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CIRCUIT CONTROLLER.

APPLICATION FILED DEC. 19, 1918.

1,413,820. Patented Apr. 25, 1922.

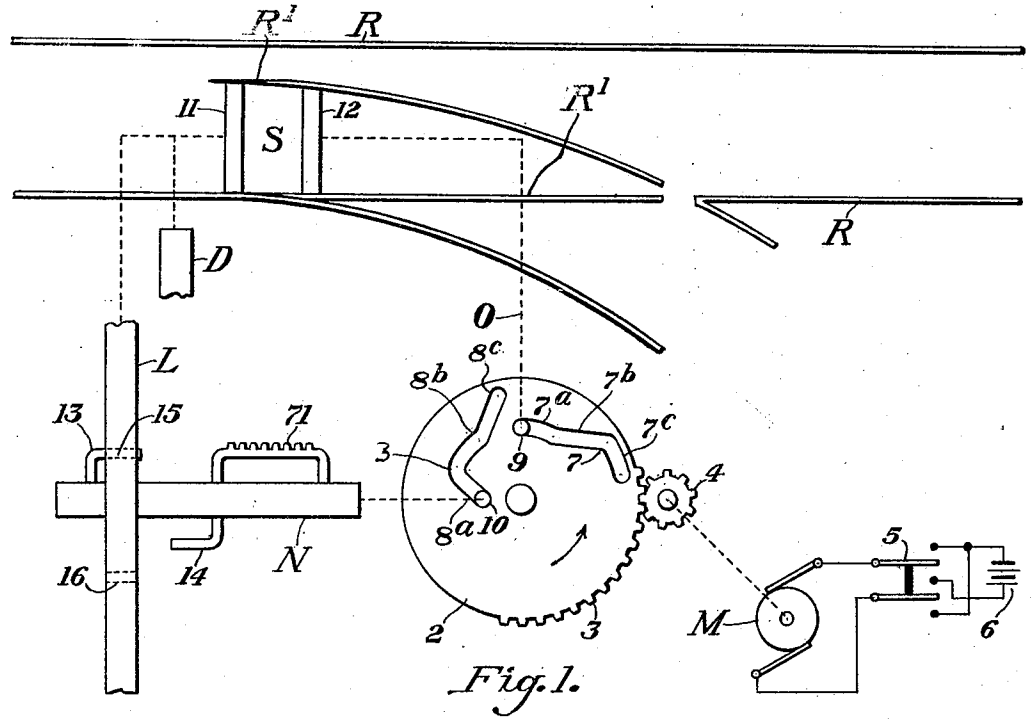


Fig. 1.

