Jan. 23, 1945. H. A. HAINES 2,367,723

RAILWAY TRAFFIC CONTROLLING APPARATUS

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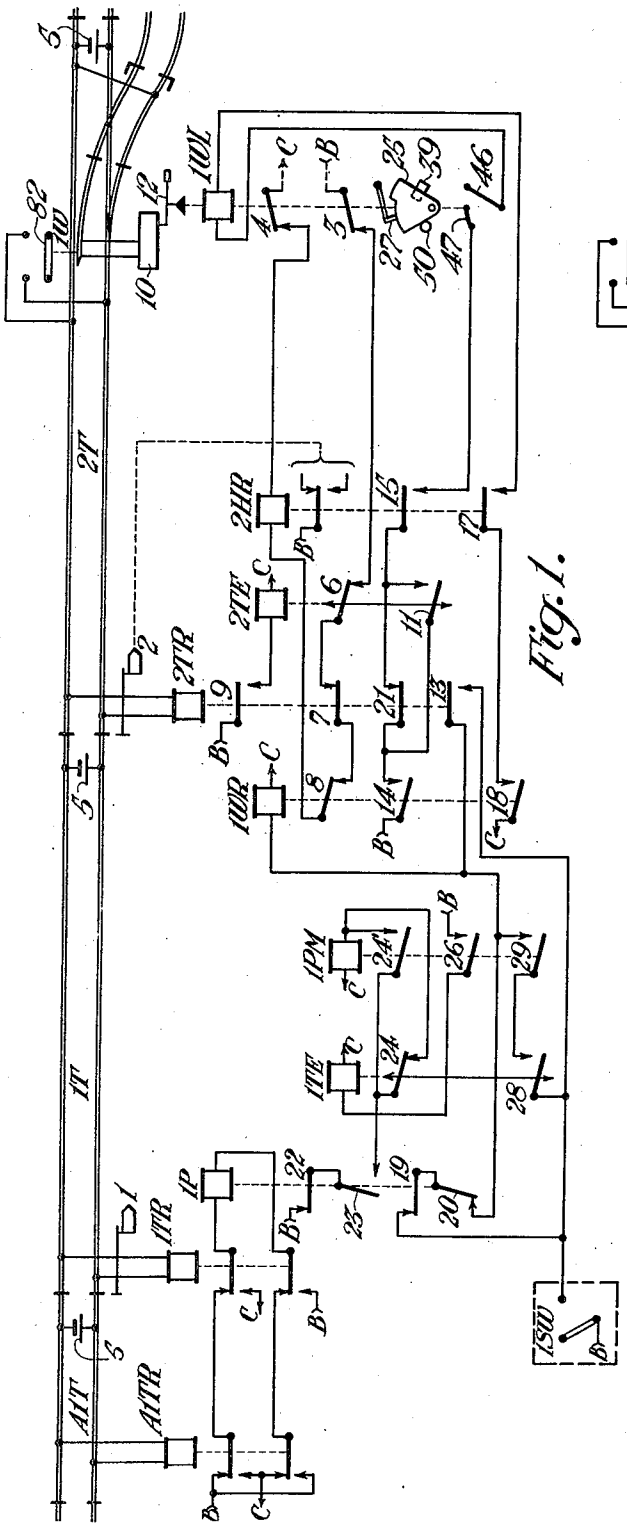


Fig. 1.

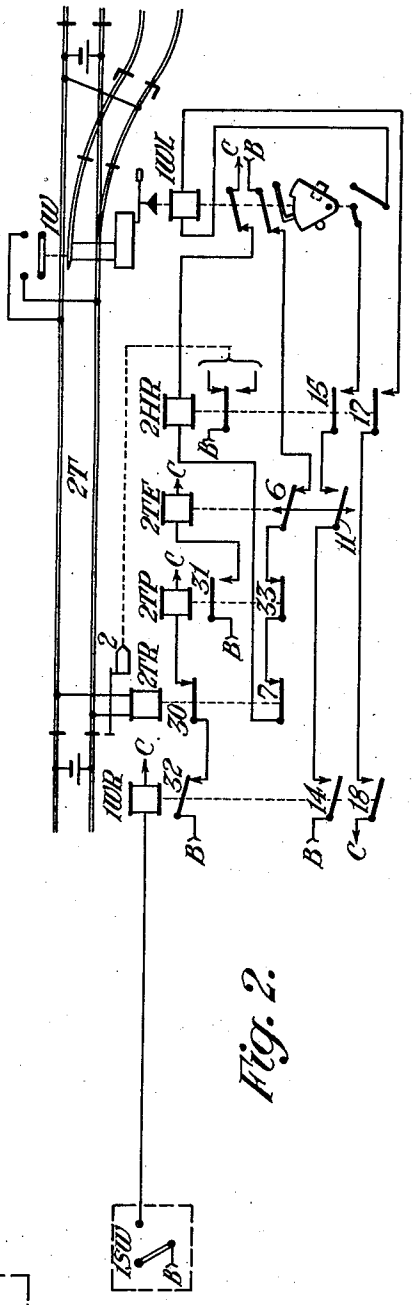


Fig. 2.

