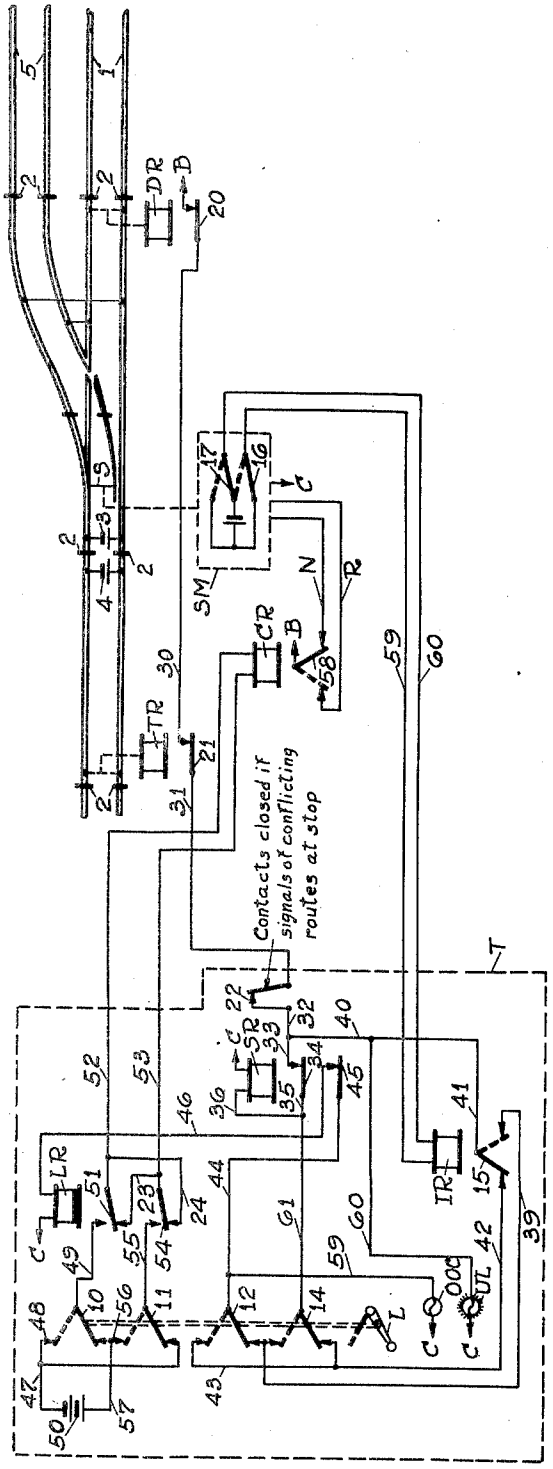
April 5, 1932. A. LANGDON 1,852,421

INTERLOCKING SYSTEM FOR RAILROADS

Filed July 11, 1930



INVENTOR
A. Langdon,
BY Neil W. Preston,
his ATTORNEY

Patented Apr. 5, 1932 1,852,421

UNITED STATES PATENT OFFICE

ANDREW LANGDON, OF ROCHESTER, NEW YORK, ASSIGNOR TO GENERAL RAILWAY SIGNAL COMPANY, OF ROCHESTER, NEW YORK

INTERLOCKING SYSTEM FOR RAILROADS

Application filed July 11, 1930. Serial No. 467,233.

This invention relates to manually controlled power operated interlocking systems for railroads, and more particularly to a system of remote control for a power operated switch machine and its associated interlocking.

In interlocking systems of the mechanically interlocked lever type, and in types of systems in which the levers are locked by suitable approach locking or detector locking means, the operator is of course not able under unsafe conditions to move the lever, and for that reason cannot tentatively set up an operating condition which may later become effective due to the clearing up of the conditions which formerly locked the lever. In other words, in systems such as just mentioned, the operator cannot initiate a control until it is proper for such control to become effective. In accordance with the present invention it is proposed to leave the levers free and unlocked at all times, and in order to provide the necessary interlocking and approach or detector locking, such as may be required to carry out such interlocking electrically and irrespective of movement of the lever, it is proposed to provide simple electrical means for effecting such approach and detector locking control, which requires movement of the control lever con-currently with favorable approach and detector locking conditions, and this is carried out without manually restraining the movement of the control lever.