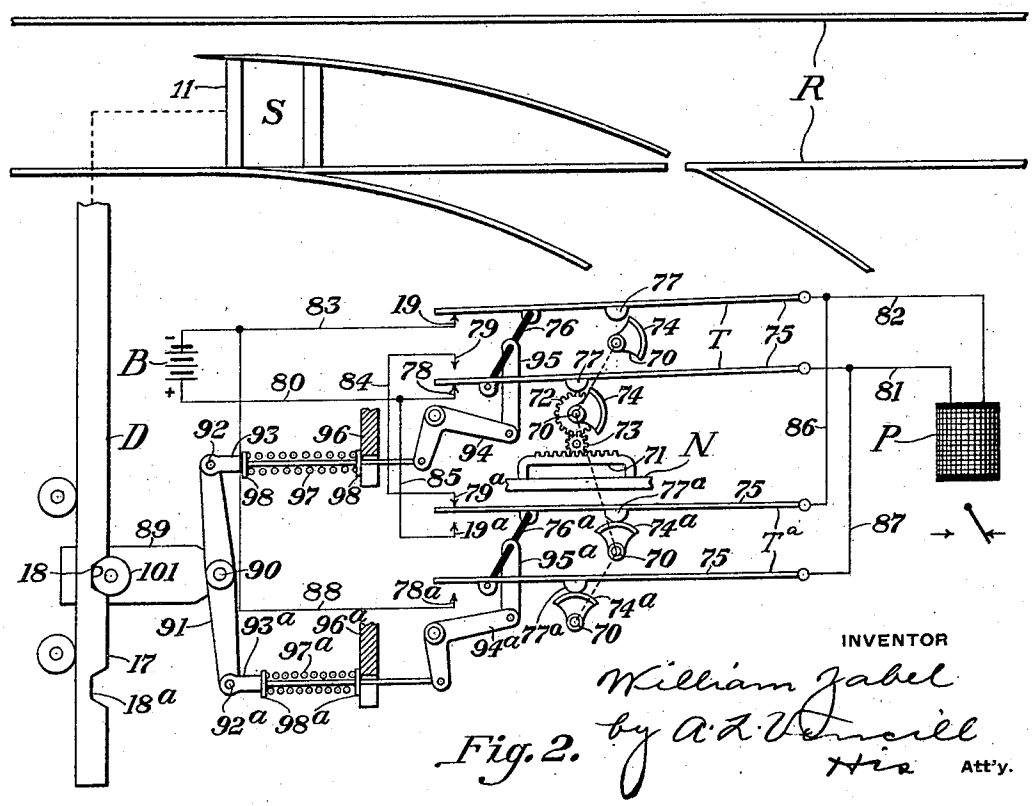


Fig. 2.

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UNITED STATES PATENT OFFICE.

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CIRCUIT CONTROLLER.

1,413,820. Specification of Letters Patent. **Patented Apr. 25, 1922.**

Original application filed January 25, 1917, Serial No. 144,330. Divided and this application filed December 19, 1918. Serial No. 267,467.

To all whom it may concern:

Be it known that I, WILLIAM ZABEL, a citizen of the United States, residing at Swissvale, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Circuit Controllers, of which the following is a specification.

My invention relates to circuit controllers, and particularly to circuit controllers which are adapted for use in connection with railway switches to govern indication apparatus, that is, apparatus which indicates at a distant point the position occupied by the switch rails and by the switch locking means.

The present application is a division of my copending application filed January 25, 1917, Serial No. 144330, for Railway traffic controlling apparatus, which application has matured into Patent No. 1293290, granted February 4, 1919.

I will describe one form of circuit controller embodying my invention, and will then point out the novel features thereof in claims.

In the accompanying drawing, Fig. 1 is a diagrammatic view showing one form of railway switch, together with operating and locking mechanism therefor, to which a circuit controller embodying my invention may be applied. Fig. 2 is a view showing one form of circuit controller embodying my invention, applied to the switch and locking mechanism shown in Fig. 1.

Similar reference characters refer to similar parts in the two views.

Referring first to Fig. 1, the reference character S designates a railway switch comprising the usual main or stock rails R, R, and the usual movable switch rails R′, R′, the two latter rails being connected by a front rod 11 and a head rod 12. The operating and locking mechanism for the switch, in the form here shown, comprises a cam disk 2, which disk is rotated in opposite directions through an arc of a circle by an electric motor M through the medium of a pinion 4 which meshes with gear teeth 3 on the periphery of the disk. The motor M is supplied with current from a suitable source, such as a battery 6, and the direction of rotation of this motor is controlled by a pole-changer 5.

The disk is provided with two cam slots 7 and 8. The cam slot 7 comprises two radial end portions 7^a and 7^c, connected by an inclined middle portion 7^b. Cam slot 8 comprises two inclined end portions 8^a and 8^c, connected by a radial middle portion 8^b. Coacting with slot 7 is a roller 9 which is connected with the head rod 12 of the switch and by virtue of which the switch is shifted from normal to reverse position and vice versa. Coacting with cam slot 8 is a roller 10 which is connected with a slide bar N to cause longitudinal reciprocation thereof. This slide bar N is provided with two plungers 13 and 14 which are arranged to project into holes 15 and 16 respectively in a lock rod L, which rod is operatively connected with the front rod 11 of the switch.

The operation of the apparatus shown in Fig. 1 is as follows:

As shown in this view, the switch S is in one extreme position, which I will call the "normal" position, and the parts of the operating and locking mechanism are in the proper positions corresponding to this position of the switch. When it is desired to move the switch to its other extreme position, which I will term the "reverse" position, the pole-changer 5 is moved to such position that the motor M is energized in the proper direction to rotate the disk 2 in the direction indicated by the arrow. During the first part of this movement of the disk, roller 9 is not moved because the end section 7^a of the slot 7 is radial. During this part of the movement of the disk, however, roller 10 is moved to the left so that the slide bar N is likewise moved to the left, whereby the plunger 13 is withdrawn from the hole 15. This movement of the bar N, consequently, serves to unlock the switch S. During the middle portion of the movement of the disk 2, roller 9 is shifted by the inclined middle portion 7^b of the cam slot 7, and this movement of the roller serves to move the switch S to its reverse position. During this operation of the switch, the slide bar N remains stationary, owing to the fact that the middle portion 8^b of the cam slot 8 is radial. The reversal of switch S causes longitudinal movement of the lock rod L, whereby the hole 15 moves out of the path of the plunger 13 and the hole 16 moves

into the path of the plunger 14. During the last part of the movement of the disk 2, roller 9 remains stationary, owing to the radial formation of the end portion 7^c of its cam slot, but roller 10 is moved by the inclined end portion 8^c of its cam slot so that the plunger 14 passes into the hole 16 and so locks the switch in its reverse position.