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RAILWAY TRAFFIC CONTROLLING APPARATUS

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9 Claims. (Cl. 246—160)

My invention relates to railway traffic controlling apparatus, and more particularly to improved apparatus for controlling electric switch locks for safeguarding the operation of outlying hand throw track switches.

An outlying track switch of the type contemplated is to be understood to be one leading to an industrial siding or the like, and intended primarily for operation by the crew of a train doing local switching, after obtaining permission by telephone or otherwise, from the dispatcher or central office operator. Such switches are usually at a distance from any existing interlocking plant at locations having no relation to the proper location of the block signals for protecting main line train movements, and they must be free to be operated, at times, when there is a train at the switch, consequently the usual methods of safeguarding train movements over track switches located within interlocking limits are not applicable. Heretofore, for the control of outlying track switches of this character, it has been the practice to cut the track circuit for the block section including the switch in order to interpose a short releasing section adjacent the switch, and to so control the electric lock that an unlock may be obtained to enter the side track only when the short cut section is occupied, and to leave the siding only when the main track is unoccupied.

One feature of my invention resides in the provision of a system of time locking initiated automatically by train movements, and so arranged that an unlock to enter the side track can be obtained promptly when the train arrives at the switch, provided it approaches at a greatly reduced speed, while on the other hand, when a high speed train passes the governing home signal at clear, the switch remains positively locked until the train has passed the switch. The short cut section as generally used heretofore is eliminated, thereby effecting a saving in the cost of installation and also facilitating train operation, in view of the difficulty in stopping long heavy trains with sufficient accuracy to insure that they will occupy the short cut section but without overrunning the switch.

Another feature of my invention resides in the provision of means for insuring that the home signal at the entrance to the block section including the switch will be cleared only when the switch is properly locked in its normal position, and for controlling the signal to its stop position in order to allow the switch to be unlocked.

A further feature of my invention resides in the provision of a system of approach locking which is controlled automatically by train movements in such a manner as to permit the switch to be unlocked to effect a train movement out of the side track under certain conditions even though the main track is occupied as, for example, by a train standing on the main track or moving at a slow speed and approaching the home signal at stop.

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

Referring to the accompanying drawing, Fig. 1 illustrates a preferred form of my invention embodying both time and approach locking for an outlying hand throw track switch. Fig. 2 illustrates a modification adapted more particularly to the control of a switch which is used but infrequently, embodying time locking only.

Similar reference characters refer to similar parts in both views.

Fig. 1 of the drawing shows, in its upper portion, a track diagram representing a typical stretch of main track over which traffic normally moves from left to right, which includes a hand throw switch 1W leading to a side track. The stretch of main track is divided into a plurality of track sections A1T, 1T and 2T by the usual insulated joints, each section constituting a track circuit having a source of current such as a battery 5 connected across the rails at one end, and a track relay bearing the designation TR together with a prefix identifying the track section with which the relay is associated, at the other end. The signals 1 and 2 are the usual home and distant automatic block signals for governing traffic movements into sections 1T and 2T, respectively. Sections A1T and 1T, taken together, constitute an approach zone for signal 2, the length of whch is to be understood to be in excess of the maximum stopping distance of a high speed train.

The track switch 1W is provided with an operating mechanism comprising the hand throw switch stand 10, which may, for example, be of the type shown in Letters Patent of the United States to Bone et al., No. 2,184,870, issued December 26, 1939, and its operation is governed electrically by the provision of an electric switch lock controlled by a lock magnet 1WL. The electric lock may be applied directly to the lock rod of the switch in a well-known manner, but preferably it is applied to the operating lever 12 of the switch stand 10, as shown in the drawing.

