Dec. 8, 1925. 1,564,341

M. C. GARLICK

ELECTRICALLY OPERATED SWITCH

Filed Oct. 29, 1923 2 Sheets-Sheet 1

FIG 1

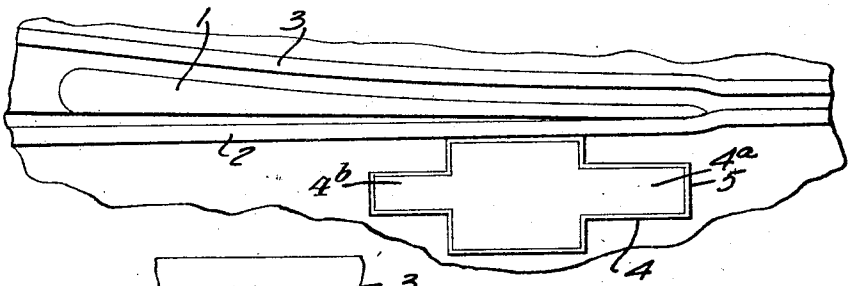


FIG 2

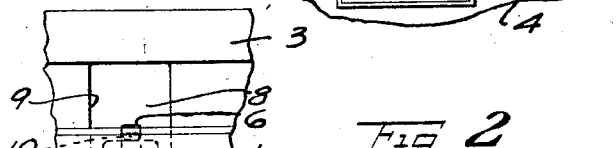


FIG 3

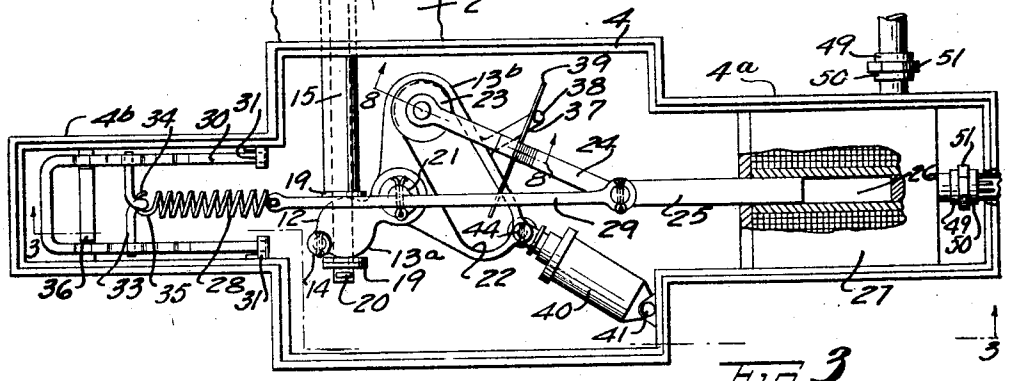
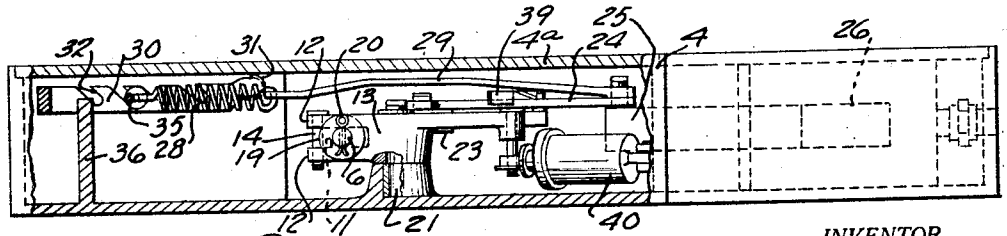
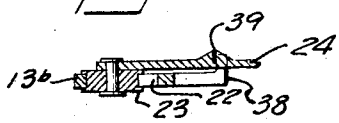


FIG 8





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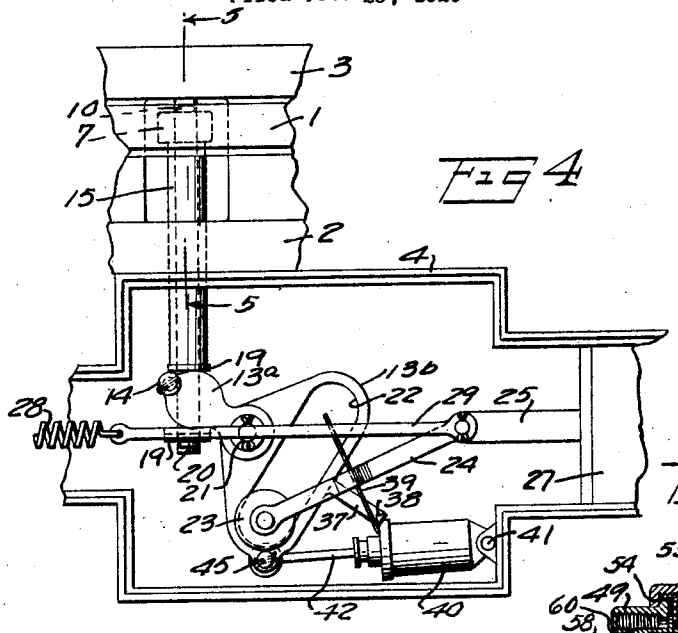


