Dec. 4, 1928. 1,694,050

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APPARATUS FOR THE CONTROL OF RAILWAY SWITCHES

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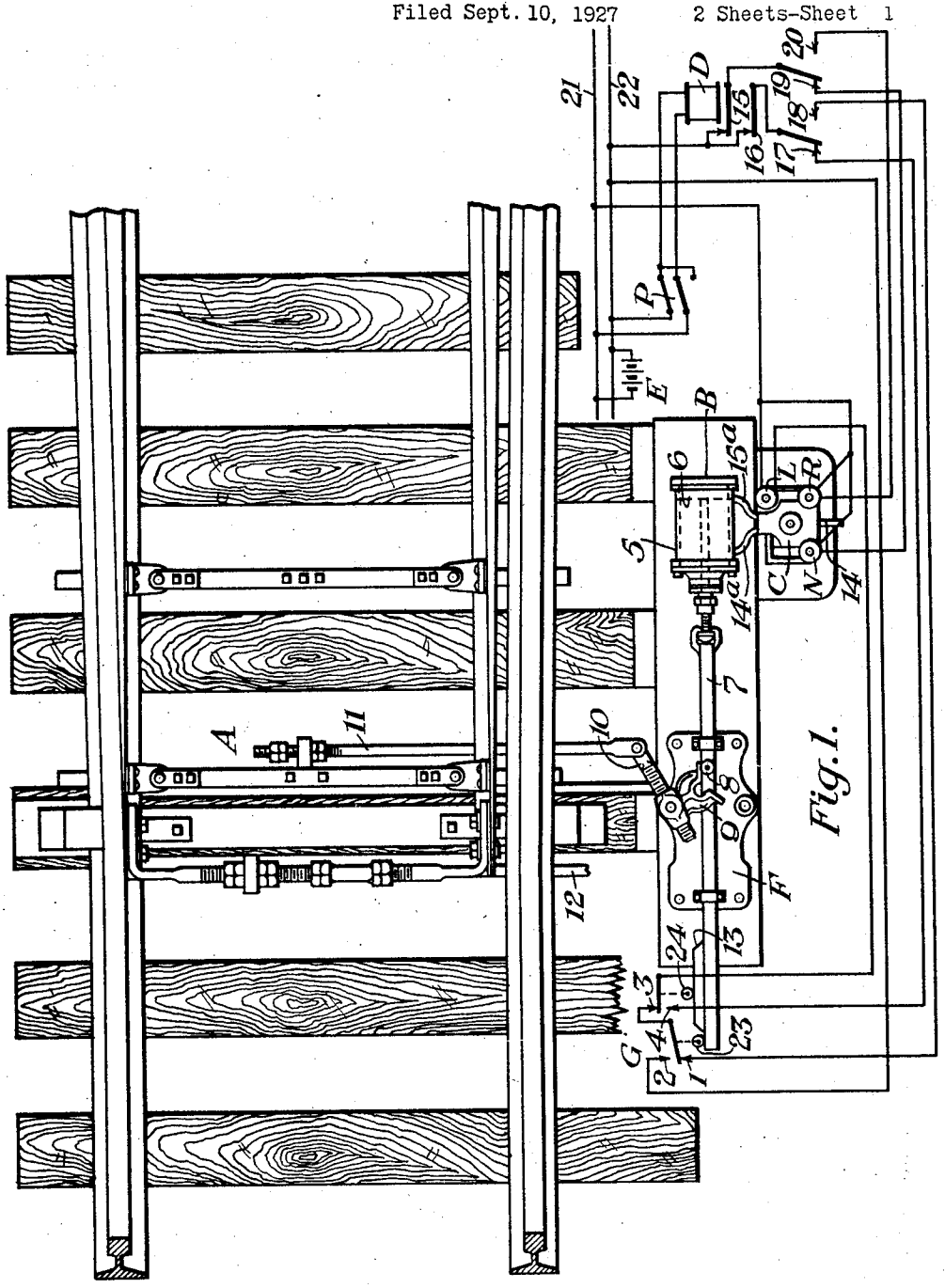

Fig. 1.