As illustrated herein, the electric switch lock is to be understood to be of the type disclosed in Letters Patent of the United States to Neubert

et al., No. 1,126,834, issued February 2, 1915. For an understanding of the details of operation of the locking mechanism reference may be made to this patent, but for an understanding of the present invention it is believed that it will suffice to point out that the operating lever 12 of the switch stand is normally locked mechanically in a position to maintain the track switch locked normal, by means of a padlock. More particularly, a lever latch attached to a segment 25 is held in locking position by the bail of a padlock 50, as indicated diagrammatically in the accompanying drawing and as shown in detail in Fig. 1 of the Neubert et al. patent. To unlock the switch, the padlock must first be removed by the train crew to permit the segment 25 to be moved a short distance to a position to engage the locking dog 27 and to close contacts 46—47. Then if traffic conditions as reflected by the circuits are such as to indicate that it is proper to unlock the switch, magnet 1WL will become energized to open contacts 3 and 4 and to lift the locking dog 27, permitting segment 25 to be moved to its full reverse position in which the switch operating lever 12 is free to be operated. The movement of lever 12 towards its reverse position projects one end of a rod 39, arranged as shown in Figs. 1, 5 and 6 of the Neubert et al. patent, into the path of the lever latch, whereby the segment is held reversed and contacts 3 and 4 held open, until lever 12 is again restored to normal.

It is also to be understood that the switch stand 10 is equipped with the usual switch circuit controller and point detector having movable contacts 82 which are open only when the switch is locked normal. As indicated in the drawing, these contacts are used to shunt the track circuit 2T to effect the release of the track relay 2TR so as to cause signal 2 to indicate stop whenever the points of switch 1W are unlocked or displaced from their normal position.

Signal 2 is controlled by a signal relay 2HR, as indicated conventionally in the drawing, and relay 2HR is controlled jointly by the track relay 2TR, by a time element device comprising the relay, 2TE, by a manually controlled relay 1WR, and by the contacts 3 and 4 actuated by the magnet 1WL of the electric switch lock. The signal control circuit over which relay 2HR is energized may be traced in Fig. 1 from the supply terminal B of a suitable local source of current over back contact 3 of magnet 1WL and the normally closed checking contact 6 of relay 2TE, front contact 7 of the track relay 2TR, back contact 8 of relay 1WR through the winding of relay 2HR and over back contact 4 of magnet 1WL to the common return terminal C of the same source. Signal 2 indicates proceed only when section 2T is unoccupied and the track switch 1W is locked normal as manifested separately and independently, in accordance with a feature of my invention, by the condition of the electric switch lock controlled by magnet 1WL and of the point detector contacts 82.

It is thought that my invention may be more readily understood by a description of its operation under different assumed conditions, and accordingly it will first be assumed that a train approaching from the left passes signal 2 at clear and stops at the switch 1W with a view to entering the side track.

The dropping of track relay 2TR when the train enters section 2T releases relay 2HR, thereby restoring signal 2 to stop, and completes a circuit at contact 9 of relay 2TR for energizing the time element relay 2TE to initiate its operation. Relay 2TE is arranged to open its checking contact 6 in the signal control circuit as soon as it becomes energized, and to close its operating contact 11 after it has been energized for an adjustable time interval, which in this particular application may be of the order of three minutes, or more if the distance from signal 2 to switch 1W exceeds 4000 feet, corresponding to an average speed of 15 miles per hour or less. The train crew will ordinarily consume this time in making a stop at the switch and in securing permission from the central office operator to enter the side track. Upon granting this permission, the operator will reverse his switch lever 1SW, completing a circuit from terminal B over back contact 13 of the track relay 2TR to pick up relay 1WR while the train crew, by removing padlock 50, will effect the closing of contacts 46—47. The closing of contact 11 of relay 2TE under these conditions completes a circuit for magnet 1WL which may be traced from terminal B at contact 14 of relay 1WR, contacts 11 and 15 of relays 2TE and 2HR, contacts 47 and 46, magnet 1WL and contacts 17 and 18 of relays 2HR and 1WR to terminal C, whereupon switch 1W may be unlocked and reversed as described in the patents hereinbefore referred to.

It will be seen that the switch will remain locked even though padlock 50 is not in place, if the train in section 2T approaches the switch at any speed in excess of that measured by the operation of contact 11 of relay 2TE.