FIG 4

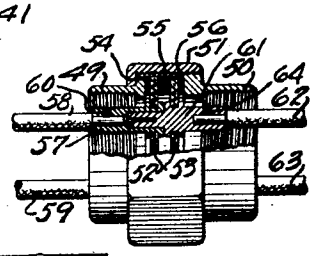


FIG 7

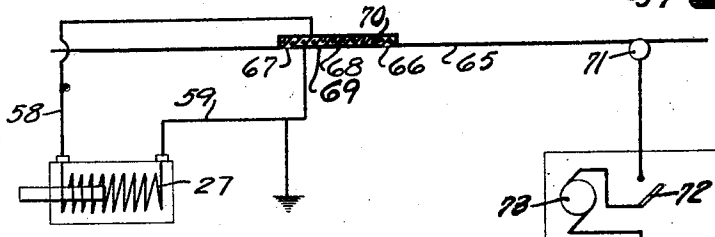


FIG 9



FIG 6

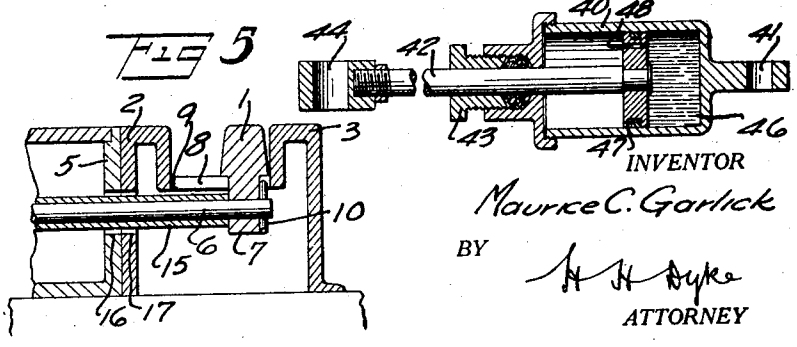


FIG 5

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UNITED STATES PATENT OFFICE.

MAURICE C. GARLICK, OF EASTON, PENNSYLVANIA.

ELECTRICALLY-OPERATED SWITCH.

Application filed October 29, 1923. Serial No. 671,514.

To all whom it may concern

Be it known that I, MAURICE C. GARLICK, a citizen of the United States, and a resident of Easton, county of Northampton, and State of Pennsylvania, have invented a new and useful Improvement in Electrically-Operated Switches, of which the following is a specification.

My invention relates to switching devices for electric railways.

The invention provides a simple and effective form of electrical apparatus, which may be used at will, as when the car is approaching the switch and it is desired to throw the switch into the opposite position, or if desired the car may be permitted to pass over the switch without causing it to operate.

The device makes use of a minimum of parts of the simplest character, which are easily assembled, not easily deranged and adapted to be readily adjusted or replaced by unskilled labor in a minimum of time and without undue interference with the operation of the line. The operating parts preferably comprise a simple electrical actuating device operating in one direction, as a solenoid, magnet or the like, and an opposed spring, preferably of the pull or expansion type, the spring being used to supplement or complete the movement initiated by the electrically operated part of the apparatus and to prevent derailments, etc., by holding the switch tongue closely against the rail.

Other features and objects of the invention will appear in connection with the following description and claims.

An embodiment of my invention is shown in the accompanying drawings, which is merely illustrative of a preferred form of my invention and is not to impose limitations thereon, it being obvious that changes can be made in the details of construction by those skilled in the art without departing from the principles of my invention.

In said drawings, Fig. 1 is a small scale plan view of a switch point and switching device box. Fig. 2 is a larger scale plan view of the switching apparatus, the lid of the box being removed. Fig. 3 is a section on line 3—3, Fig. 2. Fig. 4 is a plan view similar to a part of Fig. 2 and showing another position of the parts of the switching device. Fig. 5 is a section on line 5—5, Fig. 4. Fig. 6 is a longitudinal section of the dash pot. Fig. 7 is a side view with parts broken away of an electrical plug or coupling. Fig. 8 is a section on line 8—8, Fig. 2, and Fig. 9 is a diagram of the electrical circuit for operating the device.

