April 11, 1939. G. R. PFLASTERER 2,153,675

RECORDING MECHANISM

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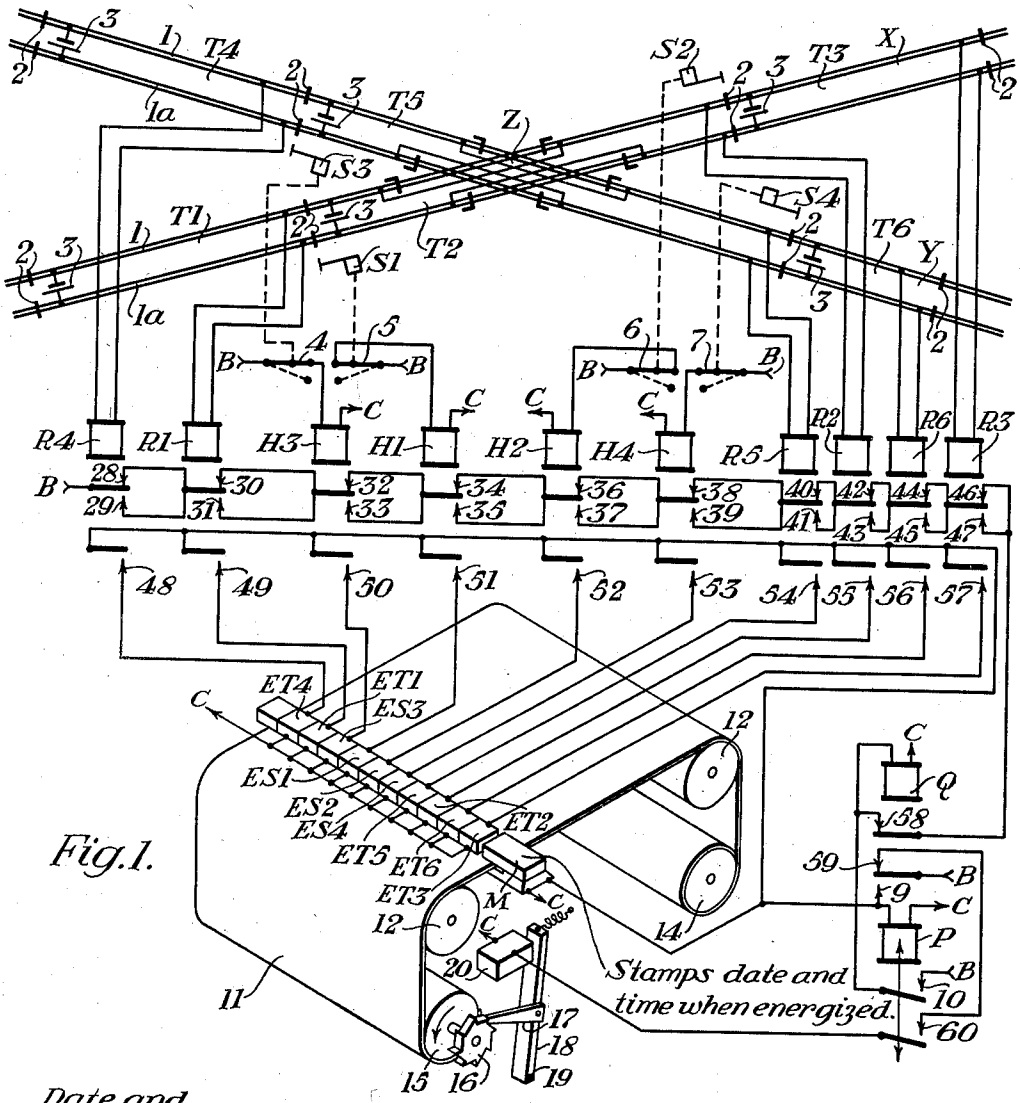


Fig. 1.

Date and Time	ET4	ET1	ES3	ES1	ES2	ES4	ET5	ET2	ET6	ET3
Feb. 8, 1938										
P.M. 1:00:00	○									
P.M. 1:00:04	○		○							
P.M. 1:01:20	○		○					○		
P.M. 1:01:24	○							○		
P.M. 1:01:40								○		
P.M. 1:02:40								○		○
P.M. 1:03:00										○
P.M. 1:04:20										

Fig. 3.

