

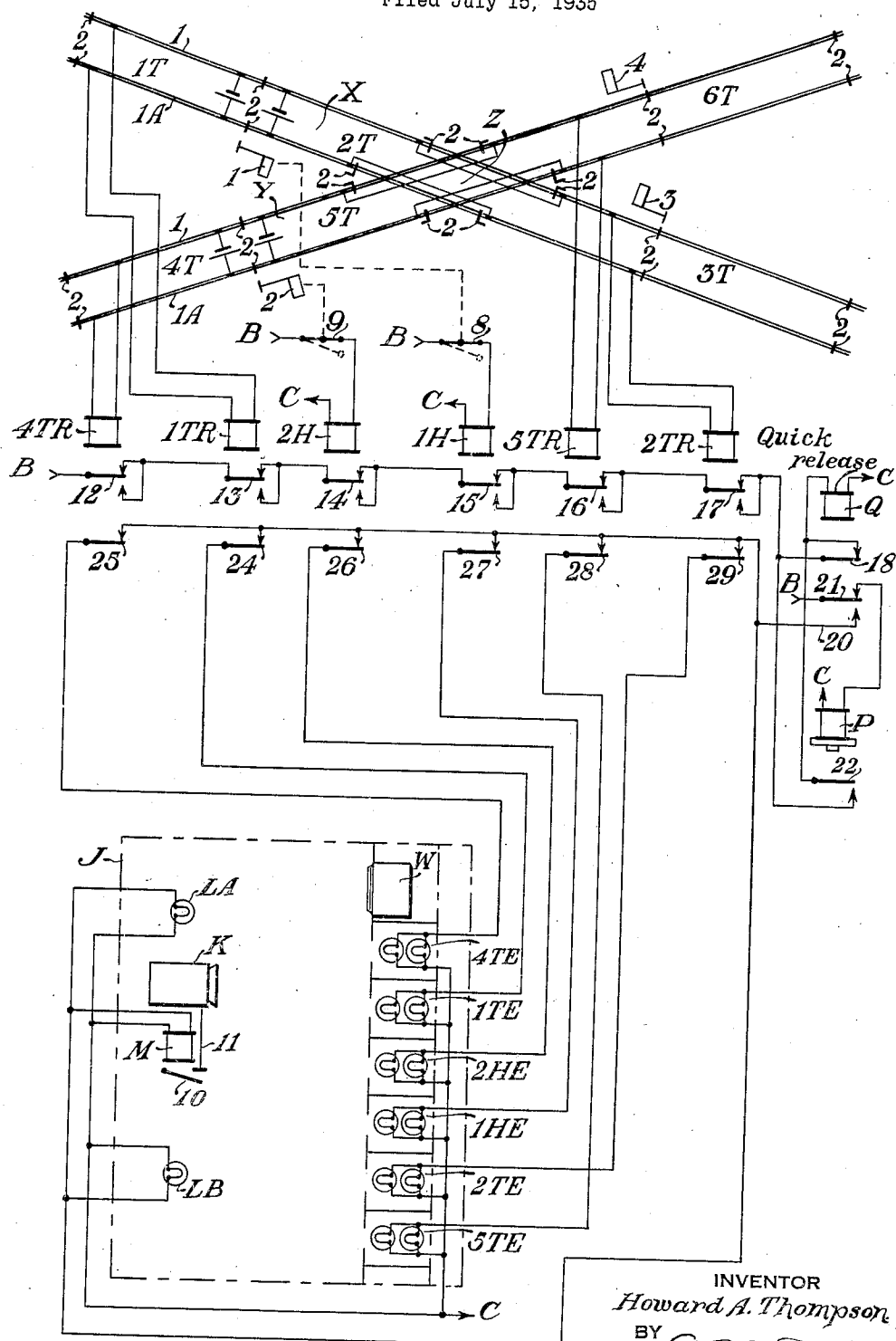
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RECORDING MECHANISM FOR RAILWAY TRAFFIC CONTROLLING APPARATUS

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RECORDING MECHANISM FOR RAILWAY
TRAFFIC CONTROLLING APPARATUSHoward A. Thompson, Edgewood, Pa., assignor
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My invention relates to recording mechanism for railway traffic controlling apparatus. More particularly, it relates to mechanism for photographically recording the progress and speed of trains along a railway, and to mechanism for photographically recording signal operations.

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

The accompanying drawing is a diagrammatic view illustrating one form of recording mechanism embodying my invention as applied to a layout wherein one track is intersected by another track.

