

Nov. 10, 1936.

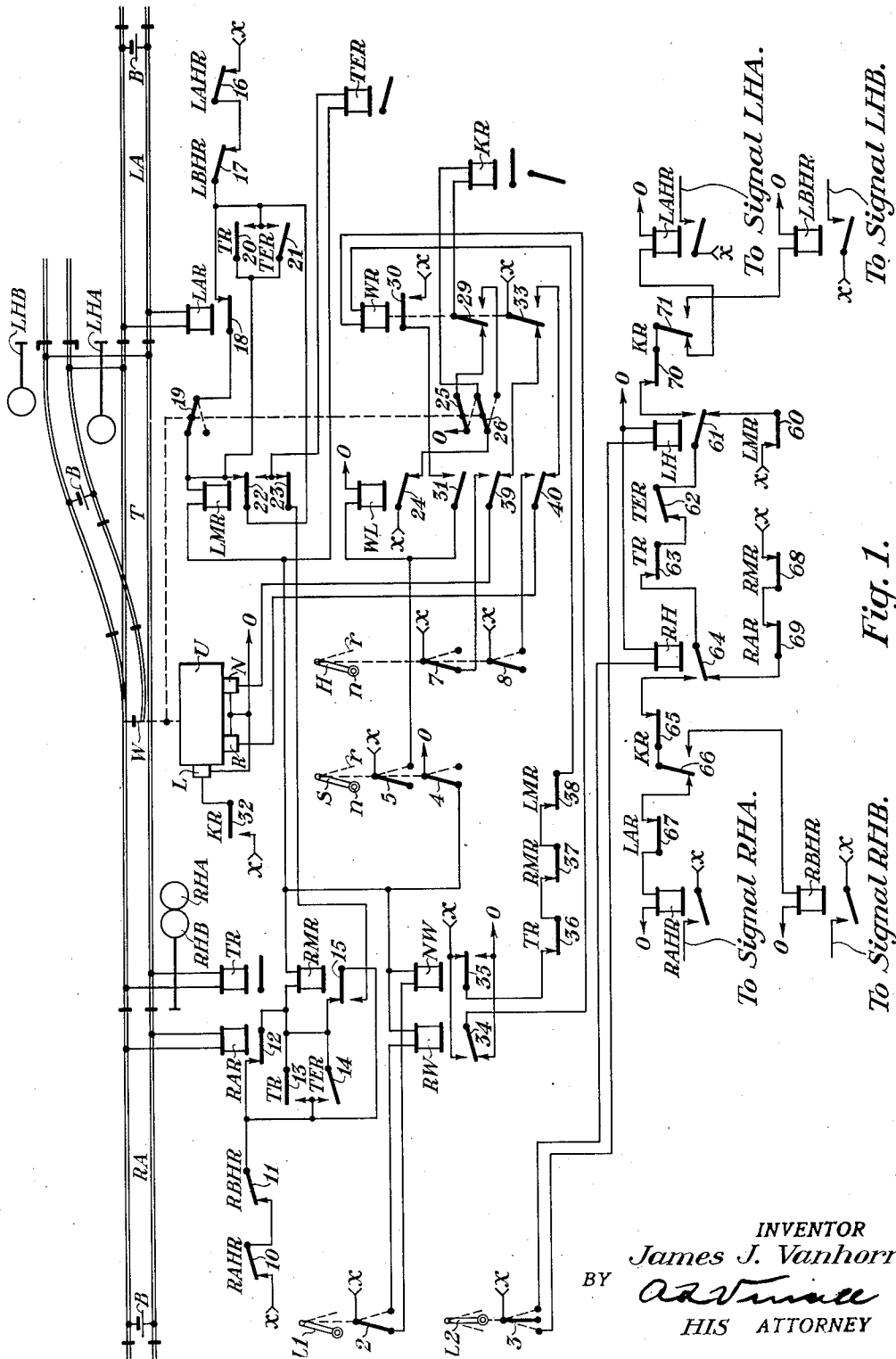
J. J. VANHORN

2,060,487

RAILWAY TRACK SWITCH CONTROLLING APPARATUS

Filed Feb. 19, 1935

4 Sheets-Sheet 1



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J. J. VANHORN

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RAILWAY TRACK SWITCH CONTROLLING APPARATUS

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4 Sheets-Sheet 2

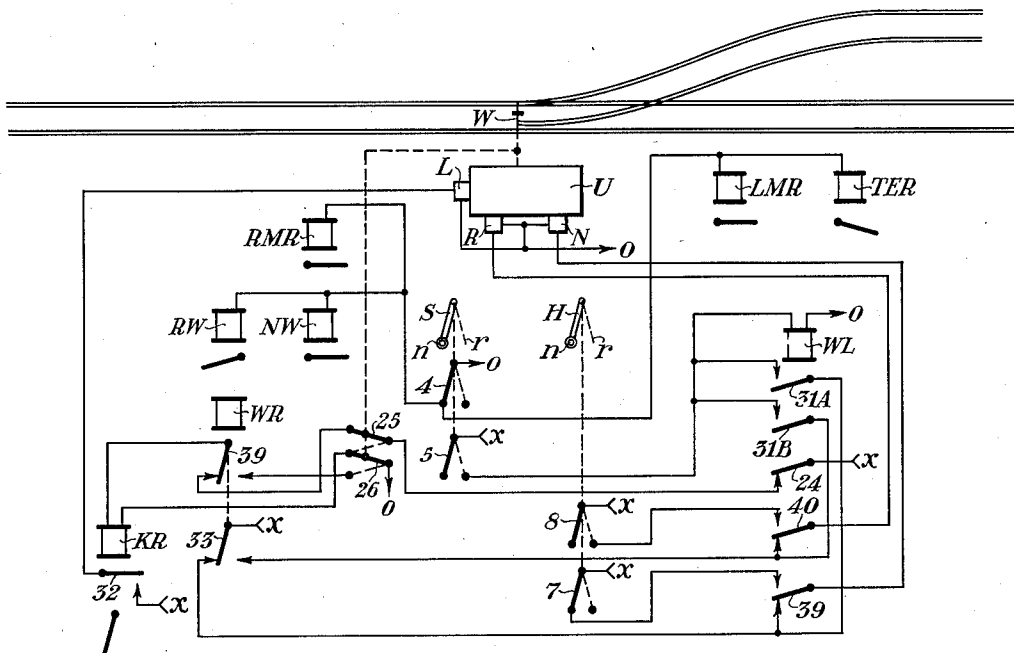


Fig. 2.