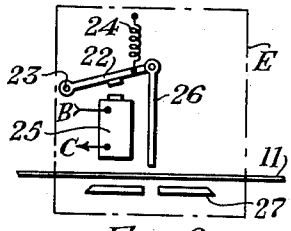


Fig. 2.

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2,153,675

RECORDING MECHANISM

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18 Claims. (Cl. 246—107)

My invention relates to recording mechanism and is particularly well adapted for, but not limited to, mechanism for recording the progress of trains operating along a stretch of railway and for recording the operation of signals.

One feature of apparatus embodying my invention is the provision of means to record the change in condition of traffic controlled apparatus on a normally stationary recording mechanism. This feature of my invention, when utilized in connection with mechanism of the recording tape type, necessitates the tape being moved only after a change in the condition of the traffic controlled apparatus has been recorded.

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

In the accompanying drawing, Fig. 1 is a diagrammatic view of a preferred form of apparatus embodying my invention. Fig. 2 is a diagrammatic view of a form of recording means that may be used with my invention. Fig. 3 is a view illustrating a portion of tape with the record made thereon by the apparatus shown in Figs. 1 and 2.

Referring to Fig. 1, the reference characters X and Y designate two railway tracks which intersect each other at Z. The track rails 1 and 1a of track X, and similarly the track rails 1 and 1a of track Y, are divided by the usual insulated track joints 2 into track sections designated by the reference characters T with suitably distinguishing suffixes. Track X is provided with the track sections T1, T2 and T3, while track Y is provided with track sections T4, T5 and T6. Track sections T2 and T5 I shall term detector sections; these sections contain the intersection Z. Track sections T1, T3, T4 and T6 I shall term approach sections.

Each track section is provided with a track circuit comprising in each instance a suitable source of current, such as track battery 3, connected across the rails at one end of the section and a track relay, designated by the reference character R with a suffix the same as that used in the reference character of the associated section, connected across the rails at the other end of the section.

The reference characters S with suitably distinguishing suffixes designate traffic controlling devices, shown here as signals, for governing traffic moving over the railway tracks. Signals S1 and S2 govern traffic moving along tracks X, and signals S3 and S4 govern traffic moving along track Y. Each signal S is operatively connected with a contact. Signal S1 controls contact 5, and similarly signals S2, S3 and S4 control contacts 6, 4 and 7, respectively, in such a manner that the contact is closed only when the associated signal is in a stop position, as shown in Fig. 1.

Associated with each signal S is a signal indication relay, designated by the reference character H with a suffix the same as that used in the reference character for the associated signal. Each signal indication relay is energized by virtue of a simple circuit including the contact operatively connected with its associated signal, as can readily be understood by an inspection of Fig. 1.

The reference character P designates a normally deenergized slow acting relay, that is, a relay provided with slow release and slow pick-up characteristics. Relay P is energized by virtue of a simple circuit including a back contact 9 of a normally energized stick relay Q. A pick-up circuit for the stick relay Q passes from terminal B of a suitable source of current, such as a battery not shown, through front contact 10 of relay P and winding of relay Q to terminal C of the source of current. A stick circuit for relay Q serially includes a dependent front or back contact of each of the track relays and signal indication relays, as can be seen by inspection of Fig. 1; and the stick relay Q is provided with quick releasing characteristics so that it will release during the period that a movable contact member of a track relay or a signal indication relay is moving between its front and back contacts.

The mechanism employed to record the movement of trains and the operation of signals, as shown here, consists of a tape 11 which may be of paper or other suitable material, and which passes over drums 12, 12. This tape is unwound from a roll 14 on to a drum 15 by means of a suitable mechanism operating the latter drum. As shown here, this operating mechanism comprises a ratchet wheel 16 rigidly fixed to drum 15, and a propelling pawl 17 which engages the teeth of the ratchet wheel. Pawl 17 is operatively associated with lever 18, which is pivoted at 19 and is of suitable magnetic material so as to be magnetically attracted when a magnet 20 becomes energized, so that when lever 18 moves toward magnet 20 the propelling pawl 17 engages the teeth of ratchet wheel 16 and propels drum 15 through a predetermined arc.