Referring now to the drawing, the reference characters X and Y designate two intersecting railway tracks. The rails 1 and 1A of track X are divided by means of insulated joints 2 into track sections 1T, 2T and 3T. Similarly, the rails 1 and 1A of track Y are divided by means of insulated joints 2 into track sections 4T, 5T and 6T. The sections 1T, 3T, 4T and 6T, I shall term approach sections, and sections 2T and 5T, I shall term detector sections. The detector sections 2T and 5T include the intersection Z.

Each track section is provided with a track circuit including a battery connected across the rails at one end of the section and a track relay designated by the reference character R with a prefix corresponding to the reference character of the associated section, connected across the rails at the other end of the section.

The reference characters 1 and 3 designate traffic controlling devices, here shown as signals, for governing traffic moving over track X, and the reference characters 2 and 4 designate similar signals for governing traffic moving over track Y.

Signals 1 and 2 control contacts 8 and 9, respectively, in such a manner that each contact is closed only when the associated signal is in its stop condition as shown in the drawing.

The reference characters 1H and 2H designate two signal indication relays which are controlled by the contacts 8 and 9, respectively, each of these relays being energized only when the associated contact is closed.

The reference character Q designates a relay having a quick release characteristic so that such relay will release during the time the movable contact of an ordinary relay is moving between its front and back contact points.

Associated with the relay Q is a repeating relay designated by the reference character P and having a slow release characteristic. The slow

release characteristic of the relay P is utilized for establishing a pick-up circuit for the relay Q a measured interval of time after the relay Q becomes released.

The reference character J designates a light-proof chamber containing a camera K, a magnet M having an armature 10 for actuating a shutter lever 11 of the camera K, a clock W, a pair of indication lamps for each track and signal indication relay designated by the reference character E with a distinguishing prefix, and a pair of lamps LA and LB for illuminating the face of the clock and the interior of the chamber when the shutter 11 is actuated.

The camera K is located at the proper focal length from the face of the clock W and from the group of indication lamps and this camera is of the type wherein each time the shutter is actuated the exposed film will be replaced by unexposed film. By this means, a continuous photographic record is made of any change in traffic conditions in each track section and of any change in the condition of each signal together with the time at which such changes take place.

The manner in which the apparatus operates will best be understood by tracing the circuits and describing the operation of the various parts simultaneously.

With all apparatus in the normal condition as shown in the drawing, I shall assume that a train moving from left to right on track X enters section 1T so that track relay 1TR becomes released. When relay 1TR is released, relay Q will be released by the opening of a stick circuit which passes from terminal B of a suitable source of energy, through front contacts 12, 13, 14, 15, 16, 17 and 18 of relays 4TR, 1TR, 2H, 1H, 5TR, 2TR and Q, respectively, and the winding of relay Q, to terminal C of the same source of current. When relay Q is released, wire 20 will be energized by the closing of the back point of contact 21 of relay Q, and slow releasing relay P will be deenergized by the opening of the front point of contact 21 of relay Q. When wire 20 is energized, illuminating lamps LA and LB will be energized, by circuits easily traced, to illuminate the face of the clock W and the group of indication lamps; all indication lamps except lamp 1TE will be lighted by virtue of an easily traced circuit for each lamp which includes a front contact of the associated indication relay; and magnet M will be energized to cause its armature 10 to come into engagement with shutter lever 11 of the camera K. When the shutter

lever 11 is actuated, the camera K will photograph the face of the clock and the group of indication lamps which photograph will show the position of the hands of the clock W and the condition of each indication lamp. As stated above, all indication lamps except lamp 1TE will be illuminated at this time because front contact 24 of relay 1TR will be opened and front contacts 25, 26, 27, 28 and 29 of relays 4TR, 2H, 1H, 5TR and 2TR, respectively, will be closed. This photograph will therefore show that section 1TE is occupied by a train; that all other sections are unoccupied; and that all signals are in their normal "stop" condition.

On the supply of current to the wire 20 as a result of the release of the relay Q the filaments of the lamps which are energized from this circuit do not reach their full degree of incandescence instantaneously, although they do so very quickly.

Likewise on the supply of current to the wire 20 the magnet M does not operate instantaneously to actuate the shutter of the camera K. Instead operation of the magnet M will be delayed for the time interval required for the magnetic flux created by the flow of current in the winding of the magnet M to build up to a value sufficient to pick up the armature 10.

During the time interval required to produce operation of the magnet M the filaments of the lamps are being heated with the result that they reach substantially their full degree of incandescence before the magnet M actuates the shutter lever 11 to open the shutter of the camera.

