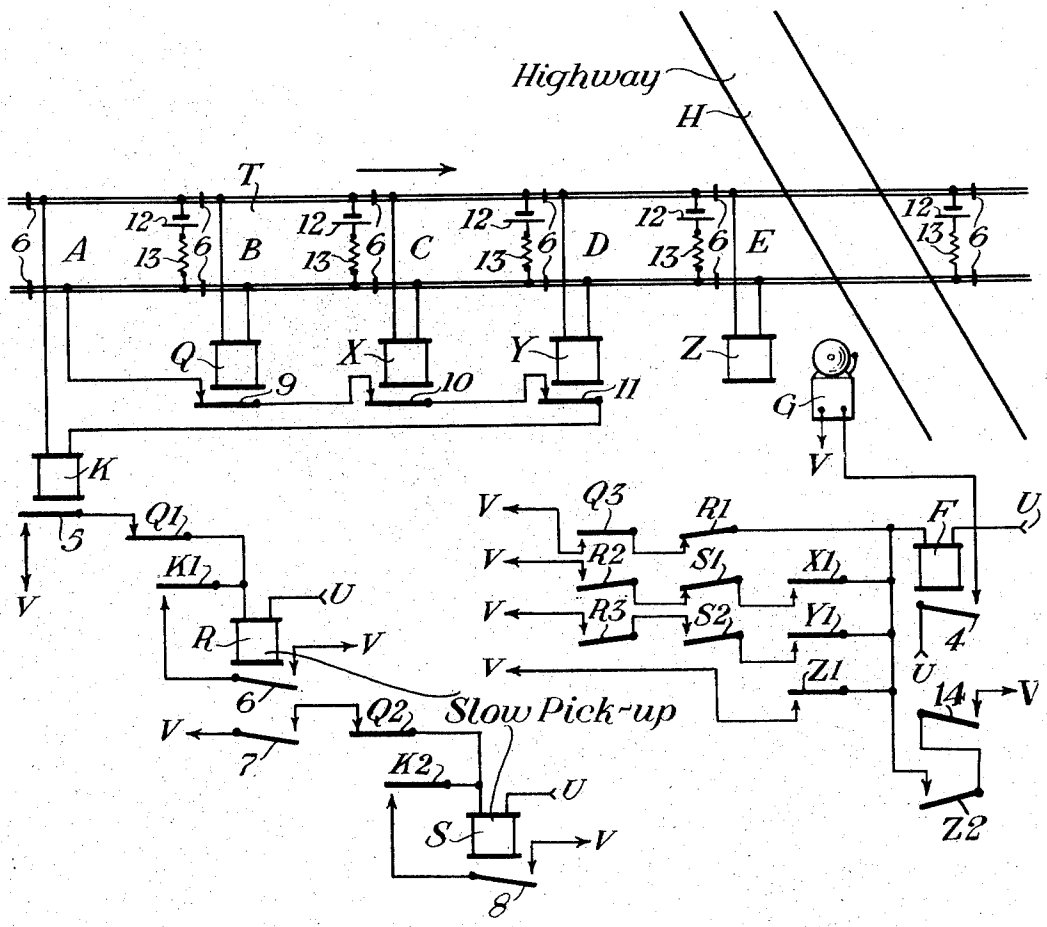
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CONTROLLING APPARATUS FOR HIGHWAY CROSSING SIGNALS

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CONTROLLING APPARATUS FOR HIGHWAY CROSSING SIGNALS

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My invention relates to controlling apparatus for highway crossing signals, and has for an object the provision of novel and improved means for causing the operation of a signal to begin when a train approaching the highway reaches a selected one of a number of different points depending on the speed of the train.

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 showing one form of apparatus embodying my invention.

Referring to the drawing, the reference character T designates a stretch of railway track along which traffic normally moves in the direction indicated by the arrow. This track is intersected by a highway H, and the intersection is protected by a signal G, which, as here shown, is an electric bell, but which may equally well be any other type of highway crossing signal, such as a lamp or a group of lamps or a wigwag device.