The switch tongue represented by the numeral 1 is pivoted between switch rails 2 and 3. The ground box 4 containing the switching device is preferably located at one side of the switch in accordance with the customary practice. Ground box 4 consists of a casing 5 and a cover 4ª. A rod member 6 is connected to the switch tongue 1 by being inserted in a hole in the lug 7 projecting downwardly from the tongue 1 through the slot 8 in the switch base 9. Cotter pin 10 is passed through rod 6 beyond the lug 7 so that rod 6 may impart pulling movement to the switch tongue 1.

The other end of rod 6 extends into casing 5 and passes through the groove or slot 11 formed between the two lips 12 of an oscillatory lever 13. Rod 6 is prevented from slipping sidewise out of said groove or slot 11 by a pin 14 passing through openings in said lips 12, 12. Rod 6 is preferably passed through a sleeve 15, which is interposed between lever 13 and switch tongue 1 and serves to impart pushing movement to the switch tongue.

Rod 6 and its surrounding sleeve 15 together pass through the registering opening 16 and 17 located respectively in the side of the casing 5 and in the rail member 2. Rod 6 and sleeve 15 are adjustably connected with the arm 13ª of lever 13, which said arm 13ª is preferably of generally rounded contour, and in the form shown such adjustable connections are provided by the provision of a plurality of washers 19 on rod 6 and the cotter pin 20 inserted through the end of rod 6 projecting beyond the lever arm 13ª. It will be obvious that by making use of a varying number of washers of suitable thickness or by moving one or more washers from one side of the lever arm 13ª to the opposite side, which can readily be accomplished by the removal of the cotter pin 20, substantially any desired adjustment may be secured between the lever arm 13ª and the push and pull link member comprising rod 6 and sleeve 15.

The oscillatory lever 13 is pivotally mounted at about its center on the bearing stud 21 projecting upwardly from the bottom of casing 5. Said lever has elongated

slot 22 formed therein on the arm 13b opposite its connection with rod 6. Such slot receives and is traversed by an anti-friction member, as the flanged wheel 23 rotatably mounted at the end of connecting rod 24. The other end of said connecting rod 24 is pivotally connected to an electromagnetic plunger 25 working in a bore 26 of the solenoid, electromagnet coil, or the like 27. The plunger 25 is adapted to be drawn inwardly into the bore 26 when an electric current is passed through the coil 27. Movement of plunger 25 and connected parts in the opposite direction is obtained by means of a pull or expansion spring 28, which is pivotally connected to the plunger 25 by means of the link 29. Provision is made for tensioning—preferably stretching—and adjustably holding spring 29 in place. The preferred form of holding and stretching means comprises a yoke 30 adjustably pivoted in the lugs 31 formed in the extension 4b of the box or casing 4, and provided on its upper face with a series of pairs of undercut notches 32, which are adapted to receive the ends of the crossbar 33. Crossbar 33 is adjustably connected to spring 28, and in the form shown the said crossbar is formed into a loop or hook portion 34 substantially midway between its ends into which the hooked end 35 of spring 28 may be adjustably hooked. The stop rib 36 is provided for limiting the downward movement of yoke 30 after the same has passed down to a sufficient extent to carry the crossbar 33 below the point of pivotal support 31. This movement of the yoke past a dead center operates to prevent the spring 28 from rising after same has been stretched into place by depression of the yoke 30 upon its pivots. It will be seen that the tension on the expansion spring 28 can be readily adjusted by inserting its crossbar 22 in any desired pair of undercut notches 32. The slotted side of lever 13 is provided with the projecting arm 37 having a finger 38 extending upwardly therefrom and projecting into the path of a leaf spring 39, which is secured at about its middle to the connecting rod 24. This arrangement is provided for the purpose of throwing the lever 13 past dead center with complete certainty and will be referred to later in connection with the operation of the device.

In order to prevent the switch closing with a snap or an accelerated movement, which might result at times in throwing water or the like on bystanders, dash pot means are provided for securing a slow closing movement of the switch without substantial slowing down of the movement of the switch during the earlier stages thereof. In the form shown a dash pot cylinder 40 is provided for this purpose, one end thereof being pivoted at 41 to one end of the casing 5 and the piston rod 42 thereof, which extends through the gland 43, being pivoted at 44 to the lever 13 by means of the pivot pin 45. Cylinder 40 is partially filled with fluid 46, such as oil, and the piston 47 is provided with one or more holes 48. With such arrangement the piston can move rapidly until the oil fills the space between the piston and the head or base of the cylinder, after which its movement is retarded by reason of the oil being required to pass through the openings 48 before it can get to the other side of the piston.