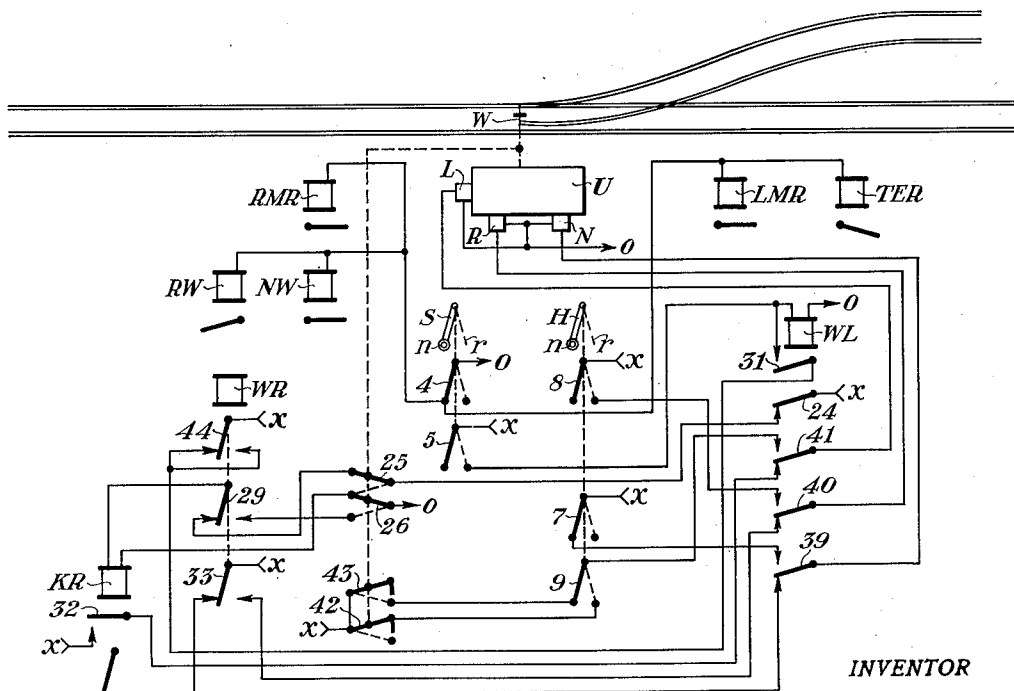


Fig. 3.

INVENTOR
James J. Vanhorn.
BY *Arthur J. Vanhorn*
HIS ATTORNEY

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J. J. VANHORN

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4 Sheets-Sheet 3

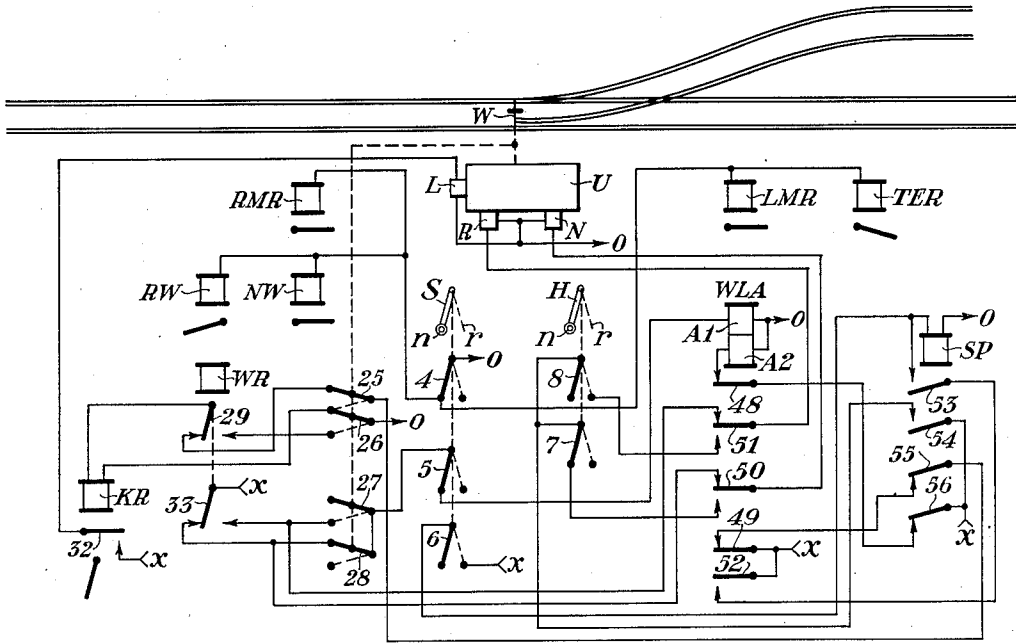


Fig. 4.