In order to secure a record of the progress of trains through the track section and of the operation of signals, each track section and signal is

provided with recording means designated by the reference character E with a suffix corresponding to the reference character and suffix of the associated section or signal. These recording means may be of the usual and well-known type, and one form that they may take is illustrated in Fig. 2.

Referring to Fig. 2, the reference character 22 designates an armature of suitable magnetic material, pivoted at 23 and biased by a spring 24 away from a magnet 25. A punch 26 is operatively associated with armature 22 and so arranged as to perforate tape 11 when armature 22 is magnetically attracted to magnet 25. A base plate 27 is also provided to prevent the punch from tearing the tape. It is to be understood that this form of recording means is given as an illustration, and that my invention is not restricted to this one form.

Referring once more to Fig. 1, the reference character M designates a time controlled printing device which, when energized, stamps the date and time on tape 11. The device M is preferably so located that the stamping of the tape will be in line with the punch marks made by the recording means E. Device M may be of the many and well-known types, and, as the form of this device is in no way connected with my present invention, a detailed discription of the operation of device M is not thought necessary.

The apparatus is in its normal condition, as shown in the drawing, when no train is operating upon the approach or detector sections. In this condition of the apparatus, the traffic controlled apparatus, that is, the track relays and the signal indication relays, are energized. Also, stick relay Q is energized by virtue of its stick circuit which serially includes front contacts 28, 30, 32, 34, 36, 38, 40, 42, 44 and 46 of relays R4, R1, H3, H1, H2, H4, R5, R2, R6 and R3, respectively. Relay P, recording device M, recording means E, and the operating mechanism for drum 15 are all in their deenergized condition.

To illustrate the operation of apparatus embodying my invention, I shall assume that a train moving from left to right on track X enters track section T1. As a shunt path around the winding of relay R1 is provided by the wheels and axles of the train, relay R1 becomes released, and front contact 30 of relay R1 opens to open the stick circuit for relay Q. Because of its quick release characteristics, relay Q becomes released prior to back contacts 31 and 49 of relay R1 closing, so that front contacts 58 and 59 of relay Q open, and back contact 9 of relay Q closes. The closing of back contact 9 of relay Q, in addition to completing the simple energizing circuit for relay P mentioned previously, also completes a simple circuit for recording device M. Device M becomes energized and stamps the date and time upon tape 11. When back contacts 31 and 49 of relay R1 close, a circuit for magnet 25 of recording means ET1 is completed, the circuit passing from terminal B through back contact 9 of relay Q, back contact 49 of relay R1 and winding of magnet 25 of recording means ET1 to terminal C. Magnet 25 of recording means ET1 becomes energized, and punch 26 of recording means ET1 perforates tape 11.

When, at the end of its slow pick-up period, relay P picks up and closes front contacts 10 and 60, the closing of front contact 10 completes the simple pick-up circuit for relay Q. Relay Q becomes energized and opens back contact 9 to open the circuits previously mentioned for relay P, recording device M and recording means ET1. As magnet 25 of recording means ET1 is no longer energized, punch 26 of recording means ET1 is drawn away from tape 11 as explained previously. And when front contacts 58 and 59 of relay Q close, front contact 59 completes a circuit for magnet 20 of the operating mechanism for drum 15. This circuit passes from terminal B through front contact 59 of relay Q, front contact 60 of relay P, and winding of magnet 20 of the operating mechanism for drum 15 to terminal C. The magnet 20 becomes energized to magnetically attract lever 18, and to move the drum 15 through a predetermined arc, as was explained previously. Tape 11 is wound upon drum 15 when this movement of the drum occurs, and the tape is moved sufficiently so that a legible and distinguishing record may be made on tape 11 by the recording means of a subsequent change in the traffic controlled apparatus. The closing of front contact 58 of relay Q connects relay Q in a stick circuit which now serially includes front contacts 28, 32, 34, 36, 38, 40, 42, 44 and 46 of relays R4, H3, H1, H2, H4, R5, R2, R6 and R3, respectively, and back contact 31 of relay R1. This stick circuit holds relay Q energized when relay P, at the end of its slow release period, releases to open front contact 10, which opens the pick-up circuit for relay Q, and front contact 60, which opens the energizing circuit for magnet 20 of the operating mechanism for drum 15.

