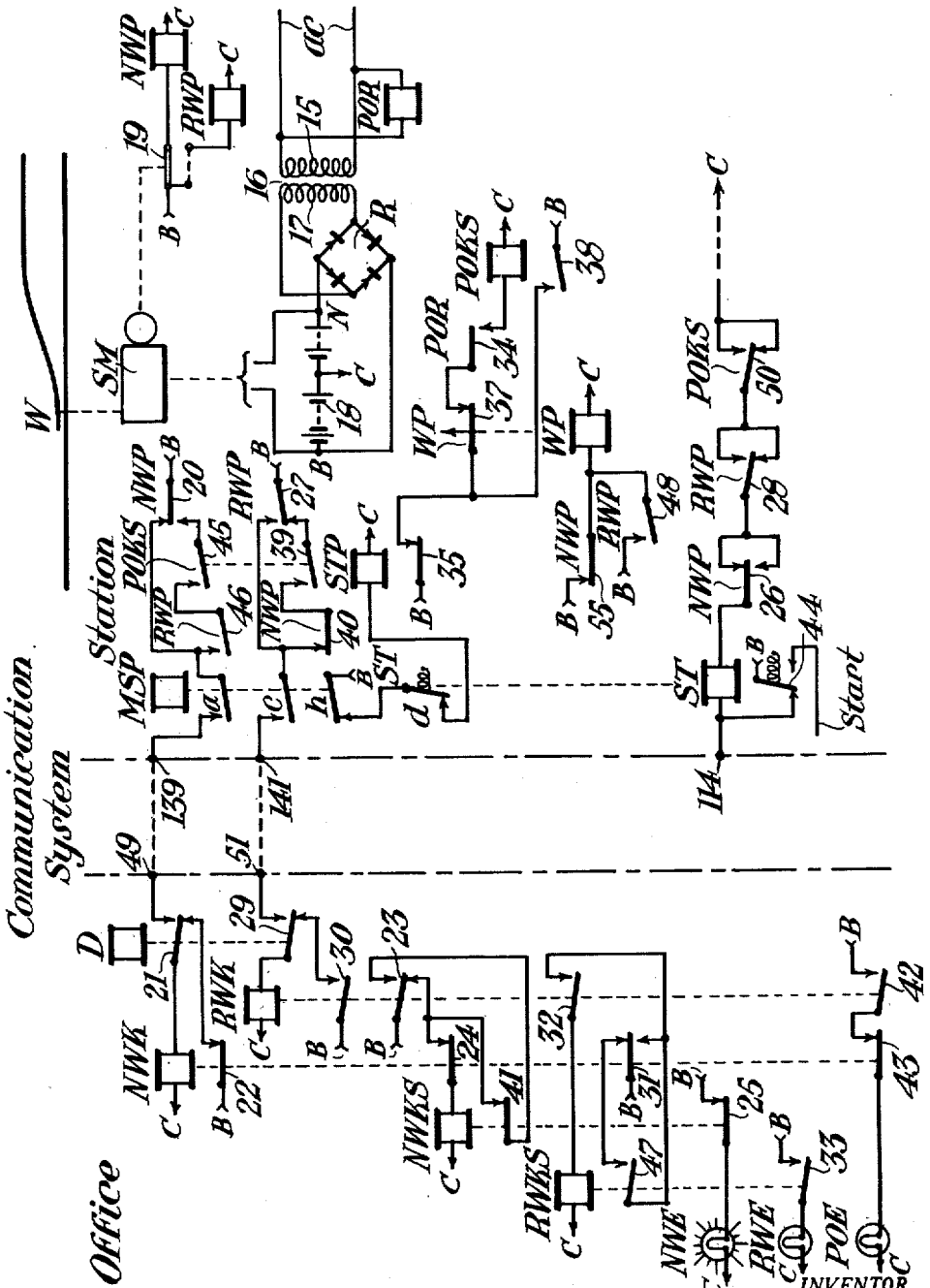
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INDICATING MEANS FOR TRACK SWITCH AND ITS PRIMARY POWER SUPPLY IN REMOTE CONTROL SYSTEMS

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INDICATING MEANS FOR TRACK SWITCH AND ITS PRIMARY POWER SUPPLY IN REMOTE-CONTROL SYSTEMS

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1

My invention relates to remote control systems and more particularly to centralized traffic control systems for railroads, in which traffic governing devices located along a trackway are governed from a control office and the conditions of the devices and associated apparatus are indicated at such office.

In systems of the type described the office is linked with the traffic governing devices along the trackway by means of a communication system which may be either of the direct wire type, or of the code type, one example of the code type comprising a modification of the system of L. V. Lewis United States Patent No. 2,229,249 granted on January 21, 1941, which modification is shown in an application for Letters Patent of the United States Serial No. 496,907, filed July 31, 1943, by A. P. Jackel for Remote control systems, now Patent No. 2,411,375, dated November 19, 1946, and assigned to the assignee of the present invention. The system of the Jackel application is illustrated and described in Manual No. 506–A published October 1943 by the Union Switch & Signal Company.