Another object of the present invention is to provide a simple and novel organization of parts and circuits to obtain the necessary and desirable indications, such as means for indicating the electrically unlocked condition of the lever, and the out of correspondence condition of the lever with respect to the distant traffic controlling device it controls, as well as other suitable means for preventing the control of the traffic controlling devices under unsafe conditions or by the application of unauthorized current.

More specifically it is proposed to control the distant traffic controlling device, such as a switch machine, through the medium of a snap action or stick type relay, and to provide suitable means which permit such switch machine to be controlled by the associated lever only under proper approach traffic and route conditions, including suitable means for preventing operation of such switch machine even though route conditions and approach conditions clear up and the operator has left the lever in such operated position, and to render said suitable means inactive as soon as the distant traffic controlling device or switch machine has assumed a position corresponding to that of the lever for controlling the same.

Other objects, purposes and characteristic features of the present invention will in part be obvious from the accompanying drawing and will in part be more specifically pointed out hereinafter.

In describing the invention in detail reference will be made to the accompanying drawing, in which the portion in the dotted rectangle represents the apparatus located in the interlocking tower, and the remaining apparatus illustrated is located at a distant track switch on the railway system.

Structure

Referring to the drawing, the track rails 1 of a railway system have been shown divided into blocks by insulating joints 2, to provide the usual track circuits, of which the detector track circuit having the track relay DR and a track battery 3 and the approach section having the track relay TR and a track battery 4 only have been shown. The siding or diverging route has been indicated by track rails 5 connected to the main track through the medium of the track switch S, which track switch is operated by a switch machine SM. The switch machine SM is controlled by the snap action, or stick type, relay CR, which relay after it is operated to one of its operated positions remains there until it is electrically or manually operated to the other position, even though it is de-energized in the mean time.

In the interlocking tower, conventionally shown by the dotted rectangle T, is located a lever L having pole changer contacts 10—11 and 12—14, of which the contacts 10 and 11 control the flow of current to the polar control

relay CR, and of which the pole changer contacts 12 and 14 in cooperation with the polar contact 15 of the indicating relay IR, manifest whether or not the lever L is in correspondence with or out of correspondence with the distant traffic control device, or switch machine SM, this because the indicating relay IR is controlled by pole changer contacts 16—17 associated with the track switch S and the switch machine SM, whereby the relay IR will assume one polar position namely the full-line position when the switch S assumes the main track fully locked position and will assume the other polar position namely the dotted position when this track switch S assumes the take-siding locked-up condition.

Associated with the lever L in the tower T is also a stick relay SR, which relay can only be picked up when the lever L is in correspondence with the switch machine SM and with approach conditions manifested by the contact 20 of the track relay DR and the contact 21 of the track relay TR are closed, and with the contacts 22 closed manifesting that all of the conflicting signals are at stop, and this stick relay SR when once picked up will only remain up so long as said contacts 20, 21 and 22 remain closed.

The tower apparatus also includes a lock relay LR which is normally deenergized and normally short circuits the control relay CR through the shunting wires 23 and 24. This lock relay LR can only be picked up when the stick relay SR is energized and the lever L is out of correspondence with the distant traffic controlling device or switch machine SM as manifested through the indicating relay IR. There are also provide two indicating lamps for each of the levers L, the lamp OOC of which indicates when illuminated that the lever L is out of correspondence with the distant traffic controlling device, and the lamp UL of which when illuminated indicates that the lever is electrically unlocked and may, upon being moved, control its associated traffic controlling device.

Even though the contacts 22, which are closed if the signals of conflicting routes are at stop and which have been shown included in the pick up and stick circuit for the stick relay SR, thus preventing control of the switch machine SM under conflicting route conditions, have been illustrated, it is to be understood that these contacts 22 may be omitted and suitable local interlocking between the signals and the switch machine may be employed, this local interlocking acting either upon the control relay CR or acting to prevent operation of the switch machine SM under dangerous conditions by suitable contacts included in the normal and the reverse circuits N and R of the switch machine SM. Also, in spite of the fact that the invention has been shown applied to a switch machine, it is to be understood that the same principles underlying the present invention may be applied to control circuits for controlling derails, wayside semaphore or light signals, and the like. Having now mentioned the various elements of the system, it is deemed expedient to consider the operation of the system, this in order to more clearly point out the operating characteristics and the features of safety and facility provided by the system.