It should be noted that the slow pick-up characteristics of relay P permit device M and recording means ET1 to become energized and record the respective indications on tape 11, and that the slow releasing characteristics of relay P permit the operating mechanism of drum 15 to become energized and move tape 11 a predetermined distance. Thus, it can be seen that the dating device M, recording means ET1 and operating mechanism for drum 15 are energized but momentarily.

Although for the sake of clearness I have not shown the control circuit for the signals, the signals will usually be controlled so as to occupy normally a "stop" position, and to change to "proceed" when the track relay for the associated approach section is released, provided, of course, that track conditions in the vicinity of the intersection are such as to make a proceed indication safe for a train accepting that indication. Therefore, when the train enters section T1 and relay R1 becomes deenergized, signal S1, which is controlled by its approach section T1, will change to "proceed" and open contact 5 so that indication relay H1 will become released. When relay H1 releases, the apparatus operates in a manner similar to the operation just described for relay R1 releasing. That is to say, front contact 34 of relay H1 opens the stick circuit previously traced for stick relay Q, front contacts 58 and 59 of relay Q open, and back contact 9 of relay Q closes to complete the circuit for relay P and recording device M. The recording device M becomes energized and stamps the date and time upon the tape. When back contacts 35 and 51 of relay H1 close, a circuit is completed for magnet 25 of recording means ES1, and punch 26 of recording means ES1 perforates the tape. It is to be noted that punch 26 of recording means ET1 also perforates tape 11, since magnet 25 of recording means ET1 becomes energized over its previously traced circuit including back contact 49 of relay R1, when magnet 25 of recording means ES1 becomes energized by virtue of a circuit passing

from terminal B through back contact 9 of relay Q, back contact 51 of relay H1 and winding of magnet 25 of recording means ES1 to terminal C. When relay P picks up, and relay Q is picked up by virtue of its pick-up circuit, the energizing circuits for relay P, recording device M, and recording means ES1 and ET1 are opened. Also, the energizing circuit for the operating mechanism of drum 15 is completed, and the tape is moved to permit a subsequent record to be made. Then, when relay P releases, relay Q is held energized over its stick circuit which now serially includes front contacts 28, 32, 36, 38, 40, 42, 44 and 46 of relays R4, H3, H2, H4, R5, R2, R6 and R3, respectively, and back contacts 31 and 35 of relays R1 and S1, respectively.

The tape at this time indicates that section T1 is occupied, that signal S1 is indicating proceed and the date and time at which the signal S1 changed to proceed.

When the train enters section T2 and relay R2 becomes released, the apparatus operates in a manner similar to the operation when relays R1 and H1 released. The stick circuit for relay Q is opened when front contact 42 of relay R2 opens; relay Q releases and back contact 9 of relay Q closes to complete the energizing circuits for relay P and recording device M. As back contacts 43 and 55 of relay R2 close, the energizing circuits for magnet 25 of recording means ET1, ET2 and ES1 are completed and punches 26 of recording means ET1, ET2 and ES1 perforate the tape 11. When relays P and Q pick up, magnet 20 of the operating mechanism for tape 15 is also energized, and tape 11 is moved forward its predetermined distance. Relay P releases, and relay Q is held energized by virtue of its stick circuit which serially includes front contacts 28, 32, 36, 38, 40, 44 and 46 of relays R4, H3, H2, H4, R5, R6 and R3, respectively, and back contacts 31, 35 and 43 of relays R1, H1 and R2, respectively.

The tape at this time indicates that sections T1 and T2 are occupied, that signal S1 is indicating proceed, and the time and date at which track section T2 became occupied.