In a code system of the type mentioned two steps in the indication code are used as channels to indicate three different conditions of a movable device. For example, a track switch is usually indicated over two channels arranged in such manner that one channel indicates whether or not the switch is locked in its normal position, and the other channel indicates whether or not the switch is locked in its reverse position. Thus when the switch is locked in either its normal or its reverse position it provides one character for the code step which indicates that the switch is locked in the corresponding position, and provides a different character for the other code step. When the switch is unlocked by the switch machine, as when the switch points are in transit between extreme positions, the code intervals of the two switch indication steps both have the different character mentioned, to indicate the transit condition. The two steps are capable of indicating a fourth condition if both have the one character referred to, but the switch obviously is not adapted to afford a control which establishes this character for both steps, and the full capacity of the code ordinarily is not utilized.

Means have been proposed heretofore to utilize this fourth condition of the two switch steps to effect an indication at the office reflecting a two-position device at the field. The fourth condition (both switch steps having the one character)

2

may for example, indicate the position of a relay such as a maintainer's call relay, a power-off relay, or other relay repeating a two-position function. A power-off relay, for instance, is arranged to be in one position when power is available at the switch location from a primary source and is in a second position if a power failure from that source occurs. One such system of this nature is shown in an application for Letters Patent of the United States, Serial No. 649,072, filed February 20, 1946, by Ira F. Cadman, now Patent No. 2,460,336, dated February 1, 1949.

My present invention is an improvement on the system shown in the Cadman application, in that whereas in Cadman when the fourth code condition is set up, as by release of the power-off relay to reflect a failure of power, either this fourth condition or the in-transit code only can be transmitted so that only either the in-transit indication, or the power-off indication (but no locked switch indication) is displayed at the office during the period of the power failure, while in accordance with my invention the power-off and switch position indications are simultaneously displayed at the office during the period of a power failure.

In applying my invention to indicate a two-position device, such as the position of a power-off relay, over the two switch steps of a code, I utilize a stick relay to cause transmission of a code whenever a change occurs in the position of the power-off relay, and to establish the fourth code condition whenever the stick relay is picked up. The stick relay is arranged to pick up if the power-off relay reflects a failure of the primary power supply, provided that the track switch is in either locked position, and the stick relay is arranged to remain energized in a stick circuit during the period of a power failure, except that if the switch is operated out of its locked position during this period of power failure, the relay will be released and will pick up again after the switch is again locked up and an indication code has been transmitted reflecting the position of the switch. Two successive codes are therefore transmitted after a change in switch position occurring during a failure of the primary power source, the first code reflecting the position of the switch and the second code having its two switch steps provided with the one character. The usual switch indication relays at the office are each provided with a stick repeater relay, each arranged to pick up over a front contact of the associated indication relay and a back contact of the other indication relay,

so that both stick repeater relays cannot be picked up at the same time, and provided with a stick circuit when both indication relays are picked up. The usual switch indications are controlled by the stick repeater relays, one or the other of which is picked up on an indication code in which only one switch step has the one character, and the special power-off indication is controlled by the two indication relays to indicate power failure whenever both indication relays are picked up.

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

The accompanying drawing is a diagrammatic view illustrating one form of apparatus embodying my invention. In the drawing, contacts of relays are in some cases illustrated remote from the relay controlling the contact, but in each such case the contact is identified by a reference character individual to the contact and by the reference character of the associated relay.

Referring to the drawing, a centralized traffic control system is represented as comprising apparatus at an office and at a station, and a communication system linking the office with the station.

The communication system, which may be of either the direct wire or the code system, is conventionally represented in the drawing as being a code system of the type illustrated in the previously mentioned Jackel application and Manual 506—A. For the purposes of explaining the present invention it is sufficient to state that the communication system provides a number of control channels (not represented in the drawing), and a number of indication channels some of which are represented in the drawing by dash lines, with the wires of each channel designated by reference characters which are the same as those used to designate corresponding wires in the Jackel application. For example, the indication channels 49—139 and 51—141 represent individual code steps of an indication code, and the system functions in the manner explained in the Jackel application so that if one terminal B of a suitable local source of current at the station is connected to wire 139 when an indication code is transmitted, the code will include a step of a particular character corresponding to the energization of channel 49—139, to cause terminal B of a source at the office to be applied to terminal 49. If terminal B is not connected to wire 139 when an indication code is transmitted, the code will include a step of a different character corresponding to the deenergization of channel 49—139, and in such case terminal B at the office is not applied to wire 49. Similarly, if terminal B at the station is connected to wire 141 when an indication code is transmitted, the code will include a step of a particular character corresponding to the energization of channel 51—141 to apply terminal B at the office to wire 51, but if terminal B at the station is disconnected from wire 141 when an indication code is transmitted, the code then includes a step of a different character corresponding to deenergization of channel 51—141.

The apparatus at the office, as indicated in the drawing, includes an office delivery relay D which corresponds to the office delivery relay D of the Jackel application and which is picked up at the office at the end of a complete indication code received from the station, as is explained in detail in the Jackel application, and a normal indication relay NWK and a reverse indication relay RWK selectively picked up according as energy is applied to terminal 49 or 51 at the office when the office delivery relay D is picked up. After relay NWK or RWK is picked up, it is held energized over a stick circuit including its own front contact and a back contact of relay D, when that relay releases at the end of the indication code. Indication stick relays NWKS and RWKS, associated with indication relays NWK and RWK, respectively, are provided at the office and each indication stick relay is provided with a pick-up circuit including in series a front contact of the associated indication relay and a back contact of the other indication relay. Each indication stick relay when picked up closes a front contact to prepare a stick circuit which includes in series front contacts of each of the two indication relays. To visually indicate the position of a track switch at the station, the office is provided with two indication lamps NWE and RWE controlled respectively over front contacts of indication stick relays NWKS and RWKS. An additional indication lamp POE provided at the office when lighted indicates loss of the primary power supply at the station. Lamp POE is controlled over a circuit including in series front contacts 43 and 42 of relays NWK and RWK.