Operation

Let us assume that the operator in the tower T wishes to operate the track switch S to the take-siding position, and in order to do so moves the lever L to the dotted position at a time when the detector track circuit including the track relay DR and the approach section including the track relay TR are unoccupied and the contacts 22 are closed manifesting that the signals of conflicting routes are at stop. Under the conditions assumed the stick relay SR is energized through the following circuit:—beginning at the terminal B of a suitable source of current, such as a battery, front contact 20 of the track relay DR, wire 30, front contact 21 of the track relay TR, wire 31, contacts 22, wires 32 and 33, stick contact 34 of the relay SR, wires 35 and 36, winding of the stick relay SR, and to the other terminal C of the same battery. Also, with the lever L now assuming the dotted position the lock relay LR is energized through the following circuit:—beginning at the terminal B, front contact 20 of the relay DR, wire 30, front contact 21 of the relay TR, wire 31, contacts 22, wires 32, 40 and 41, contact 15 of the indicating relay IR assuming the normal position, wires 42 and 43, contact 12 of the lever L assuming the dotted position, wire 44, front contact 45 of the stick relay SR, wire 46, winding of the lock relay LR to the other terminal C of the same battery.

Picking up of the lock relay LR removes the shunting wires 23 and 24 from the line circuit leading to the control relay CR, and with the contacts 10 and 11 of the lever L assuming their dotted position the control relay CR is energized through the following circuit:—beginning at the positive terminal of the battery 50, wires 47 and 48, contact 10 of the lever L, wire 49, front contact 51 of the lock relay LR, line wire 52, winding of the control relay CR, line wire 53, front contact 54 of the relay LR, wire 55, contact 11 of the lever L, wires 56 and 57, and back to the battery 50. Flow of current in the circuit just traced operates the control relay CR to its left hand dotted position, thereby operating the switch machine SM to the take-siding position through the medium of its reverse circuit through the reverse wire R and the contact 58 of the control relay CR.

As soon as the switch machine SM has been operated to the take-siding position the contact 16—17 within the switch machine, or in a suitable switch box, are operated to the dotted position, thereby reversing the polarity of current applied to the indicating relay IR and operating this relay IR to its dotted position, through the medium of the line wires 59 and 60. With the indicating relay IR moved to its dotted position the circuit for the lock relay LR, heretofore traced, is broken at the contact 15 of the relay IR, so that this lock relay LR again assumes its deenergized line shunting position.

Attention is directed to the fact that during the period in which the lever L assumed the dotted take-siding position and the indicating relay IR still assumed its normal full line position, the out of correspondence lamp OOC was illuminated through the following circuit:—beginning at the terminal B, front contact 20 of the relay DR, wire 30, contact 21, wire 31, contacts 22, wires 32, 40 and 41, contact 15 then assuming the full line position, wires 42 and 43, contact 12 of lever L assuming the dotted position, wire 59, indicating lamp OOC, to the other terminal C of said source. The unlocked lever lamp UL is of course illuminated so long as the contacts 20, 21 and 22 are closed, and the circuit for this lamp UL, readily traced in the drawings, and including the wire 60 is otherwise intact. It is thus seen that with the lever L out of correspondence with the indicating relay IR and with the stick relay SR energized the lock relay LR is energized so long as this out of correspondence and safe route and approach locking condition exists, and that the lock relay LR is deenergized as soon as the indicating relay IR gets into correspondence with the lever L.

Let us now see what the effect would be if the operator operated the lever L at a time when the unlocked lamp UL is dark as a result of the opening of one of the contacts 20, 21 or 22. Such opening of one of these contacts 20, 21 or 22 will of course extinguish the lamp UL, advising the operator that he must not operate the lever, and will deenergize the stick relay SR. If the operator under this condition were to operate the lever, say from the normal to the dotted position, the lock relay LR would not be energized because the contact 45 of the stick relay SR is open. Furthermore, if the operator left the lever L in the dotted position and traffic or route conditions cleared up later, so that the contacts 20, 21 and 22 are then all closed, the unlocked lever lamp UL would be again illuminated, as would also the out of correspondence lamp OOC, but the stick relay SR would remain deenergized, because the pick-up circuit for this stick relay, and including the wire 61 and the contact 14 of the lever L would be incomplete, because the contact 14 of the lever L and the contact 15 of the relay IR are out of correspondence, so that the multiple part of this circuit including the wires 42 and 39 in multiple is open, and the stick relay SR cannot be picked up.