It will next be assumed that the crew of a train on the side track requests an unlock to enter the main line. Assuming section 2T to be unoccupied, back contact 13 of relay 2TR will be open, and the operation of relay 1WR is thereby made dependent upon the condition of the approach zone as reflected by the relays 1P, 1TE and 1PM. Relay 1P is a polarized approach relay which as shown in the drawing has a normal energizing circuit including front contacts of both the track relays A1TR and 1TR, and a reverse energizing circuit which is closed when either of these track relays is released by a train occupying the approach zone comprising sections A1T and 1T. Assuming these sections to be unoccupied, relay 1WR may be energized in response to the reversal of lever 1SW by the central office operator, over the branch circuit including contacts 19 and 20 of relay 1P, and the lock magnet 1WL may then be energized at once over the branch circuit including front contact 21 of relay 2TR. On the other hand, if an approaching train enters section A1T, relay A1TR will release, reversing relay 1P to cause contact 20 to open and contact 23 to close, thereby completing a circuit from terminal B over contacts 22 and 23 of relay 1P and the normally closed checking contact 24 of the time element relay 1TE through relay 1PM to terminal C. Relay 1PM will therefore pick up and complete a stick circuit at its front contact 24', and will complete the energizing circuit for relay 1TE at contact 26. Relay 1TE is adjusted to close its operating contact 28 after it has been energized for a time interval adjusted according to the length of the approach zone, and of the order of six minutes, sufficient to insure that the train in question will have passed switch 1W before contact 28 closes, unless it is moving at slow speed. At the end of the prescribed time interval, relay 1WR may be energized over the branch circuit including contacts 28 and 29 of relays 1TE and 1PM. In case

the approaching train has not yet entered section 2T, relay 2HR will be released by the opening of contact 8 of relay 1WR, to put signal 2 to stop to hold it in section 1T, and magnet 1WL may then be energized over the circuit including front contact 21 of relay 2TR. If on the other hand, the train has already passed signal 2, the time element relay 2TE will have been set into operation, making it impossible to release the electric lock until the train has had time to pass the switch, as in the case first described.

It will be readily apparent that the clearing of signal 2 indicates that switch 1W is locked normal, and that it is not possible to release the electric lock when a high speed train occupies any of the sections A1T, 1T or 2T, but that an unlock may be obtained to enter or leave the side track, usually without delay, when any of these sections are occupied by a standing train. Furthermore, movements out of the side track are protected by signal 2 at stop, in case the approach zone is occupied or if a train enters the approach zone after such movement has been authorized.

In Fig. 2 I have shown a modified form of my invention in which the approach locking apparatus has been omitted to reduce cost, but without sacrifice in protection. In this view the manually controlled relay 1WR is free to be operated by the central office operator at all times, and a repeating relay 2TP is interposed in the control of relay 2TE, relay 2TP being controlled jointly by relays 1WR and 2TR. In Fig. 2, when a train passes signal 2 at clear, the dropping of the track relay 2TR opens contacts 7 and 30, putting signal 2 to stop and releasing relay 2TP, which relay then closes contact 31, energizing relay 2TE to initiate the time element, at the end of which an unlock to enter the side track may be obtained, as in Fig. 1 already described.

For a movement out of the siding, in Fig. 2, the central office operator will reverse lever 1SW to energize relay 1WR, in response to the usual request by the train crew, thereby releasing relay 2TP by the opening of contact 32 of relay 1WR, whereupon relay 2TP energizes relay 2TE by closing contact 31, and puts signal 2 to stop by opening the signal control circuit at contact 33. It will be clear that under this condition signal 2 is put to stop manually, and that relay 2TE, in Fig. 2, serves in place of relay 1TE of Fig. 1, in that it is relied upon to prevent an unlock when a high speed train is approaching. Accordingly, in Fig. 2, relay 2TE is preferably adjusted to have a corresponding time element of the order of six minutes. It follows that with the apparatus of Fig. 2, an unlock to enter the side track may involve some delay, due to the increase in the time of operation of relay 2TE, while to leave the side track an immediate unlock cannot be obtained. However, delay in leaving the side track may be avoided if permission is requested, and relay 1WR is operated, well in advance of the time the unlock is required. The aparatus of Fig. 2 therefore is adapted more particularly for use with hand throw switches used so infrequently that an occasional delay in obtaining an unlock is unimportant.

It will be understood that the manually controlled relay 1WR, in both forms of my invention may be controlled in any desired manner, as by a code type communication system or by a telephone selector, for example, or if local control is preferred, lever 1SW may be located adjacent the switch and arranged for operation by the train crew.

Although I have herein shown and described only two forms of railway traffic controlling 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 with a section of railway track including a hand throw track switch, means comprising a mechanical lock and an electric lock for preventing the hand operation of the switch, a track relay for said section, a time element device, a manually controlled relay, means including said track relay for initiating the operation of the time element device regardless of the condition of said manually controlled relay whenever a train enters said track section, and a circuit for energizing the electric lock to unlock the switch including a front contact of said manually controlled relay and a contact which closes when said mechanical lock is removed, said circuit also including a contact closed by said time element device a predetermined time after its operation is initiated.