Accordingly when the camera is operated to photograph the indication lamps these lamps will be fully lighted, while the lamps LA and LB for illuminating the face of the clock W will also be fully lighted.

When relay P becomes released so that its back contact 22 is closed, relay Q will be picked up by virtue of a pick-up circuit which passes from terminal B through front point of contact 12 of relay 4TR, back point of contact 13 of relay 1TR and thence through the front points of contacts 14, 15, 16 and 17 of relays 2H, 1H, 5TR and 2TR, respectively, to relay Q and terminal C. When relay Q is picked up, wire 20 will be deenergized by the opening of the back point of contact 21 of relay Q and all apparatus in the chamber J will return to its initial deenergized condition.

It is apparent, therefore, that on the release of the relay Q the apparatus in the chamber J will be energized for a time interval equal to the time required for the relay P to release. The relay P is chosen so that the release time of the relay is such that the magnet M is operated to actuate the shutter lever 11 for the camera K before the back contact of the relay becomes closed.

When the relay P releases, a circuit to the winding of the relay Q is established with the result that the relay Q picks up and establishes a stick circuit to its own winding. When the relay Q picks up it also interrupts the supply of current to the circuit leading to the apparatus in the chamber J, while it establishes the circuit to the relay P causing it to pick up.

This sequence of operation of the relays Q and P is repeated on each subsequent interruption of the circuit to the winding of the relay Q. That is, each time the relay Q is released, current is supplied to the circuit leading to the apparatus in the chamber J for a period of time

equal to that required for the relay P to release, whereupon the relay Q picks up and interrupts the supply of current to the circuit leading to the apparatus in the chamber J.

Although for the sake of simplicity I have not shown in the drawing the control circuits for the signals, such signals usually will be so controlled as automatically to indicate "proceed" when the track relay for the associated approach section is released provided, of course, that traffic conditions in the vicinity of the intersection Z are such as to make such proceed indication safe for a train accepting the indication.

Therefore, when relay 1TR becomes deenergized, signal 1 will indicate "proceed" and will open contact 8 so that indication relay 1H will become released. When relay 1H is released, relay Q will become momentarily released to actuate the camera and to illuminate the interior of the chamber in a manner similar to that just described for the release of relay 1TR. The photograph taken by the camera at this operation will indicate the time and will show all indication lamps illuminated except lamps 1TE and 1HE which indicates that the train occupying section 1T has received a proceed indication at signal 1.

When the train enters section 2T so that relay 2TR becomes released, relay Q will again be momentarily released to energize the illuminating lamps LA and LB; to energize all indicating lamps except 1TE, 1HE and 2TE; and to actuate the shutter of the camera K. The third photograph, therefore, will indicate the time and will indicate that the train has just entered section 2T.

Signal 1 will be so controlled, by circuits which are well-known and which are not shown in the drawing, as to return to its "stop" condition when the train enters the detector section 2T. When signal 1 returns to its stop condition, relay 1H will again be energized by the closing of contact 8. During the passage of contact 15 of relay 1H from its back to its front point, relay Q will be momentarily released to cause a fourth photograph to be taken of the clock and the group of indication lamps. At this time, all lamps will be illuminated except lamps 1TE and 2TE, to indicate that the train is bridging sections 1T and 2T; that all other sections are unoccupied; and that all signals are displaying their normal or stop indication.

When the train departs from section 1T so that relay 1TR becomes energized, relay Q will again be momentarily deenergized to cause a fifth photograph to be taken which photograph will indicate the time; that all sections except section 2T are unoccupied; and that all signals are displaying the stop indication.

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

Since the exact time is recorded on each photograph, my invention may be used to determine the amount of time consumed by a train in traversing any one of several track sections, from which record the speed of the train may be readily determined. Furthermore, in the event of a collision at the intersection between trains on the intersecting tracks the responsibility for such collision may very readily be determined since the time of arrival of each train in the respective approach and detector sections will be recorded,

together with the indications displayed by the signals governing the colliding trains.

Although, for the sake of simplicity, I have not shown the signals 3 and 4 as being provided with indication relays and lamps, it will be understood that these signals usually will also be so equipped.

It will be seen that operation of the mechanism for making a photographic record of traffic conditions at the track intersection is initiated on the release of the quick releasing relay Q with the result that operation of the mechanism contained in the chamber J is started promptly on a change in the traffic conditions at the track intersection. This enables the mechanism to complete its cycle of operation at the earliest possible time, which is desirable since on movement of a train through the intersection, the mechanism is required to make several photographs, and if the time required to complete each cycle of operation is very long, the mechanism could not operate rapidly enough to provide the desired photographic records on movement of a fast train through the intersection.