The control circuits for signals S usually provide that a signal, which has been indicating proceed to its associated approach section, change to stop when the detector section is entered by the train. Therefore, when the train enters track section T2 and relay R2 becomes deenergized, signal S1 changes to stop and closes contact 5 so that indication relay H1 becomes picked up. When relay H1 picks up and opens back contacts 35 and 41, the stick circuit for relay Q is opened, relay Q becomes released, front contacts 58 and 59 open, and back contact 9 closes to complete the energizing circuits for relay P and recording device M. Recording device M becomes energized and stamps the date and time upon tape 11. Magnets 25 of recording means ET1 and ET2 are also energized by virtue of circuits previously traced and including back contact 49 of relay R1 and back contact 55 of relay R2, respectively. When relay P picks up, and relay Q is picked up over its pick-up circuit, the energizing circuit for magnet 20 of the operating mechanism for drum 15 is completed, and the drum is moved so as to move tape 11 its predetermined distance. Then, when relay P releases, and since front contact 34 of relay H1 is now closed, relay Q is held energized by virtue of its stick circuit which now includes front contacts 28, 32, 34, 36, 38, 40, 44 and 46 of relays R4, H3, H1, H2, H4, R5, R6 and R3, respectively, and back contacts 31 and 43 of relays R1 and R2, respectively.

The tape now indicates that track sections T1 and T2 are occupied, and that signal S1 has returned to its normal, or "stop", position.

When the train vacates track section T1, relay R1 becomes reenergized and picks up to open back contacts 31 and 49. The stick circuit for relay Q is opened when back contact 31 of relay R1 opens; relay Q releases and opens front contacts 58 and 59 and closes back contact 9. The energizing circuits for relay P, recording device M and recording means ET2 are now completed; tape 11 is stamped with the date and time and perforated by punch 26 of recording means ET2. When relay P picks up and completes the pick-up circuit for relay Q, relay Q picks up, opening back contact 9 and closing front contacts 58 and 59. Magnet 20 of the operating mechanism for drum 15 now becomes energized, the tape is moved its predetermined distance, and when relay P releases, relay Q is held energized by virtue of its stick circuit which now includes front contacts 28, 30, 32, 34, 36, 38, 40, 44 and 46 of relays R4, R1, H3, H1, H2, H4, R5, R6 and R3, respectively, and back contact 43 of relay R2.

The tape now indicates that track section T2 is occupied; that the remainder of the sections are unoccupied; and that all the signals are in their normal, or stop, position.

When the train enters track section T3, and relay R3 becomes deenergized, recording device M, recording means ET2 and ET3 and the operating mechanism for drum 15 become energized; tape 11 is stamped with the time and the date, perforated by punches 26 of recording means ET2 and ET3, and moved its predetermined distance by the operating mechanism for drum 15. The tape now indicates that sections T2 and T3 are occupied. Relay Q is now held energized by virtue of its stick circuit in which back contact 47 of relay R3 replaces front contact 46 of relay R3 in the stick circuit last traced for relay Q.

When the train vacates section T2 and relay R2 picks up, recording means M, recording means ET3 and the operating mechanism for drum 15 are energized; and the tape 11 is stamped with the time and date, perforated by punch 26 of recording means ET3, and moved its predetermined distance by the operating mechanism for drum 15. Relay Q is now held energized by virtue of its stick circuit which includes back contact 47 of relay R3 and the front contact of each track relay and signal indication relay except the track relay R3. The tape now indicates all sections but section T3 are unoccupied. Then, when the train vacates track section T3 and relay R3 becomes energized, the recording device M and the operating mechanism for drum 15 become energized; and tape 11 is stamped with the date and time and moved forward its predetermined distance. Relay Q is held energized by virtue of its stick circuit serially including the front contacts of the track relays and signal indication relays. The tape now indicates that all track sections are unoccupied and that all apparatus has returned to its normal condition.

Although I have herein described but a few of the operations of the apparatus embodying my invention, it will be readily apparent as to how the apparatus will function for any possible train movement.