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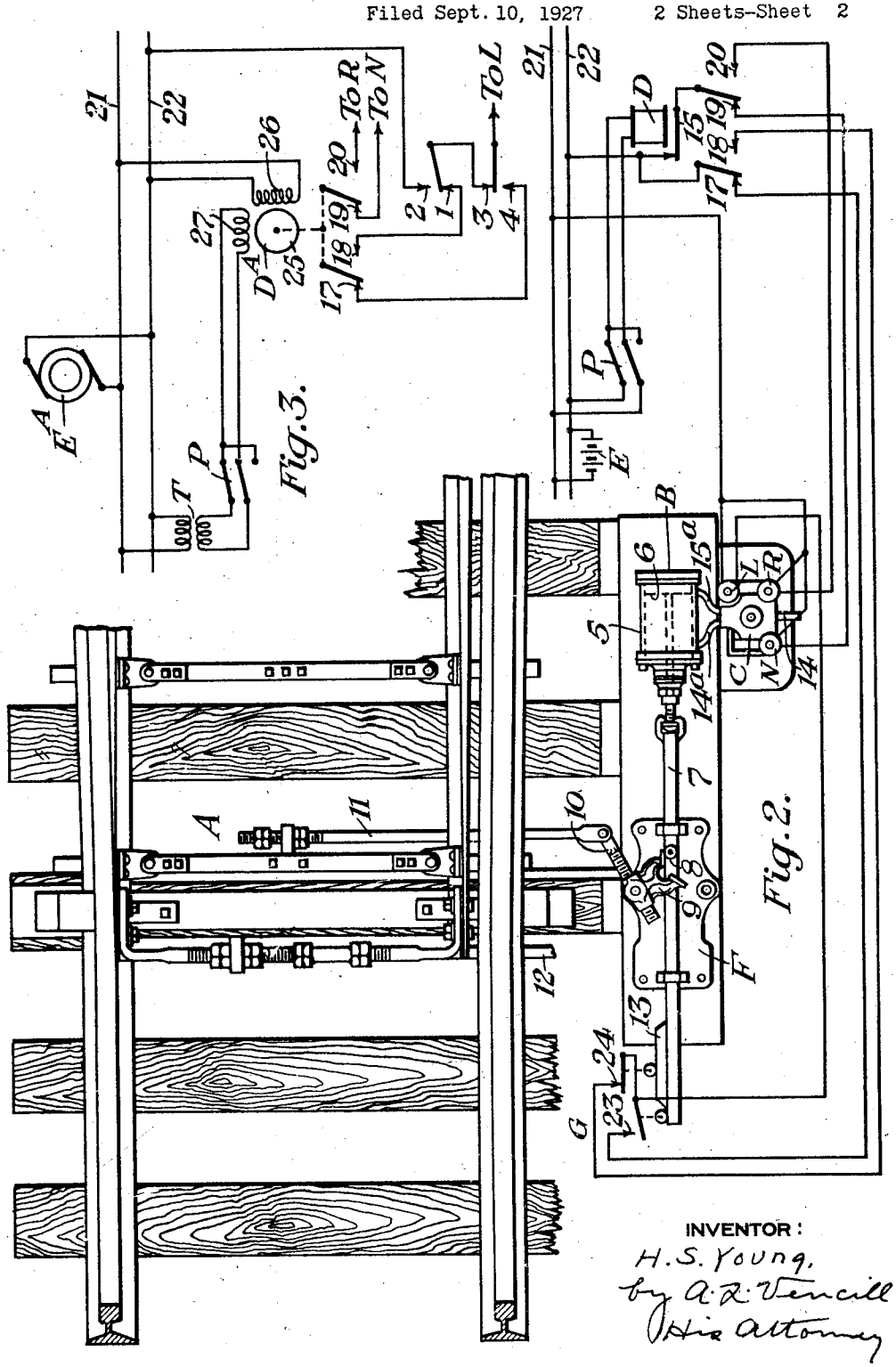

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Patented Dec. 4, 1928. 1,694,050

UNITED STATES PATENT OFFICE.