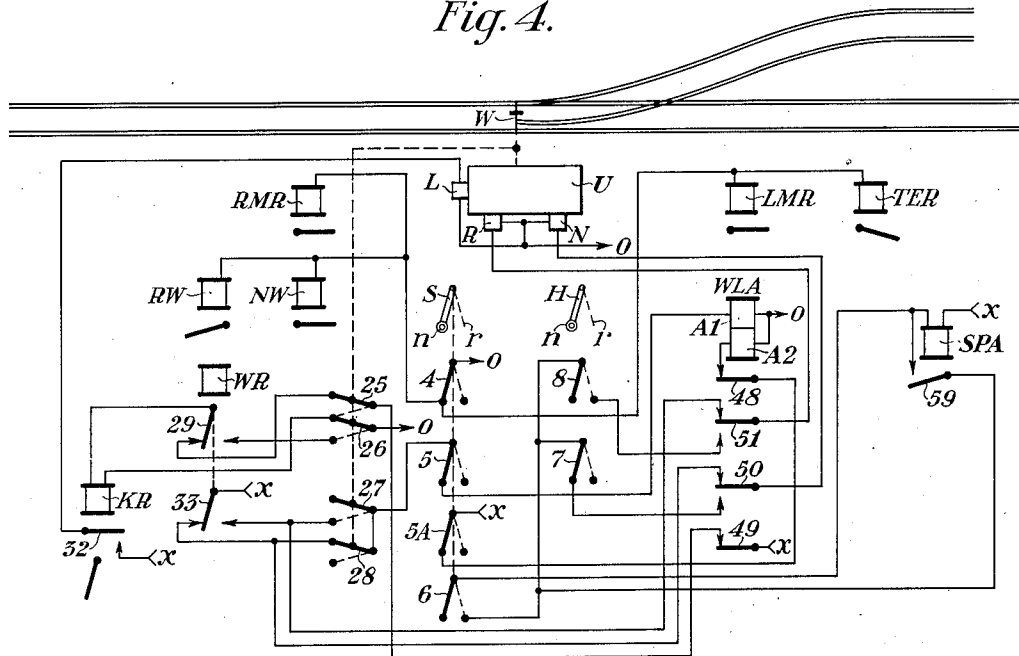


Fig. 5.

INVENTOR
James J. Vanhorn
BY *Arthur V. Tull*
HIS ATTORNEY

Nov. 10, 1936.

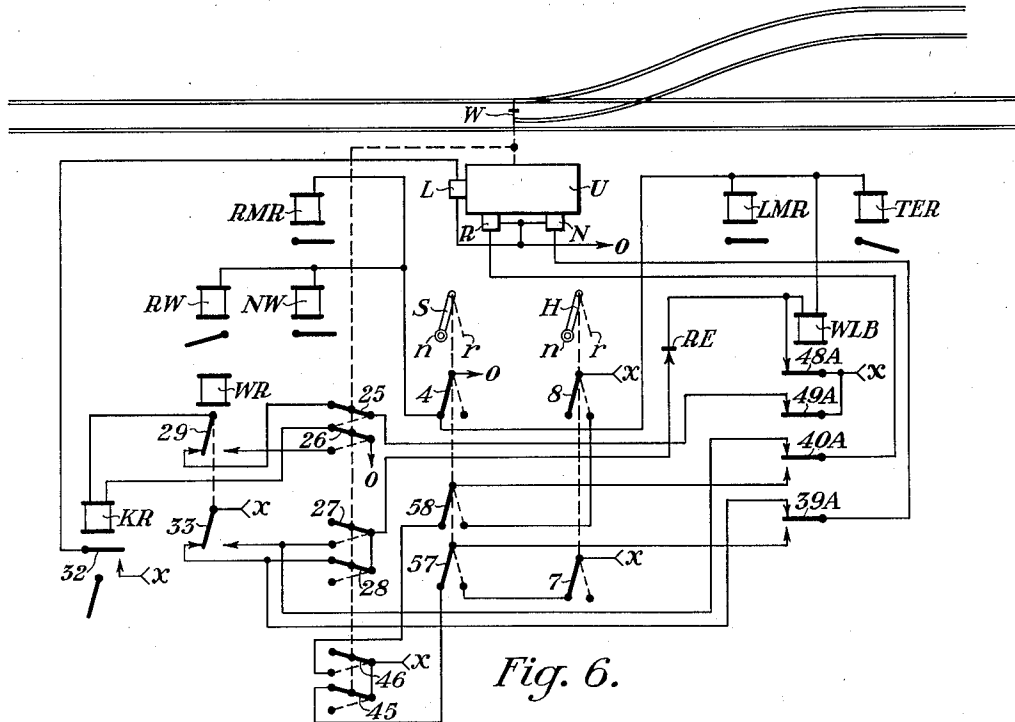
J. J. VANHORN

2,060,487

RAILWAY TRACK SWITCH CONTROLLING APPARATUS

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4 Sheets-Sheet 4



INVENTOR
James J. Vanhorn.
BY *AR Tunnell*
HIS ATTORNEY

UNITED STATES PATENT OFFICE

2,060,487

RAILWAY TRACK SWITCH CONTROLLING
APPARATUSJames J. Vanhorn, Swissvale, Pa., assignor to
The Union Switch & Signal Company, Swiss-
vale, Pa., a corporation of Pennsylvania

Application February 19, 1935, Serial No. 7,234

11 Claims. (Cl. 246—3)

My invention relates to railway track switch controlling apparatus, and more particularly to a means for safeguarding the operation of a remotely controlled power operated switch under conditions where local operation of the switch is required.

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 diagrammatic view illustrating one form of apparatus embodying my invention. Figs. 2, 3, 4, 5 and 6 are diagrammatic views illustrating modifications of a portion of Fig. 1, each 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 T designates a section of single railway track including a track circuit having a track relay designated by the reference character TR. The section T contains a track switch designated by the reference character W. The switch W, as here shown, connects to one end of a passing siding. To the left and adjacent section T is a section of single track designated by the reference character RA. The section RA is provided with a track circuit having a track relay designated by the reference character RAR. To the right and adjacent section T is a section of single track designated by the reference character LA. The section LA is provided with a track circuit having a track relay designated by the reference character LAR. Each of the track circuits in sections RA, T and LA is provided with a track battery designated by the reference character B. The switch W may be operated by a suitable mechanism, here illustrated as the well-known electro-pneumatic type, and designated by the reference character U. The mechanism U may be caused to move the switch W between its normal and reverse positions by the energization of a normal magnet N or a reverse magnet R, provided a lock magnet L is energized. The normal and reverse magnets N and R are governed by a switch control relay WR which, as pointed out in detail hereinafter, may be controlled from a remote point; and the lock magnet is controlled by a switch indicating relay KR.

The mechanism U is also provided with local control means here shown as a manually operable lever H adjacent the switch W, and with suitable selecting means for placing the mechanism under the control of the relay WR or the lever H. The selecting means may be of any suitable form and

is here illustrated as a manually operable selector lever S including a normally deenergized relay designated by the reference character WL. The local switch operating lever H has a normal position *n* and a reverse position *r*, and is provided with a contact 7 closed only when the lever occupies its normal position and with a contact 8 closed only when the lever occupies a reverse position. The selector lever S also has a normal position *n* and a reverse position *r* and is provided with a contact 4 closed only when the lever occupies its normal position and with a contact 5 closed only when the lever occupies its reverse position. It is apparent from the drawings that when lock relay WL is deenergized, the mechanism U is under control by relay WR, and that when lock relay WL becomes energized in response to the reversal of selector lever S, the mechanism U is under control by contacts 7 and 8 actuated by local switch operating lever H.