Referring now to Fig. 3, the part of tape 11

here shown bears a record which may be explained as follows: At 1 P. M. of February 8, 1938, section T1 became occupied by a train, and four seconds after 1 P. M. signal S1 was caused to indicate proceed. The tape further records that the train entered track section T2 one minute and twenty seconds after 1 P. M.; that one minute and twenty-four seconds after 1 P. M. signal S1 changed to its "stop" position; and that at 1:01:40 the train vacated section T1. Furthermore, the time the train entered track section T3 is established at 1:02:40, the train vacated section T2 at 1:03:00, and vacated track section T3 at 1:04:20. The tape therefore discloses a complete record of the progress of the train through the track sections T1, T2 and T3, and of the operation of signal S1. And as the time is stamped opposite each perforation of the tape, the speed of the train approaching the intersection may be easily calculated if desired.

In the event of a collision at intersection Z, the responsibility for such collision may readily be determined since the time of arrival of the trains in their respective approach and detector sections is noted, as well as the positions of the signals governing traffic along these tracks.

One advantage of apparatus embodying my invention is the provision of means to utilize a normally stationary tape to record the progress of trains and operation of signals, and to move this tape only after each change in the traffic controlled apparatus has been recorded. This permits legible and distinguishing records to be made of each successive operation of the traffic controlled apparatus with minimum use of the recording tape.

Although I have herein shown and described only one form of apparatus embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. In combination, a stretch of railway track having a track circuit including a track relay, a normally energized quick releasing stick relay, a first stick circuit for said stick relay including a front contact of said track relay, a second stick circuit for said stick relay including a back contact of said track relay, a normally deenergized slow acting relay, an energizing circuit for said slow acting relay including a back contact of said stick relay, a pick-up circuit for said stick relay including a front contact of said slow acting relay, a record tape, a mechanism effective when energized to move said tape a predetermined distance, and a circuit for energizing said mechanism serially including a front contact of said stick relay and a front contact of said slow acting relay.

2. In combination, a stretch of railway track having a track circuit including a track relay, a normally energized quick releasing stick relay, a first stick circuit for said stick relay including a front contact of said track relay, a second stick circuit for said stick relay including a back contact of said track relay, a normally deenergized slow acting relay, an energizing circuit for said slow acting relay including a back contact of said stick relay, a pick-up circuit for said stick relay including a front contact of said slow acting relay, a record tape, recording means effective when energized to record the condition of said track relay on said tape, and an energizing circuit for said recording means serially including a back contact of said stick relay and a back contact of said track relay.

3. In combination, a stretch of railway track having a track circuit including a track relay, a normally energized quick releasing stick relay, a first stick circuit for said stick relay including a front contact of said track relay, a second stick circuit for said stick relay including a back contact of said track relay, a normally deenergized slow acting relay, an energizing circuit for said slow acting relay including a back contact of said stick relay, a pick-up circuit for said stick relay including a front contact of said slow acting relay, a record tape, a device effective when energized to stamp the date and time on said tape, and an energizing circuit for said device including a back contact of said stick relay.

4. In combination, a stretch of railway track provided with a track relay, a normally deenergized slow acting relay, a stick relay, an energizing circuit for said slow acting relay including a back contact of said stick relay, a pick-up circuit for said stick relay including a front contact of said slow acting relay, a stick circuit for said stick relay including a front or a back contact of said track relay, a record tape, a device effective when energized to record the date and time on said tape, a circuit including a back contact of said stick relay for energizing said device, recording means effective when energized to record the condition of said track relay on said tape, a circuit including a back contact of said stick relay and a back contact of said track relay to energize said recording means, a mechanism effective when energized to move said tape a predetermined distance, and a circuit serially including a front contact of said stick relay and a front contact of said slow acting relay to energize said mechanism.

5. In combination, a stretch of railway track provided with a track relay, a signal associated with said stretch and said signal provided with a signal indication relay, a slow acting relay, a stick relay, an energizing circuit for said slow acting relay including a back contact of said stick relay, a pick-up circuit for said stick relay including a back contact of said slow acting relay, a stick circuit for said stick relay including a front or a back contact of said track relay and a front or a back contact of said signal indication relay, a record tape, recording means effective when energized to record on the tape the condition of said track relay and said signal indication relay, circuit means for energizing said recording means including a back contact of said stick relay in series with a back contact of said track relay and said signal indication relay in multiple, a device effective when energized to record on the tape the time and date, a circuit for energizing said device including a back contact of said stick relay, a mechanism effective when energized to move said tape a predetermined distance, and a circuit for energizing said mechanism including a front contact of said stick relay and a front contact of said slow acting relay.

