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L. E. SPRAY.

APPARATUS FOR THE CONTROL OF HIGHWAY CROSSING SIGNALS

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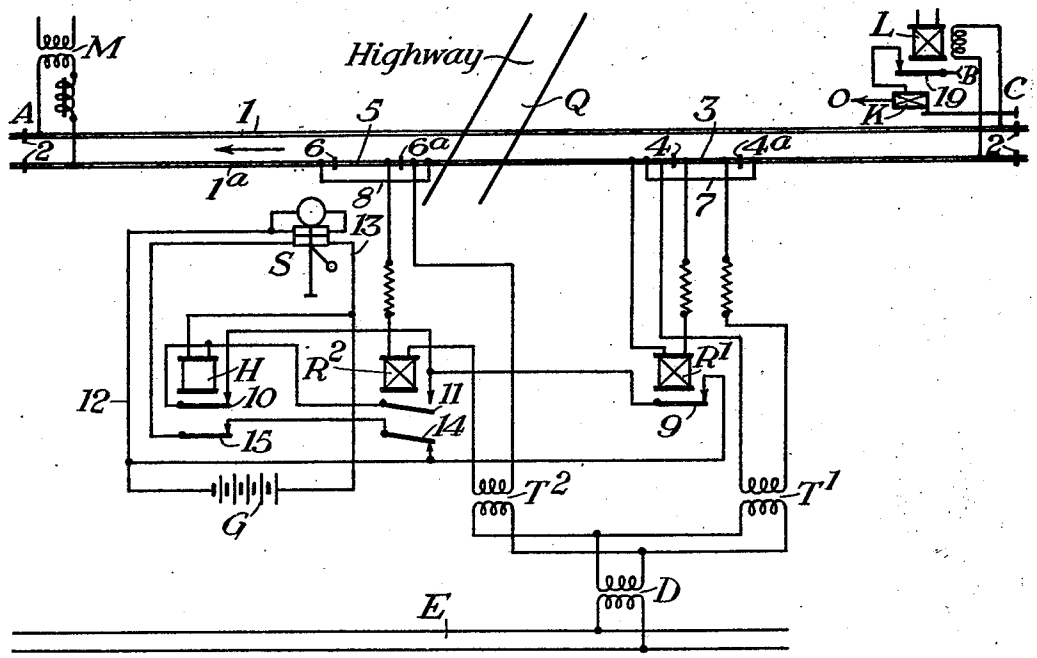


Fig. 1.

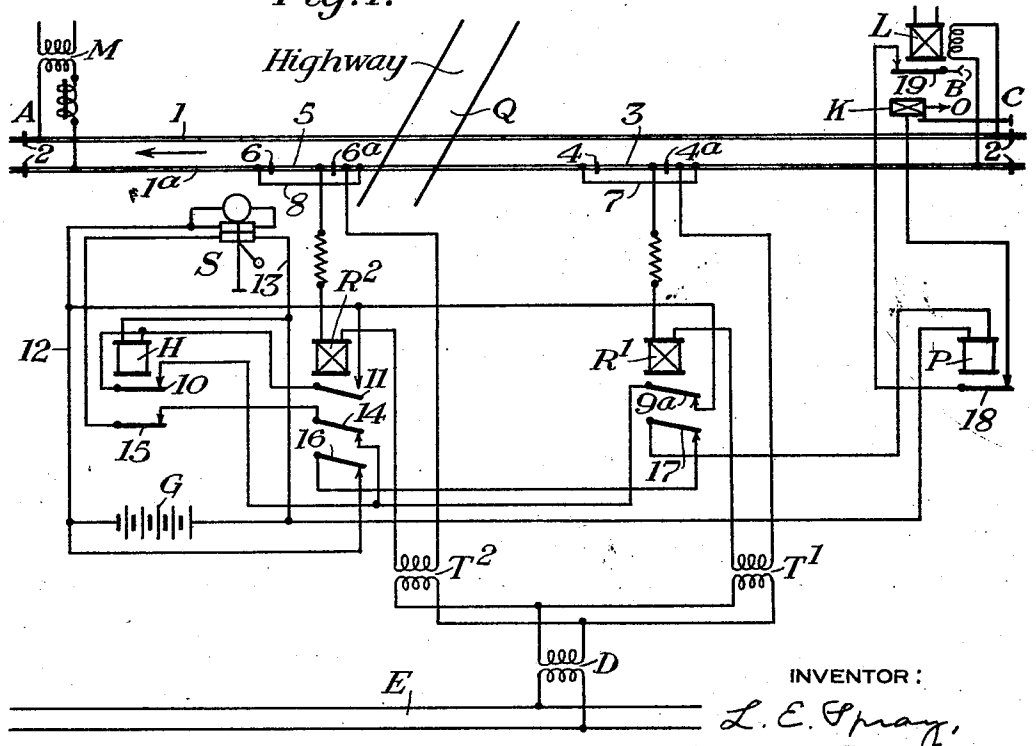


Fig. 2.