The relay WR is controlled by relays designated by the reference characters NW and RW which, as here shown, are controlled from a remote point by a contact 2 actuated by a manually operable lever L1. The relays NW and RW may also be controlled by other suitable means, such, for example, as by a centralized traffic control system one type of which is disclosed in the application of Lloyd V. Lewis, Serial No. 373,675, filed June 25, 1929.

The signals LHA, LHB, RHA and RHB, for governing traffic passing over switch W, are controlled by signal control relays LAHR, LBHR, RAHR and RBHR, respectively, which in turn are controlled by directional signal relays RH and LH. The relays RH and LH, as here shown, are controlled from a remote point by a contact 3 actuated by a manually operable lever L2, but may also be controlled by any other suitable means, such, for example, as described in the previously cited Lewis application. When any of the signal control relays, such as LAHR, is deenergized, the corresponding signal displays a stop indication, and when such relay is energized the corresponding signal is caused to display a proceed indication, the well-known circuits for the control of the signal lamps or mechanisms by the signal control relays being omitted for simplicity.

The reference characters RMR and LMR designate approach locking relays for eastbound and westbound traffic, respectively, which, as will be explained more in detail hereinafter, prevent operation of the switch and signals under certain dangerous conditions.

Associated with the approach locking relays is a time element relay having a slow pick-up characteristic and designated by the reference character TER. The relay TER has a back contact 62 which is closed only when the relay is in its initial or deenergized condition and front contacts 14 and 21 which become closed at the expiration of a time interval after the relay becomes energized.

The reference character KR designates a switch indicating relay having a neutral armature which is energized only if the position of the switch is in agreement with relay WR, and a polar armature which assumes a normal or reverse position corresponding to the position of the switch.

In order to simplify the drawings, the relay contacts have not, in all instances, been placed directly under the relay actuating such contacts. Each such contact, however, has been provided with a reference character having a suitable distinguishing prefix corresponding to the reference character of the actuating relay.

The approach locking relay RMR is provided with a pick-up circuit which passes from terminal X of a suitable source of current, through back contact 10 of relay RAHR, back contact 11 of relay RBHR, front contact 12 of approach track relay RAR, operating winding of relay RMR, and contact 4 actuated by lever S to terminal O of the same source of current. The pick-up circuit also includes back contact 13 of detector track relay TR and front contact 14 of time element relay TER, each contact bridging contact 12 of relay RAR. The relay RMR is also provided with a stick circuit which includes back contacts 10 and 11 of relays RAHR and RBHR, and front point of contact 15 of relay RMR.

The approach locking relay LMR is provided with a similar pick-up circuit which includes back contact 16 of relay LAHR, back contact 17 of relay LBHR, front contact 18 of relay LAR, switch indicating contact 19, and contact 4 actuated by selector lever S. The pick-up circuit also includes back contact 20 of relay TR and front contact 21 of relay TER, each contact bridging contact 18 of relay RAR and switch indicating contact 19. The relay LMR is also provided with a stick circuit which includes back contacts 16 and 17 of the relays LAHR and LBHR, as well as front point of contact 22 of the relay LMR.

The time element relay TER is provided with two operating circuits both of which include contact 4 actuated by selector lever S. One circuit also includes contacts 10 and 11 of the relays RAHR and RBHR, back point of contact 15 of relay RMR, and front point of contact 23 of relay LMR. The other circuit includes contacts 16 and 17 of the relays LAHR and LBHR, and back point of contact 22 of the relay LMR.

The switch indicating relay KR is provided with a circuit which includes back contact 24 of relay WL, switch indicating contacts 25 and 26 and polar contact 29 of the relay WR.

The switch governs three contacts 19, 25 and 26, as well as contacts 27 and 28, shown only in Figs. 4, 5 and 6, contacts 42 and 43, shown only in Fig. 3, and contacts 45 and 46 shown only in Fig. 6 in accordance with the switch position, by any usual and well-known means.

The relay WL is provided with a pick-up circuit which includes contact 5 actuated by lever S, and with a stick circuit which includes back contact 30 of relay WR and front contact 31 of relay WL.

The relays NW and RW, in addition to being controlled by contact 2 on lever L1 are also controlled by contact 4 actuated by selector lever S, so that neither of these relays can be energized over the lever L1, unless the selector lever S occupies its normal position.

The lock magnet L is provided with a control circuit which includes back contact 32 of relay KR. The normal and reverse magnets N and R are controlled, when the relay WL is deenergized, by polar contact 33 of relay WR, and when the relay WL is energized, by contacts 7 and 8 actuated by the local switch operating lever H.

The switch operating relay WR is provided with a control circuit which includes front and back points of contact 34 of relay RW, front and back points of contact 35 of relay NW, front contact 36 of relay TR, front contact 37 of relay RMR, and front contact 38 of relay LMR. It is obvious from the drawings without further explanation, as to the manner in which relay WR is energized and its polar armature is caused to move between the normal and reverse positions in response to the actuation of relays NW and RW by lever L1, provided the track relay TR and the approach locking relays RMR and LMR are all energized.

The relay RAHR is provided with a circuit which includes front contact 60 of relay LMR, back point of contact 61 of relay LH, back contact 62 of relay TER, front contact 63 of relay TR, front point of contact 64 of relay RH, front neutral contact 65 of relay KR, normal point of polar contact 66 of relay KR, and front contact 67 of relay LAR. The relay RBHR is provided with a similar circuit which passes over the same path as just described for relay RAHR up to and including front neutral contact 65 of relay KR, and thence through reverse point of polar contact 66 of relay KR to relay RBHR.

The relay LAHR is provided with a circuit which includes front contact 68 of relay RMR, front contact 69 of relay RAR, back point of contact 64 of relay RH, front contact 63 of relay TR, back contact 62 of relay TER, front point of contact 61 of relay LH, front neutral contact 70 of relay KR, and normal point of polar contact 71 of relay KR. The relay LBHR is provided with a similar circuit which passes over the same path as that described for relay LAHR up to and including front neutral contact 70 of relay KR, and thence through reverse point of polar contact 71 of relay KR to relay LBHR.

