A material saving may be effected in maintenance cost by using a slightly larger wire to secure increased strength adjacent to the terminals.

False Operation of Crossing Signals

"What is the best circuit arrangement to use in order to prevent false operation of a crossing signal for a train pulling out of a passing siding switch located in the ringing section receding from the crossing, or for switching moves?"

A Stick Trap Circuit

C. A. Williams
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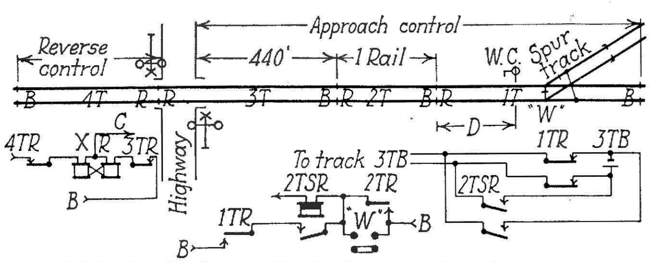
In designing highway-crossing signal-control circuits it is often necessary that some arrangement be worked out for the purpose of interrupting the signal operation in case a train approaches the crossing and stops to take water or to do some switching. This problem of avoiding false warnings has been solved in some cases with the use of a time-element relay. However, it is often the case that an accidental energization of the time relay would have the effect of shortening the operating section upon the approach of a fast train, thus creating a worse hazard than the one which it was intended to eliminate. After studying the possibilities, I have designed the accompanying circuit which eliminates the necessity for a time-element relay by the use of a slow-pickup stick relay and a trap circuit. (We term it a stick trap circuit.)

Referring to the circuit, suppose a train approaches the highway at 60 m.p.h. for a through movement over the highway. Section 1T is shunted, cutting battery off of section 3T, which in turn causes regular operation of the crossing signals. However, should a train stop and cut off cars in section 1T for the purpose of setting out or picking up cars in the spur track or beyond the highway, the crossing signals operate until switch "W" is thrown, until 2T is occupied, or until the train leaves section 3T. If the engine crosses the highway to section 4T, one side of the interlocking relay is "on the hook"; if the engine then goes beyond 4T the relay is normal for the return movement. Meanwhile, the operation of the stick circuit is as follows: As the engine crosses section 2T, 2TR is shunted and the stick relay 2TSR is energized. As 1T is still occupied by the remainder of the train, 2TSR now sticks up even though 2TR has become energized. Front contacts of 2TSR allow battery 3TB to feed around the 1TR contacts to energize section 3T and pick up one side of the interlocking relay. Thus, the signals cease to operate until the engine actually occupies section 3T adjacent the crossing.

After the train finishes switching beyond the highway and section 4T, and returns for the balance of the train, its entrance on section 4T causes the regular operation of the crossing signals. Now the opposite side of the interlocking relay goes "on the hook," but returns to normal after 3T is cleared on account of 2TSR being stuck up. Finally, the train proceeds over the crossing prepared to continue. Upon its entrance to section 3T, having started from standstill, the warning is given in the usual manner without continuing until the train completely leaves section 4T.

An additional advantage of using the stick circuit in place of the time-element relay lies in the ability of the circuit to immediately stop the operation of the crossing signals as soon as the trap section 2T is occupied to the exclusion of the crossing section 3T, or as soon as switch "W" is thrown. If a time relay were used, the signals would operate until the time interval had expired, in this situation. The shortness of the trap-circuit section and the slow-pickup feature of relay 2TSR precludes the interruption of the signal operation during fast through moves.



This circuit also applies in the case of station stops

The location of the 440-ft. cut and the one-rail-length trap cut should allow for a 20-sec. warning, based on the possible attained speed of a train after a train has been stopped to use the spur track. Also, the dimension "D" in the sketch, if at a water station, should be less than the distance from water manhole of an engine tender to the front wheels of the pony truck in order that 2T will be shunted when the engine is taking water.

Another Solution for Siding

F. George
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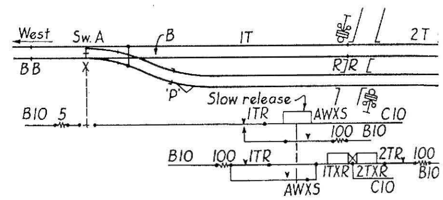
The diagram shows a circuit arrangement suitable to prevent false operation of a crossing signal while a train is pulling out of a passing siding. In this case the switch is situated in the operating section leading away from the crossing. Simplification of the circuit is accomplished by the use of a pipe-connected lift-type derail on the siding.



Circuit for train leaving a siding

If a train is occupying the siding prepared to proceed westward, it cannot shunt 1T track relay until the switchman has reversed switch A, thus lifting the pipe-connected derail off the siding rail and permitting the train to proceed westward out of the siding. Reversing switch A closes the reverse contact in the circuit controller, permitting current to flow through the front contact of the 1T relay and pick up the AWXS relay. If there are signals governing main-line movements over the switch, the track shunts in the switch circuit controller are omitted, the signal controls being broken instead.

The AWXS relay, being slow release, will remain picked up during the time necessary for 1T track relay to open its front contact and close its back contact when the engine of the train comes onto the 1T fouling circuit. Current then flows through the front contact of the AWXS relay and the back contact of the 1T track relay, holding the AWXS relay up until the rear end of the train has proceeded westward off 1T circuit, regardless of the position of the switch, which under such conditions would be back to normal.

The AWXS relay, when picked up, allows current to flow through its front contact, thus by-passing the open front contact in the 1T relay, thereby holding the crossing-signal

(Continued on page 100)

control relay 1TXR up, until the train has departed. An eastbound train has no effect on the AWXS relay, whether proceeding down the main line or into the siding, because if it were going into the siding it would necessarily have 1TR down before reversing switch A. This prevents AWXS from picking up, thereby giving crossing protection until the rear end is clear of the fouling circuit.

If crossing protection is desired for a train which might pull westward out of the siding and then proceed eastward on the main line without first clearing the west end of the track circuit, it is necessary to divide the approach circuit into two parts at point B. The track circuit west of point B would operate the AWXS relay in conjunction with switch A. The AWXS relay in turn would only by-pass this west track circuit, while the track circuit east of point B would have no effect on the AWXS circuit, but would cause the 1TXR relay circuit to be opened at any time it is occupied by a train.

Circuits for