INVENTOR:
L. E. Spray,
by A. Z. Vendill
His Attorney

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LESTER E. SPRAY, OF WILKINSBURG, PENNSYLVANIA, ASSIGNOR TO THE UNION SWITCH & SIGNAL COMPANY, OF SWISSVALE, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

APPARATUS FOR THE CONTROL OF HIGHWAY CROSSING SIGNALS.

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My invention relates to apparatus for the control of highway crossing signals, that is, signals located adjacent the intersection of railways and highways for indicating to those using the highway whether or not a train is approaching.

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

In the accompanying drawing, Fig. 1 is a diagrammatic view showing one form of apparatus embodying my invention, and Fig. 2 is a diagrammatic view showing a modified form of apparatus also embodying my invention.

Similar reference characters refer to similar parts in each of the views.

Referring first to Fig. 1, the reference characters 1 and 1^a designate the rails of a stretch of railway track along which traffic normally moves in the direction indicated by the arrow. These rails are divided by insulated joints 2 to form a track section A—C, and the stretch of track is intersected by a highway Q at an intermediate point in this section.

At a point to the right of the highway Q, the rail 1^a is provided with a short insulated rail section 3 formed by insulated joints 4 and 4^a. Adjacent the highway Q this rail is provided with a short insulated section 5 formed by insulated joints 6 and 6^a. A bond 7 is connected around the short insulated section 3, and a bond 8 is connected around the short insulated section 5.

The reference character T^1 designates a transformer, the primary of which is constantly supplied with alternating current from a transformer D. The primary of the latter transformer is connected with a transmission line E, which in turn is connected with a suitable source of alternating current. One terminal of the secondary of transformer T^1 is connected with the insulated rail section 3, and the other terminal of this secondary is connected with the rail 1^a. A control relay R^1 has one terminal connected with the insulated section 3 and its other terminal connected with the rail 1^a. In other words, the secondary of transformer T^1 is connected with the rail around the insulated joint 4 and the same thing is true of the control relay R^1. It follows that relay R^1 is normally energized, but will be momentarily de-energized when a train bridges the insulated joint 4 or 4^a.

A second transformer T^2 has its primary connected with the secondary of transformer D. The secondary of transformer T^2 is connected in series with a second control relay R^2 around the insulated joint 6^a, so that relay R^2 is normally de-energized but will be momentarily energized when the wheels of a train bridge the insulated joints 6^a or 6.

Located adjacent the highway Q is a highway crossing signal S which is governed by a signal relay H. Relay H is provided with a pick-up circuit which passes from the positive terminal of a battery G, through front contact 9 of relay R^1, front contact 11 of relay R^2, and winding of relay H to the negative terminal of battery G. Relay H is also provided with a stick circuit which passes from the positive terminal of battery G, through front contact 9 of relay R^1, front contact 10 of relay H, and winding of relay H to the negative terminal of battery G.

The signal S, as here shown, is of the three-aspect wig-wag type, having an operating circuit and a holding circuit. The operating circuit for this signal is from the positive terminal of battery G, through wire 12, operating mechanism of signal S, and wire 13 to the negative terminal of battery G. The holding circuit for the signal S is from the positive terminal of battery G, through back contact 14 of relay R^2, front contact 15 of relay H, the operating mechanism of signal S, and wire 13 to the negative terminal of battery G.

The operation of the apparatus, is as follows: In the absence of trains, relay R^1 is energized and relay R^2 is de-energized, so that relay H is held closed by its stick circuit, and the signal S is latched in its clear position because its holding circuit is closed. When a train moving toward the left bridges insulated joint A, it will de-energize relay R^1, thereby opening the stick circuit for relay H, so that the holding circuit for signal S will be opened at contact 15 of relay H. The signal will then be set into operation to indicate the approach of a train. As soon as the entire train has passed insulated joint 4, relay R^1 will again become energized, but relay H will remain de-energized. When the train bridges insulated joint 6^a, relay R^2 will become energized, so that the pick-up circuit

for relay H will become closed at contact 11. As soon as the rear of the train has passed insulated joint 6, relay R^2 will again become de-energized, but relay H will remain energized due to its stick circuit. The holding circuit for signal S is now closed at back contact 14 of relay R^2 and front contact 15 of relay H, so that the operation of this signal is discontinued.

As here shown, the track section A—C is provided with a signal K for governing railway traffic through the section. This signal is located at the point C and is controlled by contact 19 of a track relay L, which forms part of a track circuit including a transformer M.

Referring now to Fig. 2, the control relay R^2 is governed in the same manner as the corresponding relay in Fig. 1, but the control relay R^1 is connected in series with the secondary of transformer T^1 around the insulated joint 4^a. It follows that relay R^1 in this view is normally de-energized but will be momentarily energized when a train bridges either of the insulated joints 4^a or 4.

The pick-up circuit for the signal relay H is from the positive terminal of battery G, through wire 12, front contact 11 of relay R^2, and winding of relay H to the negative terminal of battery G. The stick circuit for relay H is from positive terminal of battery G, through wire 12, back contact 9^a of relay R^1, front contact 10 of relay H, and winding of relay H to the negative terminal of battery G. The operating circuit for the highway crossing signal S is the same as in Fig. 1. The holding circuit for this signal is from the positive terminal of battery G, through wire 12, back contact 9^a of relay R^1, back contact 14 of relay R^2, front contact 15 of relay H, operating mechanism of signal S, and wire 13 to the negative terminal of battery G.