The illumination of the out of correspondence lamp OOC under the conditions assumed, would of course direct the attention of the operator to the fact that his lever L is out of correspondence with the switch machine SM, in response to which the operator would return the lever L to its normal position under which condition the stick relay SR would be picked up through the following pick-up circuit:—beginning at the terminal B, front contact 20 of the detector track relay DR, wire 30, front contact 21 of the track relay TR, wire 31, contacts 22, wires 32, 40 and 41, contact 15 of the relay IR assuming its left hand full line position, wire 42, contact 14 of the lever L, wires 61 and 36, winding of the stick relay SR, and to the other terminal C of the same battery. As soon as the stick relay SR assumes its energized position the closure of its stick contact 34 shunts the contacts 14 and 15 and the associated wires 39, 40, 41, 42 and 61, so that the stick relay SR remains stuck up through its stick circuit heretofore traced so long as traffic and route conditions are favorable, from which it is apparent that the switch machine SM may be operated in response to movement of the lever L back to the dotted position.

Although the lock relay LR has been shown slow acting, this relay may be rather quick acting, in that this relay is not deenergized until the operating function has been completed in its entirety. On the other hand, this relay LR is preferably slightly slow acting so that it will not respond to an instantaneous or transient application of current thereto.

Having thus shown and described one particular combination of circuits and devices for carrying out the underlying principles of the present invention, namely the provision of means including a lever for controlling a distant traffic controlling device in which the lever must be operated concurrently with safe traffic approach locking and route conditions, and if the lever is operated under such safe conditions the control circuit for controlling the distant traffic controlling device is again broken and the control circuit is short circuited to prevent interference due to the application of unauthorized current as soon as the distant traffic controlling device gets into correspondence with the lever, it is desired to be understood that the particular system illustrated has been selected for the purpose of disclosing the principles of the present invention and the advantages resulting therefrom, and has not been selected with

the intent of disclosing the exact construction preferably employed in practicing the invention nor has it been selected to illustrate the scope of the invention, and it is further to be understood that changes, modifications and additions may be made to adapt the invention to the particular problem encountered in practicing the same, all without departing from the spirit or scope of the invention or the idea of means underlying the same, except as demanded by the scope of the following claims.

What I claim as new is:—

1. In an interlocking system for railroads; the combination with a distant traffic controlling device; of a free mechanically non-lockable lever for controlling such traffic controlling device but normally ineffective to permit said traffic controlling device being controlled by said lever; and other means for permitting control of said traffic controlling device by said lever which requires movement of said lever when traffic conditions are proper comprising; a relay which must be energized to permit control of said traffic controlling device by said lever, and means for energizing said relay effective only if traffic conditions are proper and said lever and said traffic controlling device are out of correspondence.

2. In an interlocking system for railroads; the combination with a distant traffic controlling device; of a free mechanically non-lockable lever for controlling such traffic controlling device but normally ineffective to permit said traffic controlling device being controlled by said lever; and other means for permitting control of said traffic controlling device by said lever which requires movement of said lever when traffic and route conditions are proper comprising; a relay which must be energized to permit control of said traffic controlling device by said lever, and means for energizing said relay effective only if traffic and route conditions are proper and said lever and said traffic controlling device are out of correspondence.

3. In an interlocking system for railroads; the combination with a distant traffic controlling device; of a free mechanically non-lockable lever for controlling such traffic controlling device but normally ineffective to permit said traffic controlling device being controlled by said lever; and other means for permitting control of said traffic controlling device by said lever which requires movement of said lever when traffic conditions are proper comprising; a release relay which must be energized to permit control of said traffic controlling device by said lever, a stick relay which can only be picked up when traffic and route conditions are favorable and when said lever and said traffic controlling device assume corresponding positions and which will remain stuck up irrespective of whether said lever and traffic controlling device assume corresponding positions, and a circuit for said release relay including a front contact of said stick relay.