The dash pot arrangement just described can, of course, be dispensed with if desired.

It will be seen that the parts so far described are all of such character that they can be readily assembled, adjusted or taken apart and reassembled without the use of tools or with the use of very simple tools. It is desirable also to have a form of plug or wire connection with the solenoid or magnet wire, which similarly can be taken down and put together with the utmost readiness, and in Fig. 7 I have shown a form of connection for this purpose, making use of an ordinary pipe coupling for securing the parts together. This pipe coupling comprises the two coupling members 49, 50, and the customary threaded coupling sleeve 51. A pair of insulating disks 52, 53 are adapted to be received within the sleeve 51 between the coupling members 49 and 50, and rubber or other insulating rings 54, 55 and 56 are provided on the outer sides of said disks 52 and 53 and between the same respectively. The female portion of the plug is mounted in the disk 52 and comprises a pair of headed sleeves 57, 57 inserted through openings in the disk 52 and having the wires 58 and 59 secured in place therein as by means of set screws 60, 60. For the male portion of the plug the disk 53 has the plug pins 61, 61 secured in place therein and the wires 62 and 63 are secured in place therein as by means of set screws 64, 64. It will be seen that when the parts just described are assembled and the coupling sleeve 51 screwed in place, there is no strain on the electric plugging parts and there is no tendency for them to separate, and yet by merely unscrewing the coupling sleeve 51 complete access can be had to all the parts of the electrical connecting device. Other forms of electric plugs may, of course, be used, but the one described, which has been designed and constructed particularly for use in connection with the other parts of the apparatus described herein, is preferable.

The operation of the device will be clear from the foregoing and the wiring diagram of Fig. 9. The trolley wire, third rail or other current carrying means 65 is

interrupted for a small portion of its contact surface, as between the points 66, 67, the current being carried by the insulated connecting member 68 arranged preferably behind the contact surface. Such interrupted portion of the current carrying wire is replaced by a contact member 69, which is insulated from the trolley or other current carrying member 65, as by insulating member 70.

When the contact device, as the trolley wheel 71, passes over this portion of the track carrying the contact member 69, should the control switch 72 be open, there is no current passing through the solenoid winding 27, so that the switch is not affected and remains in whatever position it may be in. If, however, trolley control switch 72 is closed when the trolley wheel 71 comes into contact with the contact member 69, a circuit is closed through the trolley motor 73 and the solenoid winding 27 and the plunger 25 is forcibly pulled within the solenoid winding, imparting a pull to lever 13 through the connecting rod 24 and roller 23, and thereby turning the lever 13 from the position which it may be in, which may be either that of Fig. 2 or of Fig. 4, toward its opposite position and at the same time exerting a pull on spring 28 through link 29 to thereby expand spring 28 against its normal condition of contraction. As soon as the momentary pull on the solenoid plunger 25 is released the contractile force of spring 28 serves to complete the turning movement of lever 13 from one extreme position to the other, and for the purpose just described the operation of the solenoid and spring are ordinarily sufficient to secure the desired result of throwing the lever 13 and switch tongue 1 from one side to the other, but in order to prevent any possibility of the wheel 23 being stopped at a dead center and thus preventing the completion of the throw, a leaf spring 39 is provided. This spring 39 coming in contact with the projection 38 of the lever 13 serves to push the finger 38 and the lever carried thereby and the connecting rod 24 in opposite directions, thus making it impossible for the parts to stop in a dead center position midway between the two extremes of the oscillatory movement of the lever 13. Where the dash pot cylinder 40 is provided, there is a sufficient slowing up of the final movement of lever 13 and tongue 1 to prevent violent contact of the tongue with the rail, thereby avoiding the undue splashing of water or mud by the throwing of the switch. It will be seen that the operation of switch tongue 1 is substantially automatic in character and that no additional parts are required to be operated by the motorman. All that he has to do upon approaching the switch is either to cut off his motor current if the switch is in the desired position, or to leave his current on when the trolley wheel is passing the contact member 69 in case he desired to have the switch thrown to the opposite position.