Having thus described in general the arrangement of the various parts, I will now describe the operation of the apparatus shown in Fig. 1.

With all of the apparatus in its normal condition as shown in Fig. 1, I shall assume that a train, desiring to make switching movements over the switch W, enters section RA. The entrance of the train into section RA releases approach track relay RAR thereby opening front contact 12 of relay RAR in the pick-up circuit for relay RMR, which relay does not release, however, since the stick circuit for relay RMR is effective through back contacts 10 and 11 of relays RAHR and RBHR, and front point of contact 15 on relay RMR. I shall also assume that the train is brought to a stop at signal RHA; and since local operation of the switch has been found to be more convenient than remote operation for switching movements, a trainman proceeds to the switch and reverses selector lever S to condition the switch for local operation. The manipulation of lever S to its reverse position opens contact 4 and closes contact 5. The opening

of contact 4 deenergizes relays NW, RMR and LMR, and in addition prevents the energization of relay RW or relay TER. The closing of contact 5 energizes the relay WL. The releasing of relay NW releases relay WR and the stick circuit for relay WL is established through back contact 30 of relay WR. The energization of relay WL opens its back contact 24 thereby releasing relay KR, and opens the back points of its contacts 39 and 40 thereby removing the control of the normal magnet N and the reverse magnet R from relay WR. The releasing of relay KR establishes the control circuit for the lock magnet L by the closing of back contact 32 of relay KR, and interrupts the signal control circuits by the opening of front neutral contacts 65 and 70 of relay KR. The signal control relay circuits are also opened by the opening of front contacts 68 and 60 of the relays RMR and LMR, respectively.

Since the normal magnet N and the reverse magnet R are no longer under the control of the relay WR and no signals may be caused to display a proceed indication, the switch W is now in a safe condition for local operation.

The normal magnet N or the reverse magnet R may now be energized by contacts 7 and 8 actuated by the lever H, to cause switch W to move by power between the normal and reverse positions in response to the corresponding manipulation of lever H.

It will now be assumed, with the train again in section RA, that the switching movements have been completed, that the switch W has been placed by lever H in its normal position, and that the selector lever S has been returned to its normal position. The restoration of lever S to its normal position closes contact 4 and opens contact 5. The closing of contact 4 restores the control of relays NW and RW to the lever L1, causes the time element relay TER to initiate its operation, energizes relay LMR, and establishes a circuit for the energization of relay RMR as soon as front contact 14 of relay TER becomes closed. The opening of contact 5 interrupts the pick-up circuit for relay WL so that relay WL may be released upon the energization of relay WR. When the relay RMR becomes energized by the closing of front contact 14 of relay TER, the closing of front contact 37 of relay RMR energizes the relay WR to release the relay WL and thereby restores the control of the normal and reverse magnets N and R to the relay WR. The energization of relay LMR will close its front contact 60 to again establish the control circuit for relay RAHR as soon as back contact 62 of relay TER recloses, so that signal RHA may be caused by the manipulation of lever L2 to indicate proceed for governing the movement of the train over the switch W.

It will now be assumed that the train, in response to the proceed indication displayed by signal RHA, enters section T preparatory to entering section LA. Upon the entrance of the train into section T the relay TR will be released. The releasing of relay TR will open its front contacts 35 and 63 and will close its back contact 13. When the signal control relay RAHR became energized the opening of its back contact 10 released the relay RMR to again interrupt the control of the relay WR by the opening of front contact 37 of relay RMR. The closing of back contact 13 of relay TR will energize relay RMR and the opening of front contacts 36 and 63 of relay TR will interrupt the control of relay

WR and signal control relay RAHR, respectively. It will now be assumed that the train has cleared section T and the relay TR will again be energized to reestablish the control circuits for the switch control relay WR and the signal control relay RAHR.

In the event the position of the switch W and the position of the polar armature of the relay WR are in agreement, it will be seen that the switch W remains in its initial position upon the transfer of the magnets N and R to control by the relay WR following the release of relay WL in response to the energization of relay WR. If, however, the position of the switch W and the position of the polar armature of the relay WR are in disagreement, the switch W will be caused to move to a position to correspond to the position of the polar armature of the relay WR upon the assumption of control of the magnets N and R by relay WR. If, at this time, the switch is not in the position to govern the train to the proper route, it will, of course, be necessary to position the switch again by manipulation of lever L1. This involves no sacrifice in safety, however, since the relay WR cannot be actuated if the detector section is occupied or if a signal has been caused to indicate proceed for permitting traffic to move over the switch.

For remote control operation the approach locking relays RMR and LMR become deenergized upon the energization of any one of the associated signal control relays. The deenergization of either relay RMR or relay LMR prevents the operation of the switch and also prevents the clearing of the opposing signals. Assuming that signal RHA has been cleared to govern a train occupying section RA, it will be seen that relay RMR will be deenergized and may again be energized provided signal RHA is caused to indicate stop, by any one of three methods. First, by the clearing of section RA, secondly, by the occupancy of section T, and lastly, by the completed operation of the time element relay TER. In the event that the train neither clears section RA nor occupies section T, and it is desired to release the locking of the switch, this may be done by placing signal RHA in the stop condition which will initiate the operation of relay TER. Upon the expiration of a given time interval, which is necessary to prevent the possibility of changing the position of the switch immediately in the face of an approaching train, the relay TER will have completed its operation to close contact 14 to establish a pick-up circuit for relay RMR, thereby releasing the locking of the switch and also establishing the control circuits for the opposing signals when other conditions governing the signals are safe for permitting the display of proceed indications. As has already been described, my invention provides for a means for deenergizing each approach locking relay without initiating the operation of the relay TER when the selecting apparatus is operated to permit local operation of the switch, and further provides for the normal operation of the relay TER and the restoration of the usual control circuits for the relays RMR and LMR when the selecting apparatus is restored to its initial condition. In other words, the approach locking becomes effective when the switch is conditioned for local operation and remains effective, after the switch has been conditioned for remote operation, until such time as the approach locking is released in the usual manner.