6. In combination, a stretch of railway track provided with a plurality of track relays, a normally deenergized slow acting relay, a quick releasing stick relay, an energizing circuit for said slow acting relay including a back contact of said stick relay, a pick-up circuit for said stick relay including a front contact of said slow acting relay,

a stick circuit for said stick relay serially including a front or a back contact of each track relay, a record tape, recording means effective when energized to record on the tape the condition of each of said track relays, circuit means for energizing said recording means including a back contact of said stick relay in series with a back contact of each of said track relays in multiple, a device effective when energized to record on the tape the date and time, a circuit for energizing said device including a back contact of said stick relay, a mechanism effective when energized to move said tape a predetermined distance, and a circuit for energizing said mechanism serially including a front contact of said stick relay and a front contact of said slow acting relay.

7. In combination, a stretch of railway track provided with a track relay and said relay capable of being operated to a deenergized position as well as to an energized position, a record tape, a device effective when energized to stamp on said tape the date and time, means to momentarily energize said device when said relay operates to its deenergized or energized position, recording means effective when energized to record mechanically on said tape the position of the track relay, means to momentarily energize said recording means when said track relay operates to its deenergized position, a mechanism effective when energized to move said tape a predetermined distance, and means governed by said relay to momentarily energize said mechanism subsequent to the energization of said device and said recording means.

8. In combination, a stretch of railway track provided with a track relay, a stick relay normally energized over a stick circuit including a front or a back contact of said track relay, a slow releasing relay, a pick-up circuit for said stick relay including a front contact of said slow releasing relay, an energizing circuit for said slow releasing relay including a back contact of said stick relay, a recording mechanism including a record tape for recording the traffic conditions upon said stretch and controlled by said stick relay, and means for moving said record tape governed jointly by said stick relay and said slow releasing relay.

9. In combination, a stretch of railway track provided with traffic controlled apparatus normally occupying one position but capable of being operated to another position, said apparatus being provided with contacts closed in each position of the apparatus, a stick relay, a stick circuit for said stick relay including a contact of said apparatus closed in said one position of said apparatus or a contact of said apparatus closed in said other position of said apparatus, a slow acting relay, a pick-up circuit for said stick relay including a front contact of said slow acting relay, an energizing circuit for said slow acting relay including a back contact of said stick relay, a recording tape, recording means effective when energized to record the position of said traffic controlled apparatus on said tape, circuit means for energizing said recording means including a back contact of said stick relay, a mechanism effective when energized to move said tape, and an energizing circuit for said mechanism including a front contact of said stick relay and a front contact of said slow acting relay.

10. In combination, a stretch of railway track provided with traffic controlling apparatus normally occupying one position but capable of being operated to another position, said apparatus being provided with contacts closed in each position of the apparatus, a stick relay, a stick circuit for said stick relay including a contact of said apparatus closed in said one position of said apparatus or a contact of said apparatus closed in said other position of said apparatus, a slow acting relay, a pick-up circuit for said stick relay including a front contact of said slow acting relay, an energizing circuit for said slow acting relay including a back contact of said stick relay, a recording tape, recording means effective when energized to record the position of said traffic controlling apparatus on said tape, circuit means for energizing said recording means including a back contact of said stick relay, a mechanism effective when energized to move said tape, and an energizing circuit for said mechanism including a front contact of said stick relay and a front contact of said slow acting relay.

11. In combination, control apparatus normally occupying one position but capable of being operated to another position, said apparatus having a contact closed in each position of the apparatus, a stick relay, a stick circuit for said stick relay including a contact of said apparatus closed in said one position of said apparatus or a contact of said apparatus closed in said other position of said apparatus, a slow acting relay, an energizing circuit for said slow acting relay including a back contact of said stick relay, a pick-up circuit for said stick relay including a front contact of said slow acting relay, a recording tape, recording means effective when energized to record on said tape the position of said apparatus, circuit means for energizing said recording means including a back contact of said stick relay, a mechanism effective when energized to move said tape, and an energizing circuit for said mechanism including a front contact of said stick relay and a front contact of said slow acting relay.