The movement of the switch D from its reverse to its normal position, is accomplished by energizing motor M in such direction as to rotate the cam disk 2 in the direction opposite to that indicated by the arrow. This operation of the switch will be understood without further explanation.

It is to be understood that the mechanism which I have shown in Fig. 1 for causing the desired movements of the switch S and slide bar N is purely diagrammatic, and that these desired movements can be accomplished with any other suitable form of mechanism, such, for example, as the mechanism shown in my parent application, Serial No. 144330, now Patent No. 1293290 of which the present application is a division. The mechanism which is shown in the present application has been chosen because of its relative simplicity.

Attached to the slide bar N, is a rack 71, the function of which will appear hereinafter. Attached to the front rod 11 of the switch S is a cam bar D, the function of which will likewise appear hereinafter.

Referring now to Fig. 2, the circuit controller, in the form here shown, comprises two sets of contact fingers T and T^a, each set comprising two fingers 75. These fingers are biased downwardly by suitable means, as hereinafter described, so that they normally tend to engage with fixed contacts 19, 78, 19^a, 78^a. These contact fingers are controlled by the slide bar N in such manner that one set of contacts or the other is reversed in opposition to the biasing force according as the slide bar is in its normal or reverse locking position; and that both sets of contact fingers are reversed while the slide bar is between its two locking positions. As here shown, this operation of the contact fingers is accomplished by two sets of cams 74 and 74^a, which cams coact with knobs 77 and 77^a fixed to the contact fingers. The cams 74 and 74^a are attached to a shaft carrying a gear wheel 72, which gear wheel is rotated by the rack 71 through the medium of an idler pinion 73.

The operation of the contact fingers T and T^a by the slide bar N, is as follows:

When the slide bar is in its normal locking position, as shown in Fig. 1, the two cams 74^a are under the co-acting knobs 77^a, so that the contact fingers T^a are held in their reverse positions in opposition to the biasing force. The two cams 74, however, are disengaged from the knobs 77, so that the contact fingers T occupy their normal positions under the influence of the biasing force. When the slide bar N is moved to its intermediate position to unlock the switch, the two cams 74^a continue to hold the contact fingers T^a in reverse position, but the two cams 74 are then moved to such position as to reverse the contact fingers T, whereby both sets of contact fingers then occupy their reverse positions. After the reversal of the switch has been completed and the slide bar N has been shifted to its reverse locking position, the two cams 74^a move out of the path of the knobs 77^a, so that contact fingers T^a return to their normal positions under the influence of the biasing force. This movement of the slide bar does not, however, move the cams 74 out of the paths of the knobs 77, and, consequently, the contact fingers T remain in their reverse positions. During the movement of the switch from reverse to normal position it is evident that both sets of contact fingers T and T^a will be held in their reverse positions while the slide bar N is in the unlocking position, and that upon the completion of the locking of the switch in its normal position contact fingers T will return to their normal positions, as shown in the drawing.

The contact fingers T and T^a are controlled by the movable rails of the switch S independently of their control by the slide bar N, and the apparatus by which this is accomplished is as follows:

89 designates a block which is mounted to slide longitudinally, that is, left and right, but is prevented from transverse movement by suitable guides which are not shown. This block carries a roller 101 which coacts with a cam surface on rod D which is connected with the front rod 11 of the switch S. The cam surface on rod D comprises two recesses 18 and 18^a, one or the other of which is opposite the roller 101 according as the switch is in normal or reverse position, and a swell 17 which is opposite the roller at all other times. It follows, then, that the block 89 can occupy its "retracted" position (the position in which it is shown) when the switch is in normal or reverse position, but that it is forced to the right (the "projected" position) when the switch begins to move and is held there as long as the switch occupies any intermediate position. 91 is a lever pivotally mounted on the block 89 at a point 90 which is midway between the ends of the lever. The two ends of this lever are connected with the two sets of contact fingers T and T^a, respectively. The connection between this lever and contacts T comprises a rod 93, a bell crank 94, a link 95 and a tie rod 76 of insulating material. The connection between lever 91 and contacts T^a is similar, the parts having the same reference characters with the exponent "a" affixed.

