

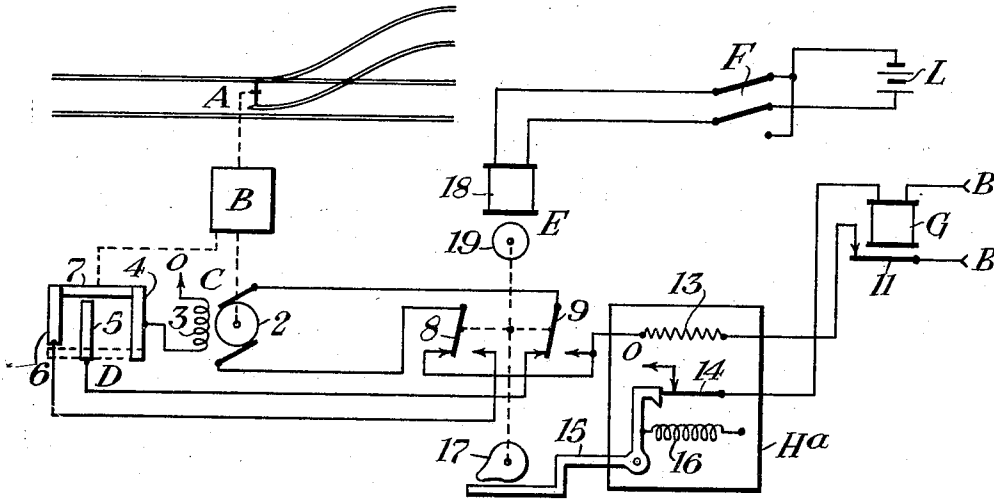
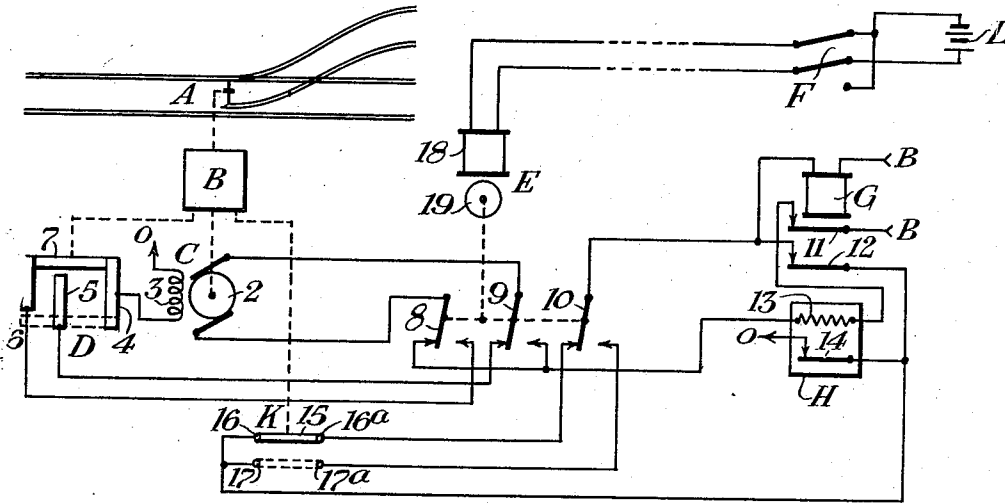
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RAILWAY SWITCH OPERATING APPARATUS

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RAILWAY SWITCH OPERATING APPARATUS

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My invention relates to railway switch operating apparatus, and particularly to apparatus of the type involving an electric motor controlled from a distant point for moving the switch to its normal and reverse positions.

One feature of my invention is the provision of means for interrupting the motor circuit in the event that the switch becomes stalled, and further means for preventing the motor circuit from being restored until the manually governed circuit controller for governing the switch is reversed.

I will describe two 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 diagrammatic view showing one form of switch operating apparatus embodying my invention. Fig. 2 is a diagrammatic view showing a modification of a portion of the apparatus shown in Fig. 1 and also embodying my invention.

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

Referring first to Fig. 1, the reference character A designates a railway switch, which is operated to its normal and reverse positions by an electric motor C through the medium of a switch operating mechanism B. This mechanism may be of any suitable type, but its structure is not illustrated in the drawing for the reason that it forms no part of my present invention. Mechanism B operates a circuit controller D in such manner that contact 6-7-4 is closed at all times except when the mechanism is in its full reverse position, whereas, contact 5-7-4 is closed at all times except when the mechanism is in its full normal position. The mechanism B also operates a second circuit controller K in such manner that contact 16-15-16^a is closed when the mechanism is in its normal position and remains closed until the mechanism reaches its reverse position at which time contact 17-15-17^a becomes closed; during the movement of the mechanism in its other direction contact 17-15-17^a remains closed until the mechanism reaches its normal position, whereupon, the latter contact opens and contact 16-15-16^a becomes closed.