The apparatus, including relay LMR, would

operate for a train approaching switch W from the section LA or from the siding in the same manner as that just described for a train approaching from the opposite direction, with the exception that, with the switch reversed, the pick-up circuit for relay LMR would be opened by switch indicating contact 19 instead of by front contact 18 of relay LAR.

While I have shown the approach locking relays RMR and LMR controlled over one track circuit in approach to the switch, and released by the occupancy of the detector section, it is understood that such controls and releases for these relays need not necessarily be limited to one track circuit each.

In Figs. 2, 3, 4, 5 and 6, signals RHA, RHB, LHA and LHB, relays RH, LH, RAR, TR, LAR, RAHR, RBHR, LAHR and LBHR with their control circuits, and portions of the control circuits for relays RW, NW, RMR, LMR and TER have, for simplicity, been omitted. It is understood, however, that while such signals, relays and circuits are not shown, they are employed in Figs. 2, 3, 4, 5 and 6 in the same manner as shown in Fig. 1.

Referring now to Fig. 2, all of the apparatus here shown is identical to that shown in Fig. 1, except that the control for the lock relay WL has been modified. The relay WL is provided with a pick-up circuit which is energized by contact 5 upon the reversal of the selector lever S, and with two stick circuits. One stick circuit, effective when relay WR is in its normal position, includes front contact 31A of relay WL, and the other stick circuit, effective when relay WR is in its reverse position, includes front contact 31B of relay WL. It is apparent from the circuits that relay WL may be energized upon the closing of contact 5, and may be deenergized by the actuation of polar contact 33 of relay WR, if and only if the selector lever S is returned to its normal condition and contact 5 becomes opened. Under remote control, the mechanism U may be caused to move the switch W between its normal and reverse positions in response to the actuation of polar contact 33 of relay WR, by the energization of the normal magnet N through back point of contact 39 of relay WL or the reverse magnet R through back point of contact 40 of relay WL. When the switch is conditioned for local operation by the energization of relay WL upon the reversal of selector lever S, the control of the normal and reverse magnets N and R is transferred over the front points of contacts 39 and 40 of relay WL to lever H. It is readily apparent that under these conditions the normal and reverse magnets N and R may be energized by the contacts 7 and 8 actuated by local switch control lever H so that switch W may be caused to move between its normal and reverse positions in response to the corresponding manipulation of lever H. After local operation of the switch, the magnets N and R may again be placed under the control of the relay WR by the actuation of the polar contact 33 to release relay WL, provided the selector lever S has been restored to its initial condition.

In the event the position of the switch W and the position of the polar armature of the relay WR are in disagreement, it will be seen that the switch W will remain in its initial position upon the transfer of the magnets N and R to control by the relay WR when the relay WL becomes released in response to the actuation of the polar

armature of relay WR. If, however, the position of the switch W and the position of the polar armature of the relay WR are in agreement, the switch W will be caused to move to a position to correspond to the position of the polar armature of the relay WR upon the assumption of control of the magnets N and R by relay WR. If at this time the switch is not in the position to govern the train to the proper route, it will, of course, be necessary to position the switch again by manipulation of lever L1. This involves no sacrifice in safety, however, since the relay WR cannot be actuated if the detector section is occupied or if a signal has been caused to indicate proceed for permitting traffic to move over the switch.

Referring now to Fig. 3, all of the apparatus here shown is identical to that shown in Fig. 1, except that the control for the relay WL and the control for the lock magnet L have each been modified. The relay WL is provided with a pick-up circuit which is energized by the closing of contact 5 upon the reversal of selector lever S, and with a stick circuit which includes polar contact 44 of relay WR and front contact 31 of relay WL. It is apparent from the drawing that relay WL may be energized upon the closing of contact 5, and may be deenergized by the actuation of polar contact 44 of relay WR, if and only if the selector lever S is returned to its normal condition and contact 5 becomes opened. The lock magnet L is controlled by back contact 32 of relay KR when relay WL is deenergized and back point of contact 41 on relay WL becomes closed, but is controlled by switch indicating contacts 42 and 43 and contact 9 actuated by lever H when relay WL is energized and front point of contact 41 on relay WL becomes closed. The switch indicating contact 42 is closed at all times except when the switch is reversed and the switch indicating contact 43 is closed at all times except when the switch is normal. It is apparent from the drawings that, when relay WL is energized and the normal and reverse magnets N and R are being alternately energized by contacts 7 and 8 in response to the manipulation of lever H, the lock magnet L will be momentarily energized by the switch indicating contacts 42 and 43 through contact 9 actuated by lever H, so that the mechanism U will be caused to operate the switch W between its normal and reverse positions. If it is desired, the lock magnet L may be controlled direct over back contact 32 of relay KR, as shown in Fig. 2, thereby eliminating contact 9, contact 41 of relay WL and switch indicating contacts 42 and 43. After local operation of the switch, the control may again be restored to the relay WR by the actuation of the polar contact 33 to release relay WL, provided the selector lever S has been restored to its initial condition, in the same manner as described for the apparatus shown in Fig. 2.

From the foregoing description of the apparatus shown in Figs. 1, 2 and 3, it will be seen that I have provided several forms of apparatus suitable for safeguarding the local operation, under its own power, of a remotely controlled power operated railway track switch. When the switch is conditioned for local operation, the switch is removed from control by the remotely controlled apparatus and the signal control relay circuits are interrupted to hold the signals in the stop condition. The apparatus shown in Figs. 1, 2 and 3 further provides for the restoration of the

switch to control by the switch control relay, only if the selector lever is returned to its normal condition and then only by the actuation of the switch control relay. An additional safeguard is also provided in that the switch will be maintained by power in the position to which last operated, until such time as the control of the switch is again assumed by the switch control relay. Furthermore, if either approach section is occupied the switch may not be restored to control by the switch control relay until the expiration of a measured time interval after the selector lever has been returned to its normal position.

Referring now to Fig. 4, the reference character WLA refers to a lock relay which has a pick-up winding A1 and a stick winding A2. It will be seen from the drawings that winding A1 may be energized only if contact 5 is closed and then only if the position of the polar contact 33 of relay WR is in agreement with the position of the switch indicating contacts 27 and 28. The stick winding A2 is provided to hold relay WLA in the energized condition during the open circuit periods in the pick-up circuit when switch indicating contacts 27 and 28 are being operated by the switch, and is separated from the pick-up winding in order to prevent false energization of the normal and reverse magnets N and R from the stick circuit for relay WLA.