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APPARATUS FOR THE CONTROL OF RAILWAY SWITCHES.

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My invention relates to apparatus for the control of railway switches, and particularly to apparatus of the type involving a fluid pressure switch operating mechanism and electric means for controlling the fluid pressure operating mechanism from a distant point, such as from an interlocking machine.

I will describe several forms of apparatus embodying my invention, and will then point out the novel features thereof in claims.

In the accompanying drawings, Fig. 1 is a view, partly diagrammatic, showing one form of apparatus embodying my invention. Figs. 2 and 3 are views showing modifications of portions of the apparatus shown in Fig. 1 and also embodying my invention.

Similar reference characters refer to similar parts in each of the several views.

Referring first to Fig. 1, the reference character A designates a railway switch which is operated by a fluid pressure motor B through the medium of a switch operating mechanism F, the motor B being in turn controlled by a valve device C.

The motor B comprises a cylinder 5 containing a piston 6, which is operatively connected with a slide bar 7. The slide bar 7 carries a stud 8 which co-operates with an alligator jaw 9 attached to a crank arm 10, which in turn is pivotally connected with an operating rod 11 connected with the movable rails of the switch A. The movable rails of the switch are also connected with a lock rod 12 which co-operates with the slide bar 7 by means of apparatus which is well known in the art, but which is omitted from the drawing for the reason that it forms no part of my present invention.

The valve mechanism C comprises a normal magnet N, a reverse magnet R, and a lock magnet L. These magnets control the valve mechanism in such manner that when the normal magnet N is energized, fluid pressure is admitted to the left-hand end of cylinder 5 to shift piston 6 to the right, and so to move the switch A to its normal position, in which position it is illustrated in the drawing. When magnet R is energized, fluid pressure is admitted to the right-hand end of cylinder 5 to move piston 6 to the left, thereby shifting switch A to its reverse position. The valve mechanism is locked at all times except when the lock magnet L is energized, and, consequently, it is essential that this magnet be energized whenever the switch is to be moved

The slide bar 7 carries a cam 13 co-operating with two rollers 23 and 24, which actuate indication contacts 1, 2, 3 and 4. In the form shown in Fig. 1, the operation of these contacts, is as follows: When the slide bar 7 is in its full normal position, contacts 1 and 3 are closed but contacts 2 and 4 are open. When the slide bar is in its full reverse position contacts 2 and 4 are closed and contacts 1 and 3 are open. During the movement of the switch from normal to reverse positions contact 1 opens and contact 2 closes as soon as the slide bar 7 moves away from its extreme normal position, and contact 3 opens and contact 4 closes just as the slide bar 7 reaches its full reverse position. During movement of the switch from reverse to normal positions, contact 4 opens and contact 3 closes as soon as the slide bar 7 moves away from its full reverse position, and contact 2 opens and contact 1 closes just as the slide bar reaches its full normal position.

The valve magnets N, R and L are controlled by a relay D which is responsive to reversals of the relative polarity of the current with which it is supplied. That is to say, the relay comprises normal contacts 17 and 19 which are closed when the relay is supplied with current of normal polarity, and it also comprises reverse contacts 18 and 19 which are closed when the relay is supplied with current of reverse polarity. The relay also has two neutral contacts 15 and 16, which are closed when the relay is supplied with current of either polarity. In the form shown in Fig. 1, relay D is of the polarized direct current type. This relay is supplied with current from a transmission line comprising wires 21 and 22, and the circuit for the relay includes a pole-changer P which will usually be a part of a manually operable lever in an interlocking machine. The transmission line 21—22 is constantly supplied with direct current from a suitable source, such as a battery E.