The switch motor is controlled by a manually governed circuit controller designated as a whole by the reference character E. This circuit controller comprises an operating winding 18, a rotor 19 responsive to the polarity of the current supplied to the winding 18, and a plurality of contacts 8, 9 and 10 operatively connected with the rotor 19. The winding 18 is supplied with current from a battery L through a pole-changer F, which pole-changer is manually operable and may be located at a distant point, such as in an interlocking tower. When the pole-changer F is in its normal position, as shown in the drawing, contacts 8, 9 and 10 are swung to the left, whereas, when the pole-changer F is reversed, these contacts are swung to the right.

The circuit for the motor C is further controlled by a thermostat H comprising a winding 13 and a normally closed contact 14 which opens when the current in the winding 13 exceeds a given value for more than a given length of time. The motor circuit is further controlled by a relay G having two front contacts 11 and 12. This relay will usually be of a type similar to the well known overload circuit breaker.

The operation of the apparatus shown in Fig. 1, is as follows: As shown in the drawings, relay G is energized by virtue of a circuit which passes from terminal B of a suitable source of current, through the operating winding of the relay, front contact 12 of the relay, and contact 14 of thermostat H to terminal O of the same source of current. Switch A and circuit controller E are both in their normal positions, so that the circuit for motor C is open at contact 5-7-4 of circuit controller D.

Assuming that the operator desires to reverse the switch A, he reverses pole-changer F, thereby causing contacts 8, 9 and 10 of circuit controller E to swing to the right. Motor C will then be supplied with current by a circuit which passes from terminal B, through contact 11 of relay G, winding 13 of thermostat H, contact 9 of circuit controller E, armature 2 of motor C, contact 8 of circuit controller E, contact 6-7-4 of circuit controller D, and contact 16-15-16^a of circuit controller K.

troller D, and field winding 3 of motor C, to terminal O of the same source of current. Motor C will then operate to reverse switch A, and when the switch reaches its full reverse position the motor circuit will become opened at contact 6—7—4 of circuit controller D. If the pole-changer F is then restored to its normal position, the contacts of circuit controller E will again be swung to the left, whereupon motor C will become energized by a circuit which passes from terminal B, through contact 11 of relay G, thermostat winding 13, contact 8, motor armature 2, contact 9, contact 5—7—4 of circuit controller D, and motor field winding 3 to terminal O. When the switch reaches its full normal position this circuit will be opened at contact 5—7—4 of circuit controller D.

I will now assume that while the switch is moving from its normal to its reverse position it becomes blocked, so that an excessive current flows through the motor circuit and the thermostat winding 13. This will result in opening contact 14 of thermostat 13, thereby opening the stick circuit for relay G, so that this relay will become de-energized. This will open the motor circuit at contact 11 of relay G, whereupon winding 13 will also become de-energized with the result that contact 14 will again close. Relay G will remain open, however, until a pick-up circuit is closed. This relay is provided with a pick-up circuit having two branches, one of which includes contact 10 in the normal position and contact 15 of circuit controller K in the normal position as well as contact 14 of thermostat H, and the other of which includes contact 10 in the reverse position and the contact 15 of circuit controller K in the reverse position as well as contact 14 of thermostat H. It will be seen, therefore, that if the stick circuit for relay G becomes opened while the switch is moving from its normal to its reverse position, this relay will remain open because both branches of its pick-up circuit will be open. In order to close the pick-up circuit for relay G, it is necessary for the operator to reverse pole-changer F, thereby reversing circuit controller E, so that the pick-up circuit for relay G will become closed through contact 10 in its normal position and the contact 15 of circuit controller K in its normal position. Relay G will then become energized, whereupon, motor C will be energized in such direction as to restore switch A to its normal position. If the switch becomes stalled while moving from its reverse to its normal position, it will similarly be necessary for the operator to move pole-changer F to its reverse position in order to close the pick-up circuit for relay G, and the switch will then return to its reverse position from which it started.

Referring now to Fig. 2, the apparatus shown in this view is similar to that shown

in Fig. 1, except for the structure of the thermostat and the control of the relay G. In Fig. 2 the thermostat, which is here designated H^a, comprises a latch 15 arranged to hold contact 14 open after this contact is opened due to excessive current in the thermostat winding 13. Latch 15 is biased by a spring 16 so that when the contact 14 opens, this latch will move into engagement with the contact to mechanically hold it in the open position. The latch 15 may be moved against the bias of spring 16 to release the contacts 14 by a cam 17 operated by the rotor 19 of circuit controller E. That is to say, assuming that contact 14 is latched in the open position and that circuit controller E is in either its normal or reverse position, then when this circuit controller is operated, the cam 17 will actuate the latch 15 to release the contact 14 as the rotor 19 passes through its intermediate position.