Surrounding rod 93 is a spring 97 which abuts against two collars 98, 98, one of which rests against a shoulder on the rod and the other against a fixed guideway 96. Rod 93ª is provided with a spring 97ª which abuts against collars 98ª arranged in a similar manner. It will be seen that spring 97 biases the contact fingers T to their downward or normal positions, and that spring 97ª has a similar effect on contact fingers Tª.

The proportioning of the parts is such that while the block 89 is in its retracted position, either set of contacts can be reversed (elevated) while the other set is normal (down). When the block is moved to its projected position, however, both sets of contacts are necessarily reversed irrespective of the position of the slide bar N. It follows, then, that if the switch S be moved while the slide bar N is in its normal locking position, contacts Tª will remain in the reverse position, and contacts T will be moved to and held in their reverse positions. Similarly, if the switch S be moved away from its reverse position while the slide bar N is in its reverse locking position, contacts T will remain reversed and contacts Tª will be reversed.

During the proper operation of the switch, slide bar N is, of course, moved to its intermediate position prior to movement of the switch rails. This movement of the slide bar causes contacts T to be reversed, and in so doing, it swings lever 91 in clockwise direction around point 92ª as the center, so that the block 89 is moved to its projected position. The subsequent movement of the bar D during the movement of the switch has no effect on block 89, but after the movement of the switch is completed and the slide bar N is shifted to its reverse locking position, contacts Tª are released so that the block 89 returns to its retracted position. It will be seen, therefore, that unless the switch makes a complete movement, both sets of contacts will be held in the reverse position even though a complete movement of the slide bar N to its locking position may be completed owing to the breakage or derangement of some of the parts.

The circuit controller shown in Fig. 2 is employed to govern a suitable indication mechanism, which mechanism is employed to repeat the positions of the switch at a distant point, usually at the lever which controls the switch. As here shown, this indication mechanism is represented by a relay P, which is responsive to reversals of current. Current is supplied to this relay from a battery B, and the supply is governed by the contacts T and Tª of the circuit controller. When the switch is locked in the normal position, so that contacts T are normal and contacts Tª are reverse, relay P is supplied with current of what I will term the "normal" polarity, the circuit being from battery B, through wire 80, contact 78, lower finger 75 of the pair T, wire 81, relay P, wire 82, upper finger 75 of the pair T, contact 19, and wire 83 to battery B. When the switch is locked in its reverse position, that is, when contacts Tª are normal and contacts T reversed, current of reverse polarity is supplied to relay P, the circuit being from battery B, through wires 80 and 85, contact 19ª, upper finger 75 of the pair Tª, wires 86 and 82, relay P, wires 81 and 87, lower finger 75 of the pair Tª, contact 78ª, and wires 88 and 83 to battery B. When both pairs of contacts T and Tª are in the reverse positions, the battery B is disconnected from relay P and a low resistance shunt is connected across the winding of this relay, which shunt is from relay P, through wire 81, lower finger 75 of the pair T, contact 79, wire 84, contact 79ª, upper finger 75 of the pair Tª, and wires 86 and 82 to relay P. At such times the relay P is, of course, de-energized and any stray current which may reach the winding of this relay will be diverted from the relay by the low resistance shunt.

It will be seen from the foregoing that relay P will be energized in normal direction when the switch is locked in its normal position, and that this relay will be energized in the reverse direction when the switch is locked in its reverse position. Relay P will be de-energized, however, when the switch is unlocked, and it will also be de-energized irrespective of the locking apparatus if the switch is at any point between its two extreme positions.

Although I have herein shown and described only one form of circuit controller embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. In combination, a railway switch, apparatus for moving and locking said switch, indication mechanism comprising two contact fingers each having a normal and a reverse circuit controlling position and biased to normal position, means controlled by said apparatus for holding both fingers in reverse position while the switch is unlocked and for releasing one finger or the other according as said switch is locked in one extreme position or the other, and additional means actuated by said switch for preventing either finger from assuming its normal position unless the switch occupies an extreme position.

2. In combination, a railway switch, locking means for said switch, indication means for said switch, contacts for controlling said indication means, cams actuated by said lock-

ing means for controlling said contacts, a rod connected with the movable rails of said switch and having a cam face thereon, a block movable at right angles to said rod and having a cam follower co-operating with the cam face on said rod, a lever fulcrumed on said block, spring pressed rods pivoted to the ends of said lever, bell cranks pivotally connected to said spring-pressed rods, and links connecting said bell cranks and said contacts.