The operation of the apparatus shown in Fig. 1 is as follows: As shown in the drawing, the pole-changer P is in its normal position, so that the normal contacts of relay D are closed and switch A is in its normal position. When the operator desires to reverse switch A, he reverses the position of the pole-changer

P, thereby causing the normal contacts 17 and 19 of relay D to open and the reverse contacts 18 and 20 of this relay to close. Current then flows from transmission wire 22 through neutral contact 15 and reverse contact 20 of relay D, and the reverse magnet R to transmission wire 21. Lock magnet L also becomes energized by virtue of a circuit which passes from wire 22, through neutral contact 16 and reverse contact 18 of relay D, contacts 1 and 3 in circuit controller G, and lock magnet L to wire 21. Magnets R and L being energized, and magnet N being de-energized, fluid pressure is supplied to the motor device B to cause this device to shift slide bar 7 to the left, thereby moving switch A to its reverse position. As soon as this movement of the slide bar begins, contact 1 opens and contact 2 closes, whereupon a second circuit for lock magnet L becomes closed, this circuit being from wire 22, through contacts 2 and 3 of circuit controller G and magnet L to wire 21. When slide bar 7 reaches the end of its stroke, contact 3 will open and contact 4 will close, thereby de-energizing lock magnet L, and this results in the locking of the valve mechanism C.

To return the switch to its normal position, the operator restores the pole-changer P to its normal position, thereby again energizing relay D in the normal direction. The opening of contact 20 opens the circuit for the reverse magnet R, and the closing of contact 19 closes the circuit for normal magnet N. The closing of contact 17 of relay D closes a third circuit for lock magnet L, which circuit is from wire 22, through neutral contact 16 and normal contact 17 of relay D, contact 4 of circuit controller G, and lock magnet L to wire 21. Magnets N and L being energized, motor device B operates to return the switch A to its normal position. At the beginning of the movement of slide bar 7, contact 4 opens and contact 3 closes, whereupon lock magnet L is energized by the second circuit traced hereinbefore for this magnet, which circuit includes contacts 2 and 3. At the end of the movement of the slide bar 7, contact 2 opens and contact 1 closes, thereby again de-energizing magnet L and so locking the valve mechanism C.

It will be observed that the normal magnet N is energized whenever relay D is energized in normal direction, and that the reverse magnet R is energized whenever relay D is energized in the reverse direction. It will furthermore be observed that the lock magnet L is energized through contacts 2 and 3 whenever the slide bar 7 is not in an extreme position. It follows that if the switch operating mechanism is shifted out of the extreme position corresponding to the position of the polarized contacts on relay D, motor device B will be supplied with fluid pressure to restore the slide bar 7 and switch A to the position corresponding to the position of the polarized contacts on relay D.

Referring now to Fig. 2, the apparatus is similar to that shown in Fig. 1, except that circuit controller G comprises two contacts 23 and 24, which are operated by the cam 13 on slide bar 7 in the following manner: Contact 24 is closed at all times except when the slide bar is in its full reverse position, and contact 23 is closed at all times except when the slide bar 7 is in its full normal position. The control of the normal and reverse magnets N and R by relay D is exactly the same as in Fig. 1. When the operator desires to reverse the switch A he reverses pole-changer P, thereby reversing relay D, with the result that lock magnet L becomes energized by virtue of a circuit which passes from wire 22, through reverse contact 18 of relay D, contact 24 of circuit controller G^1, and magnet L to wire 21. This circuit remains closed until the slide bar 7 reaches its full reverse position, whereupon contact 24 opens, so that lock magnet L becomes de-energized. To restore the switch to its normal position the operator restores pole-changer P to its normal position, thereby returning relay D to its normal position, with the result that lock magnet L becomes energized by a circuit which passes from wire 22, through normal contact 17 on relay D, contact 23 of circuit controller G^1, and magnet L to wire 21. When the slide bar 7 reaches its full normal position contact 23 opens, thereby de-energizing lock magnet L.