The reference character SP designates an auxiliary lock relay which is energized by contact 6 when the selector lever is reversed and is held in the energized position by a stick circuit which includes a back contact 52 of relay WLA and a front contact 53 of the relay SP. When the relay SP is in its deenergized condition, a stick circuit is established for winding A2 of relay WLA which includes back contact 56 of relay SP and front contact 48 of relay WLA, and also the control circuit is established for the relay KR which circuit includes front contact 49 of relay WLA and back contact 55 of relay SP. When the relay SP is energized and its front contact 54 becomes closed a circuit is established for the control of the normal magnet N and the reverse magnet R so that magnets N and R may be energized by contacts 7 and 8 actuated by lever H provided relay WLA is deenergized and back points of contacts 50 and 51 on the relay WLA become closed. When the relay WLA is energized the normal and reverse magnets N and R are controlled by polar contact 33 of relay WR through front points of contacts 50 and 51 on relay WLA.

When the lever S is reversed to condition the switch for local operation, relay WLA is deenergized to transfer magnets N and R to control by the lever H, and the relay SP is energized to supply current to contacts 7 and 8 for the operation of the magnets N and R. When the selector lever S is restored to its initial condition, relay WLA becomes energized if the position of the switch is in agreement with the position of the polar armature of relay WR, and if relay WLA is energized, the relay SP becomes deenergized to interrupt the local operating circuit for magnets N and R which circuit cannot be reestablished until selector lever S is again reversed. In the event that the position of the switch and the position of the polar armature of the switch control relay WR are not in agreement when the lever S is returned to its initial condition, the relay WLA will remain deenergized and relay SP will remain energized thereby maintaining switch W by power

in the position to which last operated until such time as the polar armature of relay WR is brought, by manipulation of lever L1, into agreement with the position of the switch. When the switch has been restored to the control of relay WR, a signal may be caused to display a proceed indication for permitting traffic to pass over the switch in the same manner as described for the apparatus shown in Fig. 1.

Referring now to Fig. 5, the relay WLA is controlled in the same manner as shown in Fig. 4, except that the stick circuit for winding A2 is controlled by contact 5A which is closed when lever S is in its normal position and open when lever S is in its reverse position.

The reference character SPA designates an auxiliary lock relay energized by a pick-up circuit which is effective, when contact 6 becomes closed, for placing the operating winding of relay SPA in series with either the normal magnet N or the reverse magnet R, depending upon the position of the lever H, provided relay WLA becomes deenergized upon the reversal of selector lever S.

When the lever S is reversed to condition the switch for local operation, relay WLA is deenergized to transfer the magnets N and R to control by the lever H, and the relay SPA is energized to supply current to contacts 7 and 8 for the operation of the magnets N and R. When the selector lever is restored to its initial condition, relay WLA becomes energized if the position of the switch is in agreement with the position of the polar armature of relay WR, and, if relay WLA is energized, the relay SPA becomes deenergized to interrupt the local operating circuit for magnets N and R which circuit cannot be reestablished until selector lever S is again reversed. In the event that the position of the switch and the position of the polar armature are not in corresponding positions when the lever S is returned to its initial condition, the relay WLA will remain deenergized and relay SPA will remain energized thereby maintaining switch W by power in the position to which last operated until such time as the polar armature of relay WR is brought, by manipulation of lever L1, into agreement with the position of the switch. When the switch has been restored to control by the relay WR, a signal may be caused to indicate proceed for permitting traffic to pass over the switch in the same manner as described for the apparatus shown in Fig. 1.

Referring now to Fig. 6, the relay WLB is controlled in part by contact 4 actuated by lever S and, in addition, is provided with a stick circuit which includes front contact 48A of relay WLB and a pick-up circuit which includes polar contact 33 of relay WR and switch indicating contacts 27 and 28. A unidirectional conductor, such as a copper oxide rectifier RE, is introduced into the pick-up circuit to prevent the false energization of the magnets N and R through switch indicating contacts 27 and 28 when front contact 48A is closed. The stick circuit is required to hold relay WLB in the energized position during the open circuit periods of the pick-up circuit while the contacts 27 and 28 are being moved between their normal and reverse position in response to corresponding movements of the switch W.

The normal and reverse magnets N and R are controlled by polar contact 33 of relay WR if relay WLB is energized so that front points of contacts 39A and 40A on relay WLB are closed, but when relay WLB is deenergized and back points of contacts 39A and 40A on relay WLB become closed, the magnets N and R are controlled by switch

indicating contacts 45 and 46 provided the selector lever S is in its normal position. When the selector lever is in its reverse position, the magnets N and R are placed, by contacts 57 and 58 operated by lever S, under the control of contacts 7 and 8 operated by lever H, provided relay WLB becomes released.

Upon the reversal of the selector lever to condition the switch for local operation, the opening of contact 4 releases relay WLB, thereby opening front contact 49A of relay WLB which deenergized relay KR. The releasing of relay KR energizes lock magnet L by the closing of back contact 32 of relay KR. Since back contacts 39A and 40A of relay WLB are now closed and contacts 57 and 58 are in their reverse positions, the switch W is now under control by lever H. When the lever S is restored to its initial condition, relay WLB becomes energized and is effective if the position of the switch is in agreement with the position of the polar armature of relay WR, to restore the magnets N and R to control by the relay WR. In the event that the position of the switch and the position of the polar armature of the relay WR are not in corresponding positions when the selector lever is restored to its normal position, the relay WLB will remain deenergized thereby connecting normal or reverse magnet N or R to switch indicating contact 45 or 46, depending upon the position of the switch, to maintain switch W by power in the position to which last operated until such time as the polar armature of relay WR is brought by manipulation of lever L1, into agreement with the position of the switch. When the switch is restored to control by the relay WR, a signal may be caused to indicate proceed for permitting traffic to pass over the switch in the same manner as described for the apparatus shown in Fig. 1.