The operation of the apparatus shown in Fig. 2 and thus far described, is as follows: When a train moving toward the left bridges insulated joint 4^a, it energizes relay R^1, thereby opening the stick circuit for relay H and so opening the holding circuit for signal S at both contacts 9^a and 15. This sets signal S into operation. When the train bridges insulated joint 6^a, it energizes relay R^2, thereby closing the pick-up circuit for relay H, so that after relay R^2 again becomes de-energized the holding circuit for signal S will be closed and so the operation of this signal will cease.

If a broken down insulated rail joint 4 or 6 should exist simultaneously with a broken bond 7 or 8 respectively, while a train is between insulated section 3 and point A, there will be a possibility that track relay L might be falsely energized by transformer T^1 or the transformer T^2. False operation of signal K due to this condition can be prevented by a safety relay P having a front contact 18 included in the circuit for signal K. The circuit for relay P is from the positive terminal of battery G, through back contact 16 of relay R^2, back contact 17 of relay R^1, and winding of relay P to the negative terminal of battery G. It follows that relay P is energized only when relays R^1 and R^2 are both de-energized, and since any false operation of track relay L by transformers T^1 or T^2 can occur only when one or the other of these transformers is supplying current to the track rails through its associated relay R^1 or R^2, it follows that relay P cannot be energized if such false supply of current is occurring.

Although I have herein shown and described only two forms 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 intersected by a highway, two control relays connected with the track rails and arranged to be momentarily operated respectively by a train approaching the highway and a train passing the highway, a signal relay having a stick circuit opened by the operation of the control relay first affected by a train moving along said stretch and a pick-up circuit closed by the operation of the other control relay, and a highway crossing signal controlled by said signal relay.

2. In combination, a stretch of railway track, intersected by a highway, two normally de-energized control relays connected with the track rails and arranged to be momentarily energized respectively by a train approaching the highway and a train passing the highway, a signal relay having a pick-up circuit controlled by a front contact of the second control relay operated by a passing train and a stick circuit controlled by a back contact of the control relay first operated by a passing train, and a highway crossing signal controlled by said signal relay.

3. In combination, a stretch of railway track intersected by a highway, two normally de-energized control relays connected with the track rails and arranged to be momentarily energized respectively by a train approaching the highway and a train passing the highway, a stick relay governed by said control relays, a highway crossing signal controlled by said stick relay, a safety relay controlled by said two control relays, and a signal governing traffic along said stretch of railway track and controlled in part by said safety relay.

4. In combination, a stretch of railway track, intersected by a highway, two nor-

mally de-energized control relays connected with the track rails and arranged to be momentarily energized respectively by a train approaching the highway and a train passing the highway, a stick relay governed by said control relays, a highway crossing signal controlled by said stick relay, a safety relay provided with a circuit including in series a back contact of each of said control relays, and a signal governing traffic along said stretch of railway track and controlled in part by said safety relay.

5. In combination, a stretch of railway track, intersected by a highway, two control relays connected with the track rails and arranged to be momentarily operated respectively by a train approaching the highway and a train passing the highway, a stick relay governed by said control relays, a highway crossing signal controlled by said stick relay, a safety relay controlled by said two control relays, and a signal governing traffic along said stretch of railway track and controlled in part by said safety relay.

6. In combination, a stretch of railway track intersected by a highway and provided with a short insulated rail section located at a distance from the highway in the direction from which trains approach the highway, said stretch being provided with a second short insulated rail section adjacent the highway, a source of current and a first control relay connected in series around one of the insulated joints of said first short section, and a source of current and a second control relay connected in series around one of the insulated joints of said second short section, a stick relay governed by said control relays, and a highway crossing signal controlled by said stick relay.

7. In combination, a stretch of railway track intersected by a highway and provided with a short insulated rail section located at a distance from the highway in the direction from which trains approach the highway, said stretch being provided with a second short insulated rail section adjacent the highway, a source of current and a first control relay connected in series around one of the insulated joints of said first short section, a source of current and a second control relay connected in series around one of the insulated joints of said second short section, a signal relay having a stick circuit controlled by a back contact of said first control relay and a pick-up circuit controlled by a front contact of said second control relay, and a highway crossing signal governed by said signal relay.

8. In combination, a stretch of railway track intersected by a highway and provided with a short insulated rail section located at a distance from the highway in the direction from which trains approach the highway, said stretch being provided with a second short insulated rail section adjacent the highway, a source of current and a first control relay connected in series around one of the insulated joints of said first short section, a source of current and a second control relay connected in series around one of the insulated joints of said second short section, a stick relay governed by said control relays, a highway crossing signal controlled by said stick relay, a safety relay arranged to be energized only when both of said control relays are de-energized, and a signal governing traffic along said railway stretch and controlled in part by said safety relay.

In testimony whereof I affix my signature

LESTER E. SPRAY.