Referring now to Fig. 3, the apparatus is the same as that shown in Fig. 1, except that the control relay, which is here designated D^A, is an alternating current relay comprising a rotor 25 and two stator windings 26 and 27. Winding 26 is constantly energized from the transmission line 21, 22, which in this instance is supplied with alternating current from a generator E^A. Winding 27 is supplied with current of one relative polarity or the other from the transmission line 21, 22 through the pole-changer P. Contacts 17 and 19 are closed when winding 27 of relay D^A is supplied with current of normal relative polarity, and contacts 18 and 20 are closed when this winding is supplied with current of reverse relative polarity. The control of the valve magnets by relay D^A is the same as the control of the valve magnets in Fig. 1, with the exception that the neutral contacts 15 and 16 are, of course, omitted from the circuits of these magnets.

As shown in Fig. 3, a transformer T is interposed between the transmission line 21, 22 and the pole-changer P to electrically insulate the circuit for relay winding 27 from all other circuits in the system, thus providing maximum protection against false operation of any switch or signal due to grounds or crossed wires.

One feature of my invention is the fact

that it requires only two control wires from the pole-changer P to the controlling relay D or D^A. Another feature of my invention, which applies particularly to Figs. 1 and 2, is that maximum protection against false operation of switches and signals by grounds or crossed wires is obtained by the use of the polarized relay, because the control circuit for this relay does not connect with the transmission line 21, 22 except through the contacts of pole-changer P.

Although I have herein shown and described only a few forms of apparatus 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; operating mechanism for said switch having normal and reverse positions and comprising a normal magnet, a reverse magnet and a lock magnet; a relay having normal and reverse contacts one or the other of which is closed according as the relay is supplied with current of normal or reverse relative polarity, means including a manually operable lever for supplying said relay with current of normal or reverse relative polarity, a circuit for said normal magnet including a normal contact of said relay, a circuit for said reverse magnet including a reverse contact of said relay; four indication contacts controlled by said operating mechanism, the first and third of which are closed when the mechanism is in its full normal position, the second and fourth of which are closed when the mechanism is in its full reverse position, the first of which opens and the second of which closes at the beginning of an operation of said mechanism from normal position, the third of which opens and the fourth of which closes at the end of a reverse operation of said mechanism, the fourth of which opens and the third of which closes at the beginning of a movement of said mechanism from reverse position, and the second of which opens and the first closes at the end of a normal operation of said mechanism; a first circuit for said lock magnet including a reverse contact on said relay and the first and third of said indication contacts, a second circuit for said lock magnet including the second and third indication contacts, and a third circuit for said lock magnet including a normal contact on said relay and the fourth indication contact.

2. In combination, a railway switch; operating mechanism for said switch having normal and reverse positions and comprising a normal magnet, a reverse magnet, and a lock magnet; a relay having normal and reverse contacts one or the other of which is closed according as the relay is supplied with current of normal or reverse relative polarity, means including a manually operable lever for supplying said relay with current of normal or reverse relative polarity, a circuit for said normal magnet including a normal contact of said relay, a circuit for said reverse magnet including a reverse contact of said relay; indication contacts controlled by said operating mechanism, and means controlled jointly by said relay contacts and said indication contacts for energizing said lock magnet whenever the normal or reverse relay contacts are closed and the operating mechanism is not in the corresponding full normal or reverse position.

3. In combination, a railway switch; operating mechanism for said switch having normal and reverse positions and comprising a normal magnet, a reverse magnet and a lock magnet; a relay having normal and reverse contacts one or the other of which is closed according as the relay is supplied with current of normal or reverse relative polarity, means including a manually operable lever for supplying said relay with current of normal or reverse relative polarity, a circuit for said normal magnet including a normal contact of said relay, a circuit for said reverse magnet including a reverse contact of said relay; indication contacts controlled by said operating mechanism, and means controlled jointly by said relay contacts and said indication contacts for energizing said lock magnet at all times except when the relay contacts and the operating mechanism are in corresponding extreme positions.