The apparatus at the station includes a track switch W, a power switch operating mechanism SM operatively connected with the switch for operating it between its two extreme (normal and reverse) positions, and a primary source of power indicated conventionally in the drawing by the reference characters *ac*, connected to a primary winding 15 of a transformer 16 having its secondary winding 17 connected to the input terminals of a rectifier R. The output terminals of the rectifier are connected across end terminals B and N of a battery 18, and normally supply rectified current to the battery to maintain it fully charged. Connections from terminals B and N of battery 18 provide energy for operating the motor of switch machine SM for switch W, and connections to terminals B and C of battery 18 provide energy for operating other apparatus at the switch location. The supply of energy from battery 18 to the motor of switch machine SM is governed by suitable apparatus, not illustrated but which may correspond to that shown in the Jackel application, controlled by the communication system so as to establish control of the operation of switch W from the office. Switch repeating relays NWP and RWP are provided at the station to indicate the position of track switch W. These relays are selectively energized over a contact 19 operated by switch mechanism SM, provided switch W is locked in its normal or reverse position, respectively. The relays NWP and RWP govern the transmission of switch indication codes from the station to the office in the customary manner. That is to say, relay NWP when picked up prepares a circuit for connecting terminal B at front contact 20 of relay NWP to wire 139; while relay RWP when picked up prepares a circuit for connecting terminal B at front contact 21 of relay RWP to wire 141. The connection of terminal B to wire 139 or 141, as the case may be, is completed when a relay MSP, hereinafter referred to, picks up to close its contacts *a* and *c* during the transmission of an indication code to the office. The relays NWP and RWP also control a slow pick-up repeater relay WP arranged to be energized whenever front contact 55 of relay NWP or front contact 48 of

relay RWP is closed. Relay WP when picked up indicates that switch W is locked either in its normal or its reverse position.

A power-off relay POR connected across primary winding 15 of transformer 16 indicates the continuity of power from source *ac* and is held energized so long as power is available from the alternating current source. Relay POR controls a stick repeater relay POKS over a circuit traced hereinafter, and relay POKS governs the transmission of an indication controlling the power-off lamp POE at the office. The provision of this indication is of particular advantage in connection with a power operated track switch, because in the event of a power failure it enables the operator to call the maintainer promptly, usually over the communication system, and thereby facilitates the correction of the fault and restoration of the power supply before switch battery 18 is fully discharged.

The indication codes are initiated at the station in the manner explained in the Jackel application by the release of a normally energized station starting relay ST corresponding to the similarly designated relay in the application. Relay ST is normally held energized over a stick circuit extending from terminal B at contact 44 of relay ST through the winding of relay ST and then over a front or a back contact of each of the several indicating relays, in series, to terminal C. As shown, the circuit of relay ST includes a contact of each of the switch repeating relays NWP and RWP and a contact of relay POKS, but it is to be understood that this circuit includes additional contacts of other indication relays, such as shown in the Jackel application.

Relay ST is provided with a repeater relay STP normally energized over a circuit from terminal B at back contact *h* of relay MSP, through contact *d* of relay ST and the winding of relay STP to terminal C. Relay MSP corresponds to the similarly designated relay in the Jackel application and as explained in that application is picked up on the code step corresponding to the last digit of the code call portion of an indication code, remaining picked up until the end of such code. Relay STP is deenergized immediately when relay ST releases, and becomes reenergized only after relay ST becomes energized and relay MSP is released.

Relays STP, WP and POR cooperate in controlling relay POKS in such a manner as to pick up the latter relay upon release of relay POR provided that relay WP is picked up (to indicate switch W is locked in one extreme position or the other) and relay STP is energized to indicate that the apparatus at the station is not in a transmitting condition. Under the conditions assumed, relay POKS is energized over a circuit extending from terminal B at front contact 35 of relay STP, through front contact 37 of relay WP, back contact 34 of relay POR and the winding of relay POKS to terminal C. Relay POKS when picked up closes its front contact 38 to complete a stick circuit including that front contact, and front contacts 37 and 34 of relays WP and POR, which stick circuit holds relay POKS picked up should relay STP release to open front contact 35 in the first traced circuit for relay POKS.

The condition of the apparatus, as shown, is that obtaining when switch W has been operated to its normal position and power is available from source *ac* at the station. At the office,

normal indication relay NWK is energized over its stick circuit extending from terminal B at its front contact 22 over back contact 21 of relay D and the winding of relay NWK to terminal C; indication stick relay NWKS is energized over its circuit extending from terminal B at back contact 23 of relay RWK through front contact 24 of relay NWK and the winding of relay NWKS to terminal C; and normal switch indication lamp NWE is energized over a circuit including front contact 25 of relay NWKS.