4. In an interlocking system for railroads; the combination with a distant traffic controlling device; of a free mechanically non-lockable lever for controlling such traffic controlling device but normally ineffective to permit said traffic controlling device being controlled by said lever; and other means for permitting control of said traffic controlling device by said lever which requires movement of said lever when traffic conditions are proper comprising; a release relay which must be energized to permit control of said traffic controlling device by said lever, a stick relay which can only be picked up when traffic and route conditions are favorable and when said lever and said traffic controlling device assume corresponding positions and which will remain stuck up irrespective of whether said lever and traffic controlling device assume corresponding positions, and a circuit for said release relay including a front contact of said stick relay and contacts closed when said lever and said traffic controlling device are out of correspondence.

5. In an interlocking system for railroads; the combination with a distant traffic controlling device; of a free mechanically non-lockable lever for controlling such traffic controlling device but normally ineffective to permit said traffic controlling device being controlled by said lever; and other means for permitting control of said traffic controlling device by said lever which requires movement of said lever when traffic conditions are proper comprising; a relay which must be energized to permit control of said traffic controlling device by said lever, means for energizing said relay effective only if traffic conditions are proper and said lever and said traffic controlling device are out of correspondence, and means for indicating when traffic and route conditions are proper.

6. In an interlocking system for railroads; the combination with a distant traffic controlling device; of a free mechanically non-lockable lever for controlling such traffic controlling device but normally ineffective to permit said traffic controlling device being controlled by said lever; and other means for permitting control of said traffic controlling device by said lever which requires movement of said lever when traffic and route conditions are proper comprising; a relay which must be energized to permit control of said traffic controlling device by said lever, means for energizing said relay effective only if traffic and route conditions are proper and said lever and said traffic controlling device are out of correspondence, and means for in-

dicating when traffic and route conditions are proper.

7. In an interlocking system for railroads; the combination with a distant traffic controlling device; of a free mechanically non-lockable lever for controlling such traffic controlling device but normally ineffective to permit said traffic controlling device being controlled by said lever; and other means for permitting control of said traffic controlling device by said lever which requires movement of said lever when traffic conditions are proper comprising; a release relay which must be energized to permit control of said traffic controlling device by said lever, a stick relay which can only be picked up when traffic and route conditions are favorable and when said lever and said traffic controlling device assume corresponding positions and which will remain stuck up irrespective of whether said lever and traffic controlling device assume corresponding positions, a circuit for said release relay including a front contact of said stick relay, and means for indicating when said lever and said traffic controlling device assume non-corresponding positions.

8. In an interlocking system for railroads; the combination with a distant traffic controlling device; of a free mechanically non-lockable lever for controlling such traffic controlling device but normally ineffective to permit said traffic controlling device being controlled by said lever; and other means for permitting control of said traffic controlling device by said lever which requires movement of said lever when traffic conditions are proper comprising; a release relay which must be energized to permit control of said traffic controlling device by said lever, a stick relay which can only be picked up when traffic and route conditions are favorable and when said lever and said traffic controlling device assume corresponding positions and which will remain stuck up irrespective of whether said lever and traffic controlling device assuming corresponding positions, a circuit for said release relay including a front contact of said stick relay and contacts closed when said lever and said traffic controlling device are out of correspondence, and means for indicating when said lever and said traffic controlling device assume non-corresponding positions.

9. In an interlocking system for railroads; the combination with a distant traffic controlling device; of a free mechanically non-lockable lever for controlling such traffic controlling device but normally ineffective to permit said traffic controlling device being controlled by said lever; and other means for permitting control of said traffic controlling device by said lever which requires movement of said lever when traffic conditions are proper comprising; a release relay which must be energized to permit control of said traffic controlling device by said lever, a stick relay which can only be picked up when traffic and route conditions are favorable and when said lever and said traffic controlling device assume corresponding positions and which will remain stuck up irrespective of whether said lever and traffic controlling device assume corresponding positions, a circuit for said release relay including a front contact of said stick relay and contacts closed when said lever and said traffic controlling device are out of correspondence, and means for indicating when traffic and route conditions are favorable.