The rails of the track T are divided by insulated joints 6 to provide a plurality of track sections A, B, C, D and E, which sections are occupied successively by a train approaching the highway, and which sections are hereinafter referred to as the first, second, third, fourth and fifth sections. Each section is provided with a track circuit comprising a battery 12 connected across the rails at one end of the section through a current limiting impedance 13, and a track relay connected across the rails at the other end of the section, the track relays for the several sections being designated K, Q, X, Y and Z. Track relay K is connected across the rails of section A through a path which includes front contact 9 of relay Q, front contact 10 of relay X, and front contact 11 of relay Y in series, so that when relay K has been deenergized due to a train occupying section A, this relay will remain deenergized until such train leaves section D. The track relay for each of the remaining sections is connected directly across the track rails in the usual manner.

In some instances a relay contact is shown at a point remote from the winding of the relay which controls it, and in such instances the relationship between the contact and the relay is indicated by designating the contact by a numeral together with the same prefix as the letter applied to the relay. For example, the reference character Q1 means that the contact to which it is applied, is contact 1 of relay Q.

Section A is provided with two slow-acting devices R and S, which devices, as here shown, are slow pick-up relays. The first device R is provided with a pick-up circuit which passes from terminal U of a suitable source of current, through the winding of relay R, front contact 1 of relay Q, and back contact 5 of relay K to terminal V of the same source of current. This device is provided with a stick circuit including its own front contact 6 and a back contact 1 of relay K. It follows that when a train enters section A, the operation of relay R will begin, provided that section B is unoccupied, and it also follows that if the operation of relay R is completed while section A is still occupied, this relay will thereafter remain energized in its operated condition as long as relay K remains deenergized, that is, until the train leaves section D. The second slow-acting device S is provided with a pick-up circuit which passes from terminal U, through the winding of relay S, front contact 2 of relay Q, and front contact 7 of relay R, to terminal V. Relay S is provided with a stick circuit which includes its own front contact 8 and a back contact 2 of relay K. It follows that if relay R completes its operation while section A is occupied, the operation of relay S will begin, and that if relay S completes its operation before the train enters section B, it will be held in its fully operated condition as long as relay K remains deenergized, that is, until the train leaves section D.

Signal G is controlled by a front contact 4 of a normally deenergized relay F, so that this signal is normally deenergized but becomes energized when relay F is energized. Relay F is provided with four pick-up or initiating circuits, the first of which is from terminal U, through the winding of relay F, back contact 1 of relay R, and back contact 3 of relay Q, to terminal V. This circuit will be closed when a train enters section B, provided that the train has traversed section A at such high speed that relay R has not completed its operation prior to the entry of the train into section B. The second circuit for relay F includes back contact 1 of track relay X, back contact 1 of relay S, and front contact 2 of relay R. This circuit will be closed when a train enters section C, provided that this train has traversed section A at such speed that relay R has completed its operation, but relay S has not completed its operation, that is, provided the train has traversed section A at an intermediate speed. The third circuit for relay F includes back contact 1 of track relay Y, front contact 2

of relay S, and front contact 3 of relay R. This circuit will be closed when a train enters section D, provided that the train has traversed section A at a low enough speed to permit both relays R and S to complete their operations. The fourth circuit for relay F includes back contact 1 of relay Z, and will be closed whenever the train enters section E regardless of what has happened during the passage of the train through the preceding sections.

It follows from the foregoing that a high speed train will set the signal G into operation when it enters section B, a medium speed train will set the signal into operation when it enters section C, and a low speed train will set the signal into operation when it enters section D. Under any one of these three conditions, the signal will continue in operation until the rear of the train leaves section E. In the event of such a failure of any part of the apparatus associated with sections A, B, C or D as to prevent signal G being set into operation while the train is traversing such sections, this signal will always be set into operation when the train enters section E.

With the apparatus thus far described, a short train which has started the signal in operation when it entered section B may allow the operation of the signal to stop when it enters section C due to the picking up of relay Q, and the operation of the signal would not then be resumed until the train enters section E. A similar undesirable operation might result if a short train starts the signal when it enters section C, in which case the operation of the signal may cease when relay Q picks up thereby causing relay S to become closed. To avoid these possible gaps in the operation of the signal, I have provided relay F with a stick circuit which includes a front contact 14 of relay F and a front contact 2 of relay Z. The result of this is that after relay F has been energized by any of the initiating circuits, it will remain energized until the train leaves section E.