At the station, switch W is in its normal position; normal switch repeating relay NWP is energized over contact 19 operated by switch mechanism SM, in its normal position; and relay POR is energized.

The apparatus at the station operates in the usual manner to reflect a change in position of track switch W. For example, if the switch machine is controlled over the communication system to cause switch W to operate from its normal to its reverse position, the switch machine functions in the usual manner so that initial movement of the mechanism as it unlocks the switch points to permit them to be moved to the reverse position, results in opening contact 19 of the mechanism in the circuit or relay NWP whereupon that relay releases. Front contact 26 of relay NWP opens to interrupt the stick circuit of starting relay ST. Relay ST is a quick-acting relay which releases prior to the closing of back contact 26 of relay NWP to prepare another circuit for relay ST, and the release of relay ST initiates the transmission of an indication code to the office, in the manner explained in the Jackel application. When relay MSP picks up on the code step corresponding to the last digit of the code call, it finds both relays NWP and RWP released so that terminal B is applied to neither wire 139 or 141. As a result, both switch indication channels in this code are deenergized and when relay D picks up at the office, the stick circuit of relay NWK is interrupted so that relay NWK releases. This interrupts the circuit of relay NWKS which releases to deenergize lamp NWE. With both lamps NWE and RWE dark at the office, an indication is provided of the unlocked or transit condition of the switch. At the end of the complete indication code initiated by releases of relay NWP, relay ST becomes energized in the manner explained in the Jackel application by virtue of the application of terminal B to wire 114 to complete a pick-up circuit for relay ST through back contact 26 of relay NWP, and relay ST thereupon closes its normal contact 44 to recomplete its stick circuit which holds relay ST energized following the interruption of its pick-up circuit in the manner set forth in the Jackel application.

When the switch reaches and is locked in its reverse position, relay RWP is energized over contact 19 of mechanism SM closed in the reverse locked position of the switch. The picking up of relay RWP deenergizes relay ST to transmit an indication code indicating that the switch is locked reverse. In this instance, when relay MSP picks up during the indication code, wire 141 is connected to terminal B over front contact 27 of relay RWP so that when relay D at the office is operated, relay RWK picks up. Relay RWK in turn energizes relay RWKS to cause reverse switch indication lamp RWE to become lighted over front contact 33 of relay RWKS.

The apparatus functions to indicate operation

of switch W from its reverse to its normal position in a similar manner, as will be readily understood.

It will now be assumed that a failure of the A. C. power supply occurs during a time when the station apparatus is not in a transmitting condition and the switch is locked normal or reverse as indicated by the lighting of lamp NWE or RWE. Due to the loss of the A. C. power, relay POR releases to close its back contact 34, and relay POKS becomes energized to interrupt at its back contact 50 the energizing circuit for relay ST, so that an indication code is initiated. Under the conditions assumed, both switch indication channels of the indication code are energized, the one channel over a front contact of the energized switch repeater relay, and the other channel over a back contact of the deenergized switch repeater relay and a front contact of relays POKS. If the switch is in its normal position so that relay NWP is energized at this time, terminal B at front contact 20 is connected to wire 139 when relay MSP picks up during the code; and terminal B at back contact 27 of relay RWP is connected to wire 141 over front contact 39 of relay POKS and front contact 40 of relay NWP. On the other hand, if the power fails when switch W is in its reverse position so that relay RWP is picked up, terminal B is connected over front contact 27 to wire 141; while terminal B at back contact 20 of relay NWK is connected to wire 139 over front contact 45 of relay POKS and front contact 46 of relay RWP. It follows that if the alternating current source of power should fail when the station is not transmitting and the switch is locked in either its normal or reverse position, channels 48—139 and 51—141 are both energized so that both indication relays NWK and RWK at the office are picked up by the indication code, and a circuit is closed including front contact 43 of relay NWK and front contact 42 of relay RWK for indication lamp POE which thereupon becomes lighted to indicate a failure of power at the station. Also, the stick circuit is completed for the one of the indication stick relays that is energized at this time to reflect the position of switch W at the station. For example, if switch W is locked in its normal position when the power fails, relay NWKS at the office is picked up to reflect this position of the switch, and when both relays NWK and RWK pick up in response to the power-off indication code, relay NWKS is maintained energized over its stick circuit passing from terminal B at front contact 23 of relay RWK, through front contact 41 of relay NWKS, front contact 24 of relay NWK and the winding of relay NWKS to terminal C. Relay NWKS accordingly is retained energized at this time to maintain lamp NWE energized to indicate that switch W is in its normal position. If switch W is in its reverse position when the power fails, relay RWKS at the office is picked up, and when both indication relays RWK and NKS are picked up by the power-off code, relay RWKS is retained energized over its stick circuit extending from terminal B at front contact 31 of relay NWK, through front contact 47 of relay RWKS, front contact 32 of relay RWK and the winding of relay RWKS to terminal C. Lamp RWE is therefore maintained energized to indicate the reverse position of switch W.