10. In an interlocking system for railroads; the combination with a distant traffic controlling device; of a free mechanically non-lockable lever for controlling such traffic controlling device but normally ineffective to permit said traffic controlling device being controlled by said lever; and other means for permitting control of said traffic controlling device by said lever which requires movement of said lever when traffic conditions are proper comprising; a release relay which must be energized to permit control of said traffic controlling device by said lever, a stick relay which can only be picked up when traffic and route conditions are favorable and when said lever and said traffic controlling device assume corresponding positions and which will remain stuck up irrespective of whether said lever and traffic controlling device assume corresponding positions, a circuit for said release relay including a front contact of said stick relay and contacts closed when said lever and said traffic controlling device are out of correspondence, and two indicators one of which is rendered active when traffic and route conditions are favorable and the other of which is rendered active when said lever and said traffic controlling device assume non-corresponding positions.

11. In a centralized traffic controlling system for railroads, a track switch, a switch machine for operating said track switch, a switch control relay for governing said switch machine, a control lever, a polarized control circuit connecting said switch control relay and said control lever, approach locking means associated with said track switch for preventing during actuation of said means upon the passage of a train the operation of said switch control relay by said control lever, and means requiring said control lever to be in correspondence with said track switch subsequent to the release of said approach locking means before said control lever can govern said switch control relay.

12. In a centralized traffic controlling system for railroads, a track switch, a control lever, operating means for operating said track switch when actuated by said control lever, locking means preventing actuation of

said operating means during passage of a train over said track switch, and means requiring said control lever to be in correspondence with said track switch subsequent to the passage of a train before said operating means can again be actuated by said control lever.

13. In combination, a switch machine, a lever operated contact, a lock means for preventing operation of said switch machine, and a control circuit for said switch machine including said lever operated contact, said control circuit being effective to cause operation of said switch machine only if said locking means is inactive at the time of closure of said lever operated contact.

14. In combination, a distant track switch, a local lever for controlling the operation of said track switch, a relay for manifesting traffic conditions, and means for preventing response of said track switch to a change in the position of said lever when said relay is deenergized and also preventing response of said track switch to such change in the position of said lever upon reenergization of said relay unless said lever is for a time placed into correspondence with said track switch after such reenergization of said relay.

15. In combination, a distant traffic controlling device, a local lever for controlling the operation of said device, a relay for manifesting traffic conditions, and means for preventing response of said device to a change in the position of said lever when said relay is deenergized and also preventing response of said device to such change in the position of said lever upon reenergization of said relay unless said lever is for a time placed into correspondence with said device after such reenergization of said relay.

16. In combination, a distant traffic controlling device, electro-responsive means for operating said device, a lever for controlling said means, a relay for manifesting traffic conditions, and means for preventing response of said electro-responsive means to a change in the position of said lever when said relay is deenergized and also preventing such response upon reenergization of said relay unless said lever is for a time placed into correspondence with said device after such reenergization of said relay.

17. In combination, a distant traffic controlling device, electro-responsive means for operating said device, a lever for controlling said means, a relay for manifesting traffic conditions, means for preventing response of said electro-responsive means to a change in the position of said lever when said relay is deenergized and also preventing such response upon reenergization of said relay unless said lever is for a time placed into correspondence with said device after such reenergization of said relay, and means for indicating when said lever and said electro-responsive device are out of correspondence.

18. In combination, a distant traffic controlling device, electro-responsive means for operating said device, a lever for controlling said means, a relay for manifesting traffic conditions, and means for preventing response of said electro-responsive means to a change in the position of said lever when said relay is deenergized and also preventing such response upon reenergization of said relay unless said lever is for a time placed into correspondence with said device after such reenergization of said relay, and means for indicating the condition of energization of said relay.

19. In combination, a distant traffic controlling device, electro-responsive means for operating said device, a lever for controlling said means, a relay for manifesting traffic conditions, means for preventing response of said electro-responsive means to a change in the position of said lever when said relay is deenergized and also preventing such response upon reenergization of said relay unless said lever is for a time placed into correspondence with said device after such reenergization of said relay, means for indicating when said lever and said electro-responsive device are out of correspondence, and means for indicating the condition of energization of said relay.

In testimony whereof I affix my signature.

ANDREW LANGDON.