The motor circuit includes thermostat winding 13 and relay contact 11 in series, but the winding of relay G is provided with only one circuit which passes from terminal B through the relay winding and thermostat contact 14 to terminal O.

The operation of the apparatus shown in Fig. 2 is as follows: Assuming that the switch A becomes stalled while moving from its normal to its reverse position, contact 14 will open, so that relay G will become de-energized and the motor circuit will be opened at contact 11 of this relay. To release contact 14 it will be necessary for the operator to restore pole-changer F to its normal position, whereupon relay G will become energized and the motor C will be operated to restore the switch to its normal position. Similarly, if the switch becomes stalled while moving from its reverse to its normal position, it will be necessary for the operator to move the pole-changer F to its reverse position, whereupon relay G will become energized and the switch will be moved to its reverse position.

Although I have herein shown and described only two 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, mechanism including an electric motor for operating said switch, a circuit for said motor including a manually governed circuit controller having normal and reverse positions for reversing the relative direction of current flow in one element of the motor, a thermostat comprising a winding included in said motor circuit and a normally closed contact which opens when the amount of current in said winding becomes excessive, a circuit con-

troller operated by said switch mechanism and comprising normal and reverse contacts closed respectively when the mechanism is in its full normal and reverse positions, a relay having an operating winding and two contacts closed when the winding is energized, the first of said relay contacts being included in said motor circuit, a pick-up circuit for the operating winding of said relay having two branches, one including in series a normal contact of said manually governed circuit controller and the normal contact of said mechanism circuit controller, and the other branch including in series a reverse contact of said manually governed circuit controller and the reverse contact of said mechanism circuit controller, and a holding circuit for the operating winding of said relay including the second relay contact and said thermostat contact connected in series.

2. In combination, a railway switch, mechanism including an electric motor for operating said switch, a circuit for said motor including a manually governed circuit controller having normal and reverse positions for reversing the relative direction of current flow in one element of the motor, a thermostat comprising a winding included in said motor circuit and a normally closed contact which opens when the amount of current in said winding becomes excessive, a relay having a front contact included in said motor circuit, a holding circuit for the operating winding of said relay including said thermostat contact, and means operating when said thermostat contact has been opened to prevent subsequent energization of said relay operating winding until said manual circuit controller has been moved.

3. In combination, a railway switch, mechanism including an electric motor for operating said switch, a circuit for said motor including a manually governed circuit controller having normal and reverse positions for reversing the relative direction of current flow in one element of the motor, a thermostat comprising a winding included in said motor circuit and a normally closed contact which opens when the amount of current in said winding becomes excessive, a circuit controller operated by said switch mechanism, a relay having a front contact included in said motor circuit, a pick-up circuit for said relay controlled jointly by said manually governed circuit controller and said mechanism circuit controller, and a holding circuit for said relay including a front contact of the relay and said thermostat contact.

4. In combination, a railway switch, mechanism including an electric motor for operating said switch, a manually operable governed controller for controlling said motor, a thermostat having a winding included in the circuit for said motor and a normally

closed contact which opens in response to excessive current in said winding, a relay having a front contact included in the circuit for said motor, a circuit controller operated by said mechanism, a pick-up circuit for said relay controlled jointly by said manually governed circuit controller and said mechanism circuit controller and a holding circuit for said relay including a front contact of the relay and said thermostat contact.

5. In combination, a railway switch, mechanism including an electric motor for operating said switch, a manually governed circuit controller for governing said motor, a thermostat having a winding included in the circuit for said motor and a normally closed contact which opens in response to excessive current in said winding, a relay having a front contact included in the circuit for said motor, a holding circuit for the operating winding of said relay including said thermostat contact, and means operating when said thermostat contact has been opened to prevent subsequent energization of said relay operating winding until said manual circuit controller has been moved.

6. In combination, a railway switch, mechanism including an electric motor for operating said switch, a circuit for said motor including a manually governed circuit controller having normal and reverse positions for reversing the relative direction of current flow in one element of the motor, a thermostat comprising a winding included in said motor circuit and a normally closed contact which opens when the amount of current in said winding becomes excessive, a relay having an operating winding and a contact closed only when the winding is energized, said relay contact being included in said motor circuit, a circuit for the operating winding of said relay including said thermostat contact, and means operating after said thermostat contact has opened to mechanically hold it open until said manual circuit controller is subsequently operated.

7. In combination, a railway switch, mechanism including an electric motor for operating said switch, a circuit for said motor including a manually governed circuit controller having normal and reverse positions for reversing the relative direction of current flow in one element of the motor, a thermostat comprising a winding included in said motor circuit and a normally closed contact which opens when the amount of current in said winding becomes excessive, a relay having an operating winding and a contact closed only when the winding is energized, said relay contact being included in said motor circuit, a circuit for the operating winding of said relay including said thermostat contact, a latch for mechanically holding said thermostat contact open after it has opened due to excessive current in the thermostat winding,

and means for releasing said latch when said manual circuit controller is subsequently operated.