2. In combination with a section of railway track including a hand throw track switch equipped with an electric lock for preventing the hand operation of the switch, a signal for governing traffic movements into said section, a time element device, means for initiating the operation of said time element device and at the same time causing said signal to indicate stop, a manually operable contact located adjacent the switch and normally locked in its open position, a circuit for energizing the electric lock to unlock the switch including a contact closed by the time element device a predetermined time after its operation is initiated and also including said manually operable contact, and means controlled by the electric lock for maintaining said signal at stop until the switch is again locked in its normal position.

3. In combination with a section of railway track including a hand throw switch equipped with an electric lock; a track relay for said section, a time element device, and a manually controlled relay; means for initiating the operation of the time element device in response to the release of said track relay when a train enters said section and also when said manually controlled relay is operated even though said section is unoccupied, and a circuit for energizing the electric lock to unlock the switch including a front contact of said manually controlled relay and a contact closed by said time element device a predetermined time after its operation is initiated.

4. In combination with a section of railway track including a hand throw track switch equipped with an electric lock, a signal for governing traffic movements into said section, a time element device, a track relay for said section, a signal relay for controlling said signal, a circuit for said signal relay including a normally closed checking contact of said time element device and a front contact of said track relay, and also including contacts which are closed only when the track switch is locked in its normal position by said electric lock, means for initiating the operation of the time element device in response to the release of said track relay to thereby open said checking contact, and a circuit for energizing the electric lock to unlock the switch including back contacts of said signal relay and a con-

tact closed by the time element device a predetermined time after its operation is initiated.

5. In combination with a section of railway track including a hand throw track switch equipped with an electric lock, a track circuit for said section having a track relay, a signal for governing traffic movements into said section, a signal relay for controlling said signal, an approach zone including one or more track sections located in approach to said signal, a manually controlled relay, an energizing circuit for said manually controlled relay having two branches one of which may be closed only when said approach zone is unoccupied and the other only when said approach zone has been occupied for a predetermined time interval, a circuit for energizing said signal relay closed only when said track relay is energized and opened when said manually controlled relay is energized, and a circuit for energizing the electric lock to unlock the switch effective when said section is unoccupied provided the manually controlled relay and track relay are both energized and said signal relay is deenergized.

6. In combination with a section of railway track including a hand throw track switch equipped with an electric lock, a track circuit for said section having a track relay, a time measuring device controlled by the track relay and set into operation each time a train enters said section, manually operable means for setting said time measuring device into operation at times when said section is not occupied, and manually controlled means for energizing said electric lock to unlock the track switch rendered effective when said device has measured a predetermined time interval.

7. In combination with a stretch of railway track, a track section in said stretch including a hand throw track switch equipped with an electric lock, an approach zone in said stretch adjoining said track section, a first and a second time measuring device, means for setting the first time measuring device into operation each time a train enters said approach zone, means for setting the second time measuring device into operation each time a train enters said track section, and manually controlled means for energizing the electric lock to unlock the track switch effective when said track section is unoccupied provided the approach zone is either unoccupied or the first time measuring device has completed its operation, and also when said track section is occupied provided the second time measuring device has completed its operation.

8. In combination with a stretch of railway track, a track section in said stretch including a hand throw track switch equipped with an electric lock, an approach zone in said stretch adjoining said track section, a first and a second time measuring device, means for setting the first time measuring device into operation each time a train enters said approach zone, means for setting the second time measuring device into operation each time a train enters said track section, a manually controlled relay, means for energizing said relay effective either when the track section is occupied, or the track section and approach zone are both unoccupied, said means being also effective when there is a train in the approach zone provided the first time measuring device has completed its operation, and means for energizing the electric lock to unlock the track switch rendered effective upon the energization of said manually controlled relay provided said track section is unoccupied or the second time measuring device has completed its operation.

9. In combination with a section of railway track including a hand throw switch equipped with an electric lock, a track relay for said section, a normally clear signal for governing traffic movements into said section, a time measuring device, a manually controlled relay, means for setting said time measuring device into operation and restoring the signal to stop in response to the release of said track relay when a train enters said section and also in response to the operation of said manually controlled relay when said section is unoccupied, and means controlled by said time measuring device for energizing the electric lock to unlock the track switch rendered effective when said signal has been at stop for a time sufficient to enable a train entering said section to pass the switch unless it is moving at a given slow speed.

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