12. In combination, a stretch of railway track divided into a plurality of track sections each provided with a track relay capable of operating to a deenergized as well as an energized position, a normally stationary recording tape, recording means effective when energized for recording on said tape the position of each of said relays, means for momentarily energizing said recording means effective whenever any one of said track relays operates to its deenergized or energized position, a slow acting relay controlled whenever any one of said track relays operates to its deenergized or energized position, operating means effective when energized for moving said tape a predetermined distance, and means governed by said slow acting relay for momentarily energizing said operating means.

13. In combination, a stretch of railway track divided into a plurality of consecutive track sections each having a track relay capable of operating to a deenergized and an energized position, a record tape, a first device effective when energized to make a record on said tape, means effective to energize said first device when any one of said track relays operates to its deenergized or energized position, a plurality of second devices one for each track relay effective when energized to record the deenergized position of its associated track relay, means effective to energize such second devices associated with such track relays as are in the deenergized position when any one of said track relays operates to its deenergized or energized position, a mechanism effective when energized to move said tape a predetermined distance, and means governed by the operation of

any one of said track relays to its deenergized or energized position to momentarily energize said mechanism subsequent to the energization of said first device and said second devices.

14. In combination, a section of railway track, a normally energized relay which becomes momentarily deenergized when a train enters or vacates said section, a normally stationary recording tape, a first device effective when energized to make a record on said tape, means effective to momentarily energize said first device when said relay becomes deenergized, recording means effective when energized to make a record on said tape, means including said relay effective to energize said recording means when said train enters said section, other means effective to maintain said recording means deenergized when said train vacates said section, operating means effective when energized to move said tape a predetermined distance, and means effective to momentarily energize said operating means when said relay becomes reenergized.

15. In combination, a stretch of railway track divided into a plurality of consecutive track sections, a normally energized relay which is momentarily deenergized when a train enters or vacates any one of said sections, a normally stationary recording tape, a first recording device effective when energized to make a record on said tape, means effective to momentarily energize said first recording device when said relay becomes deenergized, a plurality of second recording devices one for each section effective when energized to make a record on said tape, means including said relay effective to energize only such second recording devices as are associated with such track sections occupied by said train, operating means effective when energized to move said tape a predetermined distance, and means effective for momentarily energizing said operating means when said relay becomes reenergized.

16. In combination, a stretch of railway track divided into a plurality of track sections, a normally energized relay which is momentarily deenergized when any one of said track sections becomes occupied or vacated, a normally stationary recording tape, a first recording device effective when energized to make a record on said tape, means effective to momentarily energize said first device when said relay becomes deenergized, a plurality of second recording devices one for each section effective when energized to make a record on said tape, means including said relay effective to energize only such second recording devices as are associated with occupied track sections, operating means effective when energized to move said tape a predetermined distance, and means effective to momentarily energize said operating means when said relay becomes reenergized.

17. In combination, a stretch of railway track divided into a plurality of consecutive track sections, a normally stationary recording tape, a plurality of recording means one for each section capable when energized to make a record on said tape, a normally energized relay which becomes momentarily deenergized on a change in traffic conditions in any one of said sections, means effective when said relay is deenergized to cause each of said recording means to be energized or deenergized depending upon the traffic conditions in said stretch, operating means effective when energized to move said tape a predetermined distance, and means effective for momentarily energizing said operating means when said relay becomes reenergized.

18. In combination, a stretch of railway track provided with a signal and divided into an approach and a detector section, a normally stationary recording tape, a plurality of recording means one for each section and one for said signal each capable when energized to make a record on said tape, a normally energized relay which becomes momentarily deenergized when the condition of said signal changes or on a change in traffic conditions in either of said sections, means effective when said relay is deenergized to cause each of said recording means to be energized or deenergized depending upon traffic conditions in said stretch, operating means effective when energized for moving said tape a predetermined distance, and means effective for momentarily energizing said operating means when said relay becomes reenergized.

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