8. In combination, a railway switch, mechanism including an electric motor for operating said switch, a manually operable circuit controller for governing said motor, a thermostat having a winding included in the circuit for said motor and a normally closed contact which opens in response to excessive current in said winding, a relay having a front contact included in the circuit for said motor, a circuit for the operating winding of said relay including said thermostat contact, a latch for mechanically holding said thermostat contact open after it has opened due to excessive current in the thermostat winding, and means for releasing said latch when said manual circuit controller is subsequently operated.

9. In combination, an electric motor, a circuit for said motor including a manually governed circuit controller for governing said motor, a relay for controlling the supply of current to said motor, a circuit for energizing said relay controlled by said circuit controller, a holding circuit for retaining said relay in its energized condition, and means included in said holding circuit responsive to the magnitude of the current supplied to said motor for controlling said holding circuit.

10. In combination, an electric motor, a circuit for said motor including a manually governed circuit controller for governing said motor, a relay for controlling the supply of current to said motor, a circuit for energizing said relay controlled by said circuit controller, a thermostat comprising a heating winding included in said motor circuit and a contact, and a holding circuit for retaining said relay in its energized condition including said contact.

11. In combination, a railway switch, mechanism including an electric motor for operating said switch, a circuit for said motor including a manually governed circuit controller for operating said motor, a circuit controller operated by said switch mechanism and comprising a normal and a reverse contact closed respectively when the mechanism is in its full normal and full reverse position, a relay for controlling the supply of current to said motor, a circuit for energizing said relay having two branches, one including the normal contact and the other including the reverse contact of said mechanism circuit controller, a holding circuit for retaining said relay in its energized condition, and means responsive to the magnitude of the current supplied to said motor for controlling said holding circuit.

12. In combination, a railway switch, mechanism including an electric motor for operating said switch, a circuit for said motor

including a manually governed circuit controller for operating said motor, a circuit controller operated by said switch mechanism and comprising a normal and a reverse contact closed respectively when the mechanism is in its full normal and full reverse position, a relay for controlling the supply of current to said motor, a circuit for energizing said relay having two branches, one including in series a normal contact of said manually governed controller and the normal contact of said mechanism circuit controller, and the other branch including in series a reverse contact of said manually governed controller and the reverse contact of said mechanism circuit controller, a holding circuit for retaining said relay in its energized condition, and means responsive to the magnitude of the current supplied to said motor for controlling said holding circuit.

13. In combination, an electric motor, a circuit for operating said motor, a relay for controlling said operating circuit, a circuit for energizing said relay, a holding circuit for retaining said relay in its energized condition, and means included in said holding circuit responsive to the magnitude of the current supplied to said motor for controlling said holding circuit.

14. In combination, an electric motor, a circuit for operating said motor, a relay for controlling said operating circuit, a thermostat comprising a heating winding included in said operating circuit and a contact, a circuit for energizing said relay, and a holding circuit for retaining said relay in its energized condition including said contact.

15. In combination, an electric motor, a circuit for operating said motor, a relay for controlling said operating circuit, a thermostat comprising a heating winding included in said operating circuit and a contact, a control circuit for said relay governed by said contact, and means effective when said contact has been operated for at times retaining said contact in its operated position.

16. In combination, an electric motor, a circuit for operating said motor, a relay for controlling said operating circuit, a thermostat comprising a heating winding included in said operating circuit and a contact, a control circuit for said relay governed by said contact, a latch for holding said contact in its operated position, and means for releasing said latch.

17. In combination, an electric motor, a circuit for said motor including a manually governed circuit controller for governing said motor, a relay for controlling the supply of current to said motor, a control circuit for said relay, governing means responsive to the magnitude of the current supplied to said motor for governing said control circuit, and means cooperating mechanically with said governing means and operated by

said manually governed circuit controller for modifying the control of said relay circuit by said governing means.

18. In combination, an electric motor, a circuit for said motor including a manually governed circuit controller for governing said motor, a relay for controlling the supply of current to said motor, a thermostat comprising a heating winding included in said motor circuit and a contact, a control circuit for said relay governed by said contact, and means cooperating mechanically with said governing means and operated by said manually governed controller for modifying the control of said relay circuit by said contact.

19. In combination, an electric motor, a circuit for said motor including a manually governed circuit controller for governing said motor, a relay for controlling the supply of current to said motor, a thermostat comprising a heating winding included in said motor circuit and a contact, a control circuit for said relay governed by said contact, a latch for holding said contact in its operated position, and means controlled by said manually governed controller for releasing said latch.

In testimony whereof I affix my signature.
BERNARD E. O'HAGAN.