Furthermore it will be seen that once the relay Q is released to initiate operation of the mechanism in the chamber J, the slow releasing relay P operates to prevent the pick up of the relay Q, and thereby prevents the interruption of the operation of the mechanism in the chamber J until that mechanism has had an opportunity to complete its cycle of operation.

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 section of railway track, a normally deenergized indication lamp for said section, a camera focused with respect to said lamp, a relay momentarily operated when a train enters or leaves said section, means effective to maintain said lamp deenergized when said train enters the section, other means including said relay effective to energize said lamp momentarily when said train leaves the section, and means for actuating the shutter of said camera when said relay is operated.

2. In combination, a section of railway track, a visual indicator, a clock, a normally energized relay which becomes momentarily deenergized when a train enters or leaves said section, means effective when said relay is deenergized to cause said visual indicator to assume one or another condition depending upon whether said section is occupied or unoccupied respectively by such train, and means controlled by said relay for making a photographic record of the condition of said visual indicator and of the time indicated by said clock.

3. In combination, a section of railway track, a first lamp for indicating traffic conditions in said section, a clock, another lamp for illuminating the face of said clock, a camera disposed at the proper focal length from said first lamp and the face of said clock, said first lamp and said clock as well as said camera and said other lamp being enclosed in a lightproof container, a relay responsive to traffic conditions in said section, and means including said relay for simultaneously controlling said first lamp and said other lamp as well as the shutter of said camera.

4. In combination, a stretch of railway track provided with a signal and divided into an approach section and a detector section, a plurality of lamps one for said signal and one for each section, a camera disposed at the proper focal length from said plurality of lamps, 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 lamps to be energized or deenergized depending upon traffic conditions in said stretch, and means including said relay for controlling the shutter of said camera.

5. In combination, a section of railway track having a track circuit including a track relay, a normally energized quick releasing stick relay, two stick circuits for said stick relay each including its own front contact, one stick circuit including a front contact of said track relay and the other stick circuit including a back contact of said track relay, a slow releasing repeating relay for said stick relay, two pick-up circuits for said stick relay each including a back contact of said repeating relay, one pick-up circuit including a front contact of said track relay and the other pick-up circuit including a back contact of said track relay, a lamp controlled by said track relay, and a camera focused with respect to said lamp and controlled by said stick relay.

6. In combination, a section of railway track including a track circuit having a track relay, another relay momentarily deenergized when said track relay changes its condition in response to a train entering or leaving said section, a lamp, a circuit for said lamp including a front contact of said track relay and a back contact of said other relay, and a camera focused with respect to said lamp and controlled by a back contact of said other relay.

7. In combination, a stretch of railway track intersected by another track each divided into a plurality of sections, a plurality of indication relays one for each section and each such indication relay having a normal condition but capable of assuming a different condition when the associated section becomes occupied by a train, an indication lamp for each indication relay, another relay momentarily deenergized when any of said indication relays change from one condition to the other condition, means including a back contact of said other relay for causing each lamp to be energized if the associated indication relay occupies said normal condition but to be deenergized if the associated indication relay occupies said different condition, and a camera focused with respect to said plurality of lamps and controlled by a back contact of said other relay.

8. In combination, a stretch of railway track intersected by another stretch of railway track, a signal for each track; two indication relays one for each signal, each such relay having a normal condition but capable of assuming a different condition when the aspect of the associated signal changes; an indication lamp for each signal, another relay momentarily deenergized when either of said two indication relays changes from one condition to the other condition, means including a back contact of said other relay for causing an indication lamp to be energized if the associated indication relay occupies said normal condition but to be deenergized if the associated indication relay occupies

said different condition, and a camera controlled by a back contact of said other relay and focused with respect to said two indication lamps.

9. In combination, a plurality of sections of railway track each having associated therewith a visual indicator, a clock, 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 visual indicators to assume one or another condition depending upon whether the track section with which the indicator is associated is occupied or unoccupied by a train, and means controlled by said relay and operative when said relay becomes deenergized for making a photographic record of the condition of said visual indicators and of the time indicated by said clock.