The relays NWK and RWK are retained energized over their respective stick circuits when relay D releases following the completion of the code which transmits the power-off indication;

and the particular indication stick relay that is energized to reflect the position of switch W is likewise energized over its stick circuit. It is apparent therefore that the power-off indication lamp POE and either lamp NWE or RWE will be maintained energized following receipt of the power-off indication, to indicate failure of power at the switch location and to indicate the position of the switch. These two indications will be maintained so long as the position of the switch is not changed and the power failure is not corrected. Upon correction of the power failure, relay POR immediately picks up at the station to deenergize relay POKS at back contact 34 of relay POR, and relay POKS releases to open the circuit of starting relay ST at front contact 50, thereby initiating transmission of an indication code to the office. When relay MSP picks up during this code, terminal B is applied to wire 139 or 141 over a front contact of relay NWP or RWP, respectively, but terminal B at the back contact of one of the switch repeater relays is disconnected from the other wire because of the opening of the front contacts of relay POKS. The code transmitted under these conditions therefore reflects only the position of the switch, and causes the corresponding switch indication relay at the office to be energized and the other switch indication relay to be deenergized. The switch indication lamp NWE or RWE will be energized, but lamp POE becomes dark with only one indication relay picked up, so that the position of the switch is indicated while the power off indication is cancelled to reflect the restoration of power to the primary source.

It will next be assumed that a failure of the A. C. power occurs when the switch is in transit. In this case relay WP is released because both relays NWP and RWP are released with the switch in transit, and as a result relay WP holds open its front contact 37 in the circuit of relay POKS so that the latter relay does not become energized when back contact 34 of relay POR closes as a result of the power failure. No interruption of the circuit of starting relay ST results from the release of relay POR at this time so that this action does not effect the initiation of an indication code at the office. Operation of the switch will of course be continued under these conditions by current supplied from battery 18, and as soon as the switch completes its movement and is locked in either extreme position by the switch machine, two successive indication codes will be transmitted from the station to the office, the first indication code including a step corresponding to the locked position of the switch and the second indication code including two steps corresponding to the power-off indication. If the switch is being operated from its normal to its reverse position when the power failure occurs, relay RWP will pick up as soon as switch W is locked in its reverse position, and back contact 28 of relay RWP opens to interrupt the circuit of starting relay ST to initiate an indication code. The release of relay ST causes the release of repeater relay STP and front contact 35 of the latter relay opens prior to the time that front contact 37 of relay WP closes at the end of the slow pick-up interval of relay WP following the closing of contact 48 of relay RWP in the circuit of relay WP. At this time, therefore, relay POKS remains released and the code that is transmitted from the station to the office reflects the connection of terminal B at front contact 27 of relay RWP to wire 141, causing relay RWK at the office to pick up and energize relay RWKS

which in turn energizes lamp RWE to cause the display of the reverse position indication of switch W. At the completion of the indication code initiated by the picking up of relay RWP, relay ST becomes reenergized in the manner explained in the Jackel application and relay STP picks up to close its front contact **35** in the circuit of relay POKS. The latter relay picks up and opens its back contact **50** in the circuit of relay ST, deenergizing that relay to initiate another indication code. Front contact **38** of relay POKS is closed to hold that relay energized upon release of relay STP, and front contacts **39** and **45** of relay POKS also are closed in the circuits for wires **139** and **141**. The indication code transmitted under these conditions reflects the energization of wire **141** over front contact **27** of relay RWP, and the energization of wire **139** over back contact **20** of relay NWP, front contact **45** of relay POKS, and front contact **46** of relay RWP, so that both relays NWK and RWK become energized at the office. This results in holding relay RWKS energized over its stick circuit, to maintain the energization of lamp RWE, and in the energization of lamp POE over front contacts **42** and **43** of relays RWK and NWK, respectively.

The apparatus operates in a correspondingly similar manner to cause lamps NWE and POE to become successively energized if the power should fail when switch W is being operated from its reverse to its normal position, as will be readily understood.

It may happen that operation of switch W is required during an interval when no power is available from the primary source, as indicated by the illumination of lamp POE. Such operation may be effected from the office over the communication system by energy furnished from battery **18**, and the operation of switch W under these conditions will be reflected by the apparatus. The initial unlocking movement of switch mechanism SM will result in the release of the particular switch repeater relay NWP or RWP, as the case may be, that was energized in the locked position from which the switch is being operated. This action results in the initiation of a transit switch indication code, in which both switch steps are deenergized because both switch repeater relays are released, and as a result both relays NWK and RWK at the office are released to release in turn the stick indication relay corresponding to the particular repeater relay that became released upon initial movement of the switch machine, and to deenergize both of the switch indication lamps and the power-off indication lamp POE. Relay WP at the station also is released upon initial movement of the switch machine as reflected by a release of one of the switch repeater relays, and relay WP in turn causes relays POKS to release at a time when the switch is in a transit condition as reflected by switch repeater relays NWP and RWP. It follows that when switch W reaches and is locked in its new position, the apparatus will operate to transmit two successive codes in a manner similar to that, explained in detail hereinbefore, obtaining when the power failure occurs during a transit condition of the switch. The first code transmitted reflects the new position of the switch and is initiated by the picking up of one of the two switch repeater relays, while the second code reflects the reenergization of relay POKS resulting when relay STP closes its front contact **35** following the completion of the first indication code. The apparatus therefore functions to reflect any change in the position of the switch occurring during a power outage, and to indicate such power outage when the switch is locked in either extreme position.