From the foregoing description of the apparatus shown in Figs. 4, 5 and 6, it will be seen that I have provided several other forms of apparatus suitable for safeguarding the local operation, under its own power, of a remotely controlled power operated railway track switch. When the switch is conditioned for local operation, the switch is removed from control by the remotely controlled apparatus and the signal circuits are interrupted to hold the signals in the stop condition. The apparatus further provides for the restoration of the switch to control by the switch control relay only if the position of the switch is in agreement with the position of the polar armature of the switch control relay, with the additional safeguard, that the switch will be maintained by power in the position to which last operated until such a time as the control of the switch is again assumed by the switch control relay. Furthermore, if either approach section is occupied, the switch may not be restored to control by the switch control relay until the expiration of a measured time interval after the selector lever is returned to its normal position. In each of the forms of my invention as illustrated in Figs. 1, 2, 3, 4, 5 and 6, it will be seen that I have provided a reliable and economical means for the local control of a remotely controlled power operated railway track switch, in which, if the selector lever and the local switch operating lever are both in either full normal or full reverse position, the switch is in a safe condition for traffic, regardless of whether the switch is under the control of the switch control relay or under the control of the local switch operating lever. Furthermore,

each form of my invention provides for the restoration of the switch to control by the switch control relay, if and only if traffic conditions adjacent the switch are such as to permit this being done safely, and also provides, when the switch is under the control of the switch control relay, for the display of signal indications to govern the movement of traffic passing over the switch.

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 traffic governing device, mechanism for operating said device, remote controlled apparatus for controlling said mechanism, a circuit controller adjacent said mechanism, a lock relay controlled by a selector lever, and means including said lock relay for transferring said mechanism to control by contacts of said circuit controller.

2. In combination, a railway traffic governing device, a power mechanism for operating said device, remote controlled apparatus for controlling said mechanism, a source of power, means for intermittently supplying power for the operation of said mechanism in accordance with the condition of said remote controlled apparatus, a circuit controller, means for transferring said power mechanism to control by said circuit controller, a lock relay, and means including said lock relay for supplying power continuously to said mechanism as long as the mechanism remains under the control of said circuit controller.

3. In combination, a railway track switch, a normal and a reverse magnet for controlling movements of said switch to normal and reverse positions respectively, remotely controlled means for at times governing said normal and reverse magnets, means local to said switch for at other times governing said normal and reverse magnets, a lock relay, apparatus including said lock relay for selecting between said remote controlled means and said local means, a first contact actuated by said local means, a second contact actuated by said local means, a circuit including said first contact and a contact actuated by said lock relay for said normal magnet, and a circuit including said second contact and a contact actuated by said lock relay for said reverse magnet.

4. In combination, a railway track switch, a mechanism for operating said switch, means controlled from a point remote from said switch for at times governing said mechanism, means local to said switch for at other times governing said mechanisms, a normally energized lock relay, apparatus including said lock relay for selecting between said remote controlled means and said local means, a switch indicating relay for controlling power supply to said mechanism, and a circuit including a front contact of said lock relay for said switch indicating relay.

5. In combination, a railway track switch, a magnet for controlling movement of said switch from one position to another, a polar relay having a contact for energizing said magnet, a circuit controller adjacent the switch, a stick relay having a pick-up winding and a holding winding, means including said stick relay for placing said magnet under control by said circuit controller,

a switch indicating contact closed when said switch is in such other position, a circuit for said pick-up winding including said contact of said polar relay and said switch indicating contact, and a circuit for said holding winding.

6. In combination, a railway track switch, a normal and a reverse magnet for controlling movements of said switch to normal and reverse positions respectively, a polar relay having a normal and a reverse contact for governing said normal and reverse magnets, a circuit controller adjacent said switch, a normally energized stick relay, means including said stick relay for transferring the control of said normal and reverse magnets to said circuit controller, a stick circuit for said stick relay, a pick-up circuit for said stick relay including said normal contact of said polar relay, another pick-up circuit for said stick relay including said reverse contact of said polar relay, and a rectifier introduced into each of said pick-up circuits for preventing the false energization of said normal and reverse magnets.

7. In combination, a railway track switch, a mechanism for operating said switch, means remote from said switch for at times governing said mechanism, means local to said switch for at other times governing said mechanism, a normally energized lock relay, means for deenergizing said lock relay to transfer control of said mechanism to said local means, a normally deenergized auxiliary lock relay, and means for energizing said auxiliary relay to supply current to said local means for governing said mechanism.

8. In combination, a railway track switch, a normal and a reverse magnet for controlling movements of said switch to normal and reverse positions respectively, means remote from said switch for at times governing said normal and reverse magnets, means local to said switch for at other times governing said normal and reverse magnets, a normally energized lock relay, means for deenergizing said lock relay to transfer control of said normal and reverse magnets to said local means, a normally deenergized auxiliary lock relay effective when energized to supply current to said local means, means for energizing

said auxiliary lock relay, and circuits each including a front contact of said auxiliary relay for each of said normal and reverse magnets.

9. In combination, a railway track switch, a normal and a reverse magnet for controlling movements of said switch to normal and reverse positions respectively, means remote from said switch for at times governing said normal and reverse magnets, means local to said switch for at other times governing said normal and reverse magnets, a normally energized lock relay, means for deenergizing said lock relay to transfer control of said normal and reverse magnets to said local means, a normally deenergized auxiliary lock relay effective when energized to supply current to said local means, means for energizing said lock relay, and circuits each including the operating winding of said auxiliary relay for each of said normal and reverse magnets.

10. In combination, a railway track switch, a mechanism for operating said switch, remote controlled means for at times governing said mechanism, means local to said switch for at other times governing said mechanism, a lock relay effective when energized for transferring control of said mechanism to said remote controlled means, an auxiliary lock relay effective when deenergized for disabling said local means, means for deenergizing said auxiliary relay, a pick-up circuit for said lock relay, and a stick circuit for said lock relay including a back contact of said auxiliary relay.

11. In combination, a railway track switch, a normal and a reverse magnet for controlling movements of said switch to normal and reverse positions respectively, means remote from said switch for at times governing said normal and reverse magnets, means local to said switch for at other times governing said normal and reverse magnets, a lock relay, apparatus including said lock relay for selecting between said remote controlled means and said local means, and operating circuits for said normal and reverse magnets governed by said local means and including contacts of said lock relay.

JAMES J. VANHORN.