I claim:

1. In an electrically operated switch, a pivoted switch tongue, a lever having an elongated slot in one arm, means for connecting the opposite arm thereof with the switch tongue, a flanged wheel in said slot, a one-throw electromagnetic device, a link connecting same with the wheel, an expansion spring connected to the electromagnetic device and adapted to be put under tension by its throw while the lever is being turned by the electromagnetic device through a partial turn, and adapted by its recoil to impart a further turning movement to the lever, whereby lateral movement of the switch tongue is completed.

2. In an electrically operated switch, a pivoted switch tongue, an oscillatory lever connected therewith, means for turning said lever through a path including a dead center position, and spring means for preventing the lever stopping on dead center.

3. The combination with switch rails having a switch tongue, pivoted therebetween, of a lever connected to the switch tongue, single throw electromagnetic means connected to said lever and adapted to impart a partial turning movement thereto, expansion spring means having a connection with said lever for imparting a further throw to the lever and switch tongue, and means of adjustment for said spring including a pivoted yoke, a plurality of pairs of undercut notches provided in said yoke, and a cross-bar adapted to be received in any pair of said notches and having substantially midway thereof a loop for receiving one end of said expansion spring.

4. Means for imparting lateral spring pull to a switch tongue comprising a rod extending at substantially a right angle thereto, a lever adapted to throw said rod in either direction, a roller mounted to travel on said lever, a single throw electromagnetic means connected to said roller and adapted to impart a partial turning movement to the lever, adjustable expansion spring means having a connection with said lever for imparting a further throw to the lever and switch tongue, and spring means for preventing the stoppage of said lever in dead center.

5. The combination with switch rails having a switch tongue pivoted therebetween of a double throw lever, adjustable means of connection between the lever and the switch tongue comprising a control rod for pulling the switch tongue and a sleeve surrounding the rod for imparting a push-

ing movement thereto, a roller mounted to travel on said lever, a one-throw electromagnetic device, a link connecting same with the roller, a pull or expansion spring having a connection with said lever so as to be movable past a dead center with respect thereto, and means for adjusting the tension on said spring including a pivoted yoke, a plurality of pairs of undercut notches provided in said yoke, and a cross-bar adapted to be received in any pair of said notches and having substantially midway thereof a loop for receiving one end of said expansion spring.

6. In an electrically operated switch, a pivoted switch tongue, an oscillatory lever, a push and pull rod connecting same to the switch tongue and extending at substantially a right angle thereto, a roller mounted to travel on said lever, a one-throw electromagnetic device to turn said lever through a part of its movement, a link connecting same to the roller, an expansion spring in opposed relation to said electromagnetic device and also connected to said link for imparting a further throw to the lever and switch tongue, a leaf spring on said link for preventing stoppage of the roller and lever in dead center, a lug on the lever for guiding said leaf spring, and means for adjusting the tension of said expansion spring.

7. In an electrically operated switch, a pivoted switch tongue, a perforated lug extending down therefrom, a rod fastened to the lug and extending at substantially a right angle to the switch tongue, a loose-fitting sleeve on said rod, an oscillatory lever actuating said rod and sleeve, a roller adapted to travel on said lever, an electromagnetic device for imparting movement to said roller and lever, a link connecting same to the roller, a pivoted yoke having a plurality of pairs of notches therein, a cross-bar adapted to fit in any pair of notches and having a loop substantially midway thereof, an expansion spring in opposed relation to the electromagnetic device having one end detachably connected to said loop, a rod pivoted at one end to said link and having a hole in its other end to receive the other end of the spring, a leaf spring on said link for preventing stoppage of the roller and lever in dead center, and dash pot means for slowing up the final movement of the tongue.

8. In combination, switch rails, a switch tongue pivoted between the rails and having a downwardly extending perforated lug, a rod extending through a hole in the lug and having a cotter pin on one side thereof and a sleeve thereabout on the other side thereof, said sleeve being shorter than the rod, a lever having an arm with a slot therein through which the rod extends and against which arm the sleeve abuts, adjustable stop means between said sleeve and rod and the lever arm comprising washers and a cotter pin, an elongated slot on the side of the lever fulcrum opposite the said arm and extending at substantially right angles thereto, a roller running in said slot, a one-throw electromagnetic device, a link connecting same with the wheel, a tension-adjustable expansion spring in opposed relation to the electromagnetic device having one end connected to the link, a leaf spring mounted at its center substantially midway on said link, a lug on the side of the elongated lever slot for guiding said leaf spring, and a dash pot attached to the lever and adapted to slow up its movement as it is moved toward the rail, said dash pot comprising a cylinder partially filled with fluid and a perforated piston within the cylinder.

In testimony whereof, I have signed my name hereto.

MAURICE C. GARLICK.