An important advantage of my invention is that an additional indication of utility in maintaining a power operated track switch is provided by making use of the two indication steps normally provided for indicating the condition of the switch. The additional indication affords information relating to the presence or absence of power from a primary source, and is effective to provide this information when the switch is locked in an extreme position, thus enabling the operator to know whether a proposed operation will be effected by energy from the primary source or from the switch battery. The additional indication is provided in a manner which assures that the switch indication will always reflect the position of the switch in the field and permits a change of position of the switch during the period of a power outage to be reflected by the usual switch indication lamps.

Although I have herein shown and described only one form of remote control system embodying my invention, it is to be 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 a remote control system, a first movable device having a first and a second and an intermediate position, a first relay picked up only when said first device is in its said first position, a second relay picked up only when said first device is in its said second position, a second movable device having a normal and an operated position, a third relay picked up only when said second device is in its said operated position and either said first or said second relay is picked up, an office, a communication system linking said office with said first and second devices and including two indication channels, indication means at said office controlled by said two channels for distinctively indicating the positions of said first and second devices, and means controlled by said first and second and third relays for controlling said indication channels to cause said indication means selectively to reflect the positions of said first and second devices.

2. In a remote control system, a first movable device having a first and a second and an intermediate position, a first relay picked up only when said first device is in its said first position, a second relay picked up only when said first device is in its said second position, a second movable device having a normal and an operated position, a third relay picked up only when said second device is in its said operated position and either said first or said second relay is picked up, an office, a communication system linking said office with said first and second devices and including two indication channels, indication means at said office controlled by said two channels for distinctively indicating the three positions of said first device and the operated position of said second device, and means controlled by said first and second and third relays for controlling said indication channels to cause said indication means selectively to reflect the positions of said first and second devices.

3. In a remote control system, an office and a

station, a first movable device at said station having a first and a second and an intermediate position, a second movable device at said station having a normal and an operated position, a communication system linking said office with said station and provided with two indication channels over which code elements having one character or another may be transmitted, means for controlling said communication system by said first device so that the code element transmitted over one of said channels has one character or another depending upon whether or not said first device is in its said first position and that transmitted over the second channel has one character or another depending upon whether or not said first device is in its said second position, means for controlling said communication system jointly by said first device and said second device when in its operated position so that the code elements of both of said channels have said one character, a first means at said office for indicating the position of said first device and a second means at said office for indicating the position of said second device, and means controlled by the characters transmitted over said channels for controlling said first means when at least one of said code elements has said other character and for maintaining such control over said first means and additionally said second means when both of said code elements have said one character.

4. In combination with a power operated railway track switch, a source of current for operating said switch, a power-off relay for said source, a repeater relay for said power-off relay operable from a normal to an operated position by said power-off relay when said switch occupies either its locked normal or locked reverse position, an office, a communication system linking said office with said switch and provided with two indication channels over which code elements having one character or another may be transmitted, means controlled by said switch when said power-off relay indicates presence of power in said source for controlling said communication system so that the code element transmitted over one channel has one character or another depending upon whether or not said switch is in its locked normal position and that transmitted over the other channel has one character or another depending upon whether or not said switch is in its locked reverse position, means controlled by said switch and by said repeater relay in its said operated position for controlling said communication system so that the elements transmitted over both of said channels have said one character, a first means at said office for indicating the position of said switch and a second means at said office for indicating the power-off condition of said source, and means controlled by the character of the code elements transmitted over said channels for controlling said first means when at least one of said elements has said other character and for maintaining such control over said first means and additionally controlling said second means when both said elements have said one character.

5. In combination with a power operated railway track switch, a normal and a reverse indication relay at a control office, two stick relays one for each indication relay, a communication system linking said switch location with said office and providing two indication channels, one for energizing said normal indication relay and the other for energizing said reverse indication relay, a power-off relay normally energized from the primary source of power at the switch location, means controlled by said power-off relay when released provided said switch is in either its normal or reverse position for controlling said two indication channels to energize both of said indication relays, means controlled by said switch when said power-off relay is picked up for controlling said two indication channels to energize the indication relay corresponding to the position of said switch, means controlled by each indication relay when picked up for picking up its associated stick relay provided the other indication relay is then released, means controlled by each stick relay when picked up for preparing a stick circuit completed when both indication relays are picked up, a normal and a reverse indication lamp each having a circuit including a front contact of the stick relay for the corresponding indication relay, and a power-off indication lamp having a circuit including in series front contacts of both indication relays.

6. In combination with a power operated railway track switch having a normal and a reverse and an intermediate position, a normal and a reverse indication relay at a control office, two stick repeater relays one for each indication relay, a communication system linking said switch location with said office and providing two indication channels one for each indication relay over which code elements may be transmitted for energizing the associated indication relay, a starting relay for said system having a normal position and an operated position in which it initiates transmission of code elements over said channels, means controlled by said switch upon operation of said starting relay for energizing the normal or reverse indication relay over its channel according as the track switch is locked in the corresponding normal or reverse position, a source of power at said switch location, a power-off relay deriving its energization from said source of power, control means governed by said power-off relay when released provided said switch is in its said normal or reverse position and said starting relay is in its said normal position effective upon operation of said starting relay for controlling said two indication channels to energize both of said indication relays, means effective upon a change of position of said switch or said control means for operating said starting relay from its normal to its operated position, means controlled by each indication relay when picked up for picking up its associated stick relay provided the other indication relay is then released, means controlled by each stick relay when picked up for preparing a stick circuit completed when both indication relays pick up, and means at said office for simultaneously indicating the condition of said indication and said stick relays.