10. In combination, a section of railway track having associated therewith a visual indicator capable of giving one indication when said track section is occupied and of giving another indication when said track section is unoccupied, a camera focused with respect to said visual indicator, an electroresponsive device controlling the shutter of said camera, a supply circuit, means operative on a change in traffic conditions in said section for momentarily interrupting said supply circuit, a control relay operative when and only when energized to establish a circuit to supply current from said supply circuit to its own winding, said control relay being operative when deenergized to establish a circuit to supply current to said electroresponsive device, an operating relay having a contact having a normal position and being movable therefrom to an operated position in which it completes a circuit to supply current to the winding of said control relay, the circuit to the winding of the operating relay being controlled by the control relay in such a manner that on release of the control relay the movable contact of the operating relay is caused to move from its normal position to its operated position, whereby said control relay when released is caused to pick up after a period of time equal to that required for the movable contact of the operating relay to move from its normal position to its operated position.

11. In combination, a stretch of railway track divided into a plurality of track sections each having associated therewith a visual indicator capable of giving one indication when said track section is occupied and of giving another indication when said track section is unoccupied, a camera focused with respect to said visual indicators, an electroresponsive device controlling the shutter of said camera, a supply circuit, means operative when a train enters or leaves any one of said track sections for momentarily interrupting said supply circuit, a control relay operative when and only when energized to establish a circuit to supply current from said supply circuit to its own winding, said control relay being operative when deenergized to establish a circuit to supply current to said electroresponsive device, an operating relay having a contact having a normal position and being movable therefrom to an operated position in which it completes a circuit to supply current to the winding of said control relay, the circuit to the winding of the operating relay being controlled by the control relay in such a manner that on release of the control relay the movable contact of the operating relay is caused to move from its normal position to its operated position, whereby said

control relay when released is caused to pick up after a period of time equal to that required for the movable contact of the operating relay to move from its normal position to its operated position.

12. In combination, a plurality of sections of railway track each having a lamp associated therewith, a camera focused with respect to said lamps, an electroresponsive device controlling the shutter of said camera, a supply circuit, each of said track sections having associated therewith means responsive to traffic conditions in said section for interrupting said supply circuit and for also controlling a circuit for supplying current to the lamp associated with such section, a quick releasing relay having means operative when and only when said relay is energized to establish a circuit to supply current from said supply circuit to its own winding to maintain said relay energized, said relay also having means controlling the supply of current to said electroresponsive device and the supply of current to a circuit through which current may be supplied to said lamps, a slow acting relay having a movable contact having a normal position and an operated position, said slow acting relay being controlled by said quick releasing relay in such a manner that the contact of the slow acting relay is caused to move to its operated position when the quick releasing relay is deenergized and so that said contact is caused to move from its operated position to its normal position when said quick releasing relay is energized, the contact of the slow acting relay being operative on movement to its operated position to establish a circuit to supply current to the winding of said quick releasing relay.

13. In combination, a plurality of sections of railway track each having a lamp associated therewith, a camera focused with respect to said lamps, an electroresponsive device controlling the shutter of said camera, a supply circuit, each of said track sections having associated therewith means responsive to traffic conditions in said section for interrupting said supply circuit and for also controlling a circuit for supplying current to the lamp associated with such section, a quick releasing relay having means operative when and only when said relay is energized to establish a circuit to supply current from said supply circuit to its own winding to maintain said relay energized, said relay also controlling the supply of current to said electroresponsive device, and means controlled by said relay and operative on deenergization of said relay to establish a circuit to supply current to the winding of said relay only after a predetermined time interval, said last named means being also operative when said relay is energized to interrupt said circuit, whereby on deenergization of said quick releasing relay it is maintained deenergized for a predetermined time interval and is thereafter energized by way of a circuit which is interrupted when said relay becomes picked up.

14. In combination, a plurality of sections of railway track each having a lamp associated therewith, a camera focused with respect to said lamps, an electroresponsive device controlling the shutter of said camera, a supply circuit, each of said track sections having associated therewith means responsive to traffic conditions in said section for interrupting said supply circuit and for also controlling a circuit for supplying current to the lamp associated with such section, a quick releasing relay having means operative

when and only when said relay is energized to establish a circuit to supply current from said supply circuit to its own winding to maintain said relay energized, said relay also controlling the supply of current to said electroresponsive device and to said lamps, and means controlled by said relay and operative on deenergization of said relay to establish a circuit to supply current to the winding of said relay only after a pre-

determined time interval, said last named means being also operative when said relay is energized to interrupt said circuit, whereby on deenergization of said quick releasing relay it is maintained deenergized for a predetermined time interval and is thereafter energized by way of a circuit which is interrupted when said relay becomes picked up. 5

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