4. In combination, a railway switch, an operating mechanism for said switch having normal and reverse positions and comprising a lock magnet; a relay having normal and reverse contacts one or the other of which is closed according as the relay is supplied with current of normal or reverse relative polarity, means including a manually operable lever for supplying said relay with current of normal or reverse relative polarity, means for moving said operating mechanism to its normal or its reverse position according as the normal or reverse contacts of said relay are closed and provided said lock magnet is energized, four indication contacts controlled by said operating mechanism, the first and third of which are closed when the mechanism is in its full normal position, the second and fourth of which are closed when the mechanism is in its full reverse position, the first of which opens and the second of which closes at the beginning of an operation of said mechanism from normal position, the third of which opens and the fourth of which closes at the end of a reverse operation of said mechanism, the fourth of which opens and the third of which closes at the beginning of a movement of said mechanism from reverse position, and the second of which opens and

the first closes at the end of a normal operation of said mechanism; a first circuit for said lock magnet including a reverse contact on said relay and the first and third of said indication contacts, a second circuit for said lock magnet including the second and third indication contacts, and a third circuit for said lock magnet including a normal contact on said relay and the fourth indication contact.

5. In combination, a railway switch, an operating mechanism for said switch having normal and reverse positions and comprising a lock magnet; a relay having normal and reverse contacts one or the other of which is closed according as the relay is supplied with current of normal or reverse relative polarity, means including a manually operable lever for supplying said relay with current of normal or reverse relative polarity, means for moving said operating mechanism to its normal or its reverse position according as the normal or reverse contacts of said relay are closed and provided said lock magnet is energized, indication contacts controlled by said operating mechanism, and means controlled jointly by said relay contacts and said indication contacts for energizing said lock magnet whenever the normal or reverse relay contacts are closed and the operating mechanism is not in the corresponding full normal or reverse position.

6. In combination, a railway switch, an operating mechanism for said switch having normal and reverse positions and comprising a lock magnet; a relay having normal and reverse contacts one or the other of which is closed according as the relay is supplied with current of normal or reverse relative polarity, means including a manually operable lever for supplying said relay with current of normal or reverse relative polarity, means for moving said operating mechanism to its normal or its reverse position according as the normal or reverse contacts of said relay are closed and provided said lock magnet is energized, indication contacts controlled by said operating mechanism, and means controlled jointly by said relay contacts and said indication contacts for energizing said lock magnet at all times except when the relay contacts and the operating mechanism are in corresponding extreme positions.

7. In combination, a railway switch, an operating mechanism for said switch having normal and reverse positions and comprising a lock magnet; a relay having normal and reverse contacts one or the other of which is closed according as the relay is supplied with current of normal or reverse relative polarity, means including a manually operable lever for supplying said relay with current of normal or reverse relative polarity, means for moving said operating mechanism to its normal or its reverse position according as the normal or reverse contacts of said relay are closed and provided said lock magnet is energized, an indication contact controlled by said operating mechanism, and means for controlling said lock magnet jointly by said relay contacts and by said indication contact.

8. In combination, a railway switch; operating mechanism for said switch having normal and reverse positions and comprising a normal magnet, a reverse magnet and a lock magnet; a relay having normal and reverse contacts one or the other of which is closed according as the relay is supplied with current of normal or reverse relative polarity, means including a manually operable lever for supplying said relay with current of normal or reverse relative polarity, a circuit for said normal magnet including a normal contact of said relay, a circuit for said reverse magnet including a reverse contact of said relay; indication contacts controlled by said operating mechanism, and means for controlling said lock magnet jointly by said relay contacts and by said indication contacts.

9. In combination, a railway switch, an operating mechanism for said switch having normal and reverse positions and comprising a lock magnet; a relay having normal and reverse contacts one or the other of which is closed according as the relay is supplied with current of normal or reverse relative polarity, means including a manually operable lever for supplying said relay with current of normal or reverse relative polarity, means for moving said operating mechanism to its normal or its reverse position according as the normal or reverse contacts of said relay are closed and provided said lock magnet is energized, indication contacts controlled by said operating mechanism, and means for energizing said lock magnet at all times except when said operating mechanism is in its full normal or its full reverse position.

In testimony whereof I affix my signature.

HENRY S. YOUNG.