7. In combination with a power operated railway track switch having a normal and a reverse and an intermediate position, a slow pick-up relay energized whenever said switch is in its normal or reverse position, a normal and a reverse indication relay at a control office, two stick relays one for each indication relay, a communication system linking said switch location with said office and providing two indication channels one for each indication relay over each of which code elements may be transmitted for energizing the associated indication relay, a starting relay for said system having a normal and an operated position in which it initiates transmission of code elements over said channels, a source of power at said switch location, a power-off relay connected across said source and released upon failure of power, a

control relay provided with a pick-up circuit completed upon release of said power-off relay provided said slow pick-up relay is picked up and said starting relay is in its normal position, a stick circuit for said control relay including its own front contact and when completed remaining so as long as said power-off relay remains released and said slow pick-up relay remains picked up, means for operating said starting relay to its operated position upon a change in position of said switch or said control relay, means for controlling said communication system by said switch and said control relay so that upon operation of said starting relay to its operated position when said control relay is released the normal or reverse indication relay is energized over its channel according as said switch is in its normal or reverse position and when said control relay is picked up both said indication relays are energized, means controlled by each indication relay when energized for picking up its associated stick relay provided the other indication relay is then released, means controlled by each stick relay when picked up for preparing a stick circuit completed when both of said indication relays pick up, and means at said office for simultaneously indicating the condition of said indication and stick relays.

8. In combination with a power operated railway track switch having a normal and a reverse and an intermediate position, a slow pick-up relay energized whenever said switch is in its normal or reverse position, a normal and a reverse indication relay at a control office, two stick relays one for each indication relay, a communication system linking said switch location with said office and providing two indication channels one for each indication relay over each of which code elements may be transmitted for energizing the associated indication relay, a starting relay for said system having a normal and an operated position in which it initiates transmission of code elements over said channels, a source of power at said switch location, a power-off relay connected across said source and released upon failure of power, a control relay provided with a pick-up circuit completed upon release of said power-off relay provided said slow pick-up relay is picked up and said starting relay is in its normal position, a stick circuit for said control relay including its own front contact and when completed remaining so as long as said power-off relay remains released and said slow pick-up relay remains picked up, means for operating said starting relay to its operated position upon a change in position of said switch or said control relay, means for controlling said communication system by said switch and said control relay so that upon operation of said starting relay to its operated position when said control relay is released the normal or reverse indication relay is energized over its channel according as said switch is in its normal or reverse position and when said control relay is picked up both said indication relays are energized, said indication relays each arranged so that when energized by a code it remains energized until transmission of another code, means controlled by each indication relay when energized for picking up its associated stick relay provided the other indication relay is then released, means controlled by each stick relay when picked up for preparing a stick circuit completed when both of said indication relays pick up, and means at said office controlled by said stick relays for indicating the position of said switch and controlled by said indication relays to indicate also the failure of power at said source.

9. In combination with a power operated railway track switch having a normal and a reverse and an intermediate position, a control office, a communication system linking said control office with the switch location and providing two indication channels over each of which code elements having one character or another may be transmitted, a starting relay for said system having a normal position and an operated position in which it initiates transmission of code elements over said channels, a source of power at said switch location for supplying energy for power operation of said switch, a power-off relay deriving its energization from said source of power, control means operated from a normal to another position by release of said power-off relay provided said switch occupies its normal or reverse position and said starting relay is in its normal position, means for operating said starting relay from its normal to its operated position upon a change of position of said switch or said control means, means effective upon initiation of code by said starting relay for controlling said communication system by said switch provided said control means is in the normal position so that depending upon whether or not said switch is in its normal position the code element transmitted over one channel has said one character or the other and that transmitted over the other channel has said one character or the other depending upon whether or not said switch is in its reverse position and when said control means is in its said other position the code elements transmitted over the two channels both have said one character, a first indication means at said office for indicating the position of said switch and a second indication means at said office for reflecting the position of said power-off relay, and means controlled by said code elements when at least one has said other character for controlling said first indication means and effective to maintain such control over said first indication means and additionally control said second indication means when both said code elements have said one character.

10. In combination with a power operated railway track switch having a normal and a reverse and an intermediate position, a control office, a communicating system linking said control office with the switch location and providing two indication channels over each of which code elements having one character or another may be transmitted, a starting relay for said system having a normal position and an operated position in which it initiates transmission of code elements over said channels, a source of power at said switch location for supplying energy for power operation of said switch, a power-off relay deriving its energization from said source of power, a control relay provided with a pick-up circuit completed when said power-off relay releases provided said switch occupies either its normal or reverse position and said starting relay is in its normal position, a stick circuit for said control relay completed so long as said power-off relay remains released and said switch remains in either its normal or its reverse position, means for operating said starting relay from its normal to its operated position upon a change of position of said switch or said control relay, means effective upon initiation of code by said starting relay for controlling said communication system by said switch provided said control relay is in the normal position so that when the switch is in its normal

position the code element transmitted over one channel has said one character and that transmitted over the other channel has said other character and when the switch is in its reverse position the code element transmitted over said one channel has said other character and that transmitted over said other channel has said one character and when said control relay is in its said other position the code elements transmitted over the two channels both have said one character, a first indication means at said office for indicating the position of said switch and a second indication means at said office for indicating the position of said control relay, and means controlled by said code elements when at least one has said other character for controlling said first indication means and effective to maintain such control over said first indication means and additionally control said second indication means when both said code elements have said one character.

