that when the trolley wheel or shoe moves along the section 42 it will bridge the space or gap between the section 42 and bar 44, to electrically connect the section 42 with the trolley wire or rail.

A switch 45 is connected by a wire 46 with the section 42 and is movable alternately against the opposite contacts 47 and 48 which are connected by the respective wires 49 and 50 with the solenoids 37 and 38, and the opposite terminals of said solenoids are connected to ground by the ground wire 51. The switch 45 is controlled by an electromagnet 52 having its opposite terminals connected to the trolley wire or rail 40 and section 41, and a dashpot 53 or other suitable device is employed for retarding the dropping of the switch 45 away from the contact 47 and magnet 52. Such dashpot, however, is such as not to retard the upward movement of the switch 45. The switch 45 and magnet 52 may be located on a trolley pole or at any other suitable point.

In operation, when it is desired to throw the switch 1 to the left, as shown in the drawing, the car moving in the direction of the arrow, the car proceeds under the trolley sections 41 and 42 with the controller handle of the car in off position, so that no current flows from the trolley wire through the car to ground. Consequently, when the trolley wheel moves along the section 41, no current will flow through the magnet 52, and the switch 45 will remain in its lower position against the contact 48. When the trolley wheel reaches the section 42, thereby bridging the gap between the section 42 and bar 44, current will flow from the trolley wire 40 through the solenoid 38 to the ground, the circuit including the trolley wire 40, jumper 43, bar 44, trolley wheel, section 42, wire 46, switch 45, contact 48, wire 50, solenoid 38 and wire 51. The solenoid 38 is therefore energized to move the switch 32 to the right, so that the liquid from the cylinder 9 will flow into the lower portion of the cylinder 8, thereby moving the piston 7 and switch 1 to the position illustrated. The liquid from the upper portion of the cylinder 8 is forced through the pipes 26 and 27 into the tank 28.

When the switch 1 is to be moved to the right, the car proceeds under the sections 41 and 42 with the power on, and as soon as the trolley wheel contacts with the section 41, current flows from the trolley wire 40 through the magnet 52 and section 41 to the trolley wheel, thereby energizing said magnet and picking up the switch 45, to remove the switch from the contact 48 and hold the switch against the contact 47. Then, when the trolley wheel moves along the section 42 in contact with the bar 44, the current from the trolley wire which flows through the switch 45 will pass through the solenoid 37 by way of the jumper 43, bar 44, section 42, wire 46, switch 45, contact 47, wire 49,

solenoid 37 and wire 51, thereby energizing the solenoid 37 and moving the switch 32 toward the left. The dash pot or device 53 retards the downward movement of the switch 45 to keep the switch 45 in engagement with the contact 47, after the trolley wheel leaves the section 41 and while it moves along the section 42, so that the solenoid 37 instead of the solenoid 38 is energized. After the car moves on, the switch 45 moves down to normal position as shown. With the solenoid 37 energized and the valve 33 moved toward the left, the liquid flows under pressure from the cylinder 9 through the pipes 24 and 26 into the upper portion of the cylinder 8, thereby forcing the piston 7 and switch 1 to the opposite position from that shown, and the liquid in the lower portion of the cylinder 8 is forced through the pipes 25 and 27 into the tank 28.

The oil or liquid is used over and over again, being caught in the tank 28 when discharged from the cylinder 8, and from the tank 28 the liquid overflows through the pipe 29 down into the tank 13 from which it is pumped back into the cylinder 9. The valve body 23 and pump 14 are submerged in the liquid so that any leakage of liquid will result in the liquid being caught in the tanks. Furthermore, if the piston 10 leaks, the liquid may accumulate on the top thereof, and when the piston is raised by the pumping of liquid from the pump 14 into the cylinder 9, the liquid above the piston 10 may flow through the branches 30 and 31 of the pipe 29 back down into the tank 13. Leakages are thus taken care of without loss of liquid, and from the tank 28 and upper portion of the cylinder or tank 9 the liquid returns to the tank 13 for repeated use.

The sections 41 and 42 and contact bar 44 may not only be used in connection with a trolley wire for the contact of the trolley wheel, but may also be used in substantially the same way in a third rail for the contact of a collector shoe.

When the valve is reversed for connecting either end of the cylinder 8 with the cylinder or tank 9, the liquid from said tank 9 is forced under pressure into the cylinder 8, so as to move the switch point slowly or gradually to its reverse position, without the liability of breaking the switch point or other parts should the switch point fail to move because of ice or other obstruction. Furthermore, the switch point is held in either position under liquid pressure, so that the switch point may be forcibly moved, without excessive resistance, such as to permit trailing through the switch when the cars move in the direction opposite to that hereinbefore described, or toward the left as shown in the drawing. The switch point is therefore yieldingly moved in either direction and also yieldingly held in either position under liquid pressure.

Having thus described the invention, what is claimed as new is:—

1. An automatic switch operating apparatus comprising electrically controlled switch operating means having two electrically energized devices for reversing the switch, a conductor, such as a trolley wire or third rail, two longitudinally spaced insulated sections associated with said conductor for the contact in succession therewith of a collector movable along said conductor, means for electrically connecting said conductor and either of said devices when the collector contacts with the second insulated section, and means electrically connected between said conductor and the first insulated section for controlling the second named means when the collector contacts with the first insulated section to make the electrical connections selectively with said devices according to whether or not electrical current is permitted to flow through the collector.