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 intersected by a highway and provided with four sections occupied successively by a train approaching the highway, a track circuit including a track relay for each section, means for keeping the track relay for the first section open after a train has passed through such section until the train leaves the fourth section, a first slow-acting device controlled by a back contact of the first track relay and a front contact of the second track relay in series, a stick circuit for said device including a back contact of the first track relay, a second slow-acting device controlled by a front contact of the first device and a front contact of the second track relay in series, a stick circuit for said second device including a back contact of the first track relay, a signal relay, a first circuit for said signal relay including in series a back contact of the second track relay and a back contact of the first slow-acting device, a second circuit for said signal relay including in series a back contact of the third track relay and a front contact of the first device as well as a back contact of the second device, a third circuit for said signal relay including in series a back contact of the fourth track relay and front contacts of each of said devices, and a signal for said intersection controlled by said signal relay.

2. In combination, a stretch of railway track intersected by a highway and provided with four sections occupied successively by a train approaching the highway, a track circuit including a track relay for each section, means for keeping the track relay for the first section open after a train has passed through such section until the train leaves the fourth section, a signal for said intersection, and means controlled by said relays for setting said signal into operation when a train enters the second or the third or the fourth of said sections according as the train traverses the first section at high, medium or low speed.

3. In combination, a stretch of railway track intersected by a highway and provided with four sections occupied successively by a train approaching the highway, a track circuit including a track relay for each section, a signal for said intersection, and means controlled by said relays for setting said signal into operation when a train enters the second or the third or the fourth of said sections according as the train traverses the first section at high, medium or low speed.

4. In combination, a stretch of railway track intersected by a highway and provided with four sections occupied successively by a train approaching the highway, a signal for said intersection, and means responsive to a train approaching said highway for setting said signal into operation when the train enters the second or the third or the fourth of said sections according as the train traverses the first section at high or medium or low speed.

5. In combination, a stretch of railway track intersected by a highway and provided with four sections occupied successively by a train approaching the highway, a track circuit including a track relay for each section, means for keeping the track relay for the first section open after a train has passed through such section until the train leaves the fourth section, a first slow-acting device controlled by a back contact of the first track relay and a front contact of the second track relay in series, a stick circuit for said device including a back contact of the first track relay, a second slow-acting device controlled by a front contact of the first device and a front contact of the second track relay in series, a stick circuit for said second device including a back contact of the first track relay, a signal for said intersection, and means for setting said signal into operation when a train approaching the highway enters the second or the third or the fourth of said sections according as the first device is open or the first device is closed and the second device open or both of said devices are closed.

6. In combination, a stretch of railway track intersected by a highway and provided with four sections occupied successively by a train approaching the highway, a slow-acting device set into operation when a train enters the first of said sections, a second slow-acting device set into operation when the operation of the first device is completed while the train occupies the first section, a signal for said intersection, and means for setting said signal into operation when the train enters the second or the third or the fourth section according as the operation of the first de-

vice is incomplete when the train enters the second section or the operation of the first device is complete and the operation of the second device incomplete when the train enters the second section or the operation of both devices is complete when the train enters the second section.

7. In combination, a stretch of railway track intersected by a highway and provided with five sections occupied successively by a train approaching the highway, a track circuit including a track relay for each section, means for keeping the track relay for the first section open after a train has passed through such section until the train leaves the fourth section, a first slow-acting device controlled by a back contact of the first track relay and a front contact of the second track relay in series, a stick circuit for said device including a back contact of the first track relay, a second slow-acting device controlled by a front contact of the first device and a front contact of the second track relay in series, a stick circuit for said second device including a back contact of the first track relay, a signal relay, a first circuit for said signal relay including in series a back contact of the second track relay and a back contact of the first slow-acting device, a second circuit for said signal relay including in series a back contact of the third track relay and a front contact of the first device as well as a back contact of the second device, a third circuit for said signal relay including in series a back contact of the fourth track relay and front contacts of each of said devices, a fourth circuit for said signal relay including a back contact of the fifth track relay, a stick circuit for said signal relay including its own front contact and a front contact of the fifth track relay, and a signal for said intersection controlled by said signal relay.

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