11. In combination with a power operated railway track switch having a normal and a reverse and an intermediate position, a control office, a communication system linking said control office with the switch location and providing two indication channels over each of which code elements having one character or another may be transmitted, a starting relay for said system having a normal position and an operated position in which it initiates transmission of code elements over said channels, a source of power at said switch location for supplying energy for power operation of said switch, a power-off relay deriving its energization from said source of power, a control relay provided with a pick-up circuit completed when said power-off relay releases provided said switch occupies either its normal or reverse position and said starting relay is in its normal position, a stick circuit for said control relay completed so long as said power-off relay remains released and said switch remains in either its normal or its reverse position, means for operating said starting relay from its normal to its operated position upon a change of position of said switch or said control relay, means effective upon initiation of code by said starting relay for controlling said communication system by said switch when said control relay is released so that the code element transmitted over one channel has one character or the other depending upon whether or not said switch is in its normal position and that transmitted over the other channel has one character or the other depending upon whether or not said switch is in its reverse position, means controlled by said switch when said control relay is picked up and said starting relay is operated for controlling said communication system so the elements transmitted over both of said channels have said one character, a first indication means at said office for reflecting the position of said switch and a second indication means at said office for reflecting the position of said control relay, and means controlled by the character of the code transmitted over said channels for controlling said first means when at least one of said elements has said other character and effective to maintain such control over said first indication means and additionally control said second indication means when both said elements have said one character.

12. In combination with a power operated railway track switch having a normal and a reverse and an intermediate position, a control office, a communication system linking said control office with the switch location and providing two indication channels over each of which code elements having one character or another may be transmitted, a starting relay for said system having a normal position and an operated position in which it initiates transmission of code elements over said channels, a source of power at said switch location for supplying energy for power operation of said switch, a power-off relay deriving its energization from said source of power, a control relay provided with a pick-up circuit completed when said power-off relay releases provided said switch occupies either its normal or reverse position and said starting relay is in its normal position, a stick circuit for said control relay completed so long as said power-off relay remains released and said switch remains in either its normal or its reverse position, means for operating said starting relay from its normal to its operated position upon a change of position of said switch or said control relay, means effective upon initiation of code by said starting relay for controlling said communication system by said switch when said control relay is released so that the code element transmitted over one channel has one character or the other depending upon whether or not said switch is in its normal position and that transmitted over the other channel has one character or the other depending upon whether or not said switch is in its reverse position, means controlled by said switch when said control relay is picked up and said starting relay is operated for controlling said communication system so the elements transmitted over both of said channels have said one character, an indication relay at said office for each of said channels arranged to be energized only when its associated channel transmits a code element of said one character and when so energized retained energized until transmission of another code, two stick relays one for each indication relay, means controlled by each indication relay when energized for picking up its associated stick relay provided the other indication relay is released, a stick circuit for each stick relay including its own front contact and front contacts of each of said indication relays, and means controlled by said stick relays for indicating at said office the position of said switch and means controlled by said indication relays for indicating at said office absence of power at said source, said absence of power indication when effective being displayed simultaneously with said switch position indication.

13. In combination with a power operated railway track switch having a normal and a reverse and an intermediate position, a slow pick-up relay energized whenever said switch occupies either its normal or its reverse position, a control office, a communication system linking said control office with the switch location and providing two indication channels over each of which code elements having one character or another may be transmitted, a starting relay for said system having a normal position and an operated position in which it initiates transmission of code elements over said channels, a source of power at said switch location for supplying energy for power operation of said switch, a power-off relay deriving its energization from said source of power, a control relay provided with a pick-up circuit completed when said power-off relay releases provided said slow pick-up relay is picked up and said starting relay is in its normal position, a stick circuit for said control relay completed so long as said power-off relay remains released and said slow pick-up relay remains

picked up, means for operating said starting relay from its normal to its operated position upon a change of position of said switch or said control relay, means effective upon initiation of code by said starting relay for controlling said communication system by said switch when said control relay is released so that the code element transmitted over one channel has one character or the other depending upon whether or not said switch is in its normal position and that transmitted over the other channel has one character or the other depending upon whether or not said switch is in its reverse position, means controlled by said switch when said control relay is picked up and said starting relay is operated for controlling said communication system so the elements transmitted over both of said channels have said one character, an indication relay at said office for each of said channels arranged to be energized only when its associated channel transmits a code element of said one character and when so energized retained energized until transmission of another code, two stick relays one for each indication relay, means controlled by each indication

relay when energized for picking up its associated stick relay provided the other indication relay is released, a stick circuit for each stick relay including its own front contact and front contacts of each of said indication relays, and means controlled by said stick relays for indicating at said office the position of said switch and means controlled by said indication relays for indicating at said office absence of power at said source, said absence of power indication when effective being displayed simultaneously with said switch position indication.

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