3. In combination, a railway switch, a slide bar for locking said switch and having a normal and a reverse locking position corresponding to the normal and reverse positions of the switch, two sets of contact fingers each biased to a normal position, means operated by said slide bar for holding one set of contacts or the other in reverse position when the bar is in normal or reverse locking position and for holding both sets of contacts in reverse position when the bar is between said two positions, a block movable to a retracted and a projected position, a lever pivoted intermediate its ends to said block and the ends of said lever being connected with said two sets of contacts respectively, the parts being so proportioned that when said block is in retracted position either set of contacts may remain in normal position while the other set is in reverse position but that when the block is in projected position both sets of contacts are reversed irrespective of the positions of the slide bar, means operated by the rails of said switch for holding said block in projected position at all times except when the switch is in normal or reverse position, and indication means controlled by said contacts.

4. In combination, a railway switch, a slide bar for locking said switch and having a normal and a reverse locking position corresponding to the normal and reverse positions of the switch, two sets of contact fingers each biased to a normal position, means operated by said slide bar for holding one set of contacts or the other in reverse position when the bar is in normal or reverse locking position and for holding both sets of contacts in reverse position when the bar is between said two positions, a block movable to a retracted and a projected position, a lever pivoted intermediate its ends to said block and the ends of said lever being connected with said two sets of contacts respectively, the parts being so proportioned that when said block is in retracted position either set of contacts may remain in normal position while the other set is in reverse position but that when the block is in projected position both sets of contacts are reversed irrespective of the position of the slide bar, a cam follower carried by said block, a cam attached to the movable rails of said switch and having two recesses one or the other of which is opposite said follower according as the switch is in normal or reverse position, whereby said block is held in projected position at all times except when said switch is in normal or reverse position, and indication means controlled by said contacts.

5. In combination, a railway switch, a slide bar for locking said switch and having a normal and a reverse locking position corresponding to the normal and reverse positions of the switch, two sets of contact fingers each biased to a normal position, means operated by said slide bar for holding one set of contacts or the other in reverse position according as the bar is in normal or reverse locking position and for holding both sets of contacts in reverse position when the bar is between said two positions, a block movable to a retracted and a projected position, a lever pivoted intermediate its ends to said block and the ends of said lever being connected with said two sets of contacts respectively, the parts being so proportioned that when said block is in retracted position either set of contacts may remain in normal position while the other set is in reverse position but that when the block is in projected position both sets of contacts are reversed irrespective of the position of the slide bar, means operated by the movable rails of said switch for holding said block in projected position at all times except when the switch is in normal or reverse position, an indication relay responsive to reversals of current, and means controlled by said contacts for supplying current of one polarity to said relay when one set of contacts is normal and the other set reversed, for supplying current of the other polarity to said relay when the first set of contacts is reversed and the second set normal, and for connecting a low resistance shunt across said relay when both sets of contacts are reversed.

6. In combination, a railway switch, a slide bar having a normal and a reverse locking position corresponding to the normal and reverse positions of the switch, two sets of contact fingers each biased to a normal position, means operated by said slide bar for holding one set of contacts or the other in reverse position when the bar is in normal or reverse position and for holding both sets of contacts in reverse position when the bar is between said two locking positions, a lock rod connected with said switch and co-operating with said slide bar to prevent movement of said bar to either extreme position unless the switch is in the corresponding extreme position, additional means operatively connected with the movable rails of said switch for holding both sets of contacts in reverse positions at all times except when the switch is in normal or reverse position, an indication relay responsive to reversals of current, and means operated by said contacts for supplying current of one polarity to said relay when one set of contacts is

normal and the other set reverse, for supplying current of the other polarity to said relay when the first set of contacts is reversed and the second set normal, and for connecting a low resistance shunt across said relay when both sets of contacts are reversed.

7. In combination, a railway switch, apparatus for moving and locking said switch, an indication device responsive to reversals of current, means controlled by said apparatus for supplying current of one polarity or the other to said indication device according as the switch is locked in normal or reverse position and for discontinuing the supply of current and placing said device on short circuit when the switch is unlocked and additional means controlled by said switch for preventing removal of said short circuit and the supply of current to said device unless the switch occupies an extreme position.

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

WILLIAM ZABEL.

Witnesses:
A. HERMAN WEGNER,
E. P. CRUM.