2. An automatic switch operating apparatus embodying electrically controlled switch operating means having two electrically energized devices for reversing the switch, a conductor, such as a trolley wire or a third rail, two longitudinally spaced insulated sections associated with said conductor for the contact in succession therewith of a collector movable along said conductor, a switch electrically connected to the second insulated section and normally connected to one of said devices and adapted to be moved into connection with the other device, means in circuit with said conductor and first insulated section for moving the last named switch from connection with the first named device into connection with the second named device, and means for connecting the second named insulated section with the conductor when the collector contacts with said second insulated section.

3. An automatic switch operating apparatus comprising electrically controlled switch operating means having two electrically energized devices for reversing the switch, a conductor, such as a trolley wire or a third rail, two longitudinally spaced insulated sections associated with said conductor for the contact in succession therewith of a collector movable along said conductor, a switch electrically connected to the second insulated section and arranged to alternately make electrical connections with said devices, and normally in one position, electromagnetic means connected to the conductor and first insulated section and controlling said switch to move it to its other position when said electromagnetic means is energized, and contact means connected with said conductor and adapted to be engaged by said collector

when contacting with the second insulated section.

4. An automatic switch operating apparatus comprising liquid operated switch operating means, means for supplying a liquid under pressure and supplied by liquid from the first named means, a valve connected with said means and controlling the flow of liquid from the second named means to the switch operating means, electrical means for operating the valve, an electric conductor, such as a trolley wire or third rail, and means associated with said conductor for the contact of a collector movable along the conductor and electrically connected to said electrical means for controlling the valve according to the opening or closing of the circuit through the collector.

5. An automatic switch operating apparatus comprising liquid operated switch operating means, means for supplying a liquid under pressure and supplied by liquid from the first named means, a valve connected with said means and controlling the flow of liquid from the second named means to the switch operating means, and electrical means controlling said valve.

6. An automatic switch operating apparatus comprising liquid operated switch operating means, means for supplying a liquid under pressure, a valve connected with said means and controlling the flow of liquid from the second named means to the switch operating means, electrical means controlling said valve, and means for returning liquid discharge from said switch operating means to the second named means.

7. An automatic switch operating apparatus comprising liquid operated switch operating means, means for supplying a liquid under pressure including a tank with a movable pressure member, a valve connected with said means and controlling the flow of liquid from the tank to the switch operating means, electrical means controlling said valve, a tank adapted to receive the liquid discharged from the switch operating means, and automatic means for pumping the liquid from the second named tank into the first named tank.

8. An automatic switch operating apparatus comprising liquid operated switch operating means, means for supplying a liquid under pressure including a tank and a movable pressure member to force the liquid from the tank, a valve connected with said tank and switch operating means and controlling the flow of liquid from the tank to the switch operating means to reverse the switch, electrical means controlling said valve, a tank arranged to receive the liquid discharged from said switch operating means, a pump for pumping the liquid from the second named tank into the first named tank, an electrical motor operably connected with said pump, and means for closing and opening the circuit of said motor when said member is moved to predetermined positions.

9. An automatic switch operating apparatus comprising liquid operated switch operating means, means for supplying a liquid under pressure including a tank having a movable pressure member to force the liquid from the tank under pressure, a valve connected with said tank and the switch operating means for controlling the flow of liquid from the tank to the switch operating means, a tank arranged to receive the liquid discharged from said switch operating means, a pump submerged in the liquid of the second named tank and arranged for pumping liquid from said tank into the first named tank, and automatic means for operating said pump.

10. An automatic switch operating apparatus including liquid operated switch operating means, means for supplying a liquid under pressure including a tank and a vertically movable piston therein to force the liquid from the lower portion of the tank below the piston from said tank under pressure, a valve connected with the lower portion of said tank and the switch operating means for controlling the flow of liquid from said tank to said switch operating means, a tank arranged to receive the liquid discharged from said switch operating means and connected with the first named tank above said piston to receive liquid from above said piston, and automatic means for pumping the liquid from the second named tank into the first named tank below the piston.

11. An automatic switch operating apparatus comprising liquid operated switch operating means, means for supplying a liquid under pressure, a valve connected with said means and controlling the flow of liquid from the second named means to the switch operating means, a tank in which the valve is disposed and adapted to receive the liquid discharged from said switch operating means, a tank connected with the first named tank to receive liquid from the first named tank above a predetermined level therein, and means for pumping the liquid from the second named tank into the second named means.

12. An automatic switch operating apparatus comprising liquid operated switch operating means, means for supplying a liquid under pressure including a tank with a vertically movable piston therein for forcing the liquid from the tank below the piston, a valve connected with said tank below the piston and with said switch operating means for controlling the flow of liquid from said tank to said switch operating means to reverse the switch, a tank in which said valve is disposed and adapted to receive

the liquid from said switch operating means so as to submerge the valve in the liquid, a third tank connected with the first named tank above the piston and with the second named tank at a predetermined liquid level so as to receive liquid overflowing from the first and second named tanks, and automatic means for pumping the liquid from the third tank into the first named tank.

13. An automatic switch operating apparatus comprising, in combination with a switch, liquid operated switch operating means connected thereto, means for supplying a liquid under pressure to said switch operating means for yieldingly moving the switch to and holding it in either position and supplied by liquid from the first named means, and valve means between the switch operating means and second named means for reversing connections between them to move the switch to either position.

14. An automatic switch operating apparatus comprising, in combination with a switch, switch operating means including a cylinder and a piston working therein and connected to said switch, a liquid tank having provisions for creating pressure on the liquid, a connection between said tank and cylinder including a reversing valve for connecting the opposite ends of said cylinder with said tank, in order that said piston and switch may be moved under liquid pressure to and held by such pressure in either position, and means for returning the liquid discharged from said cylinder to said tank.

In testimony whereof I hereunto affix my signature.

LESHER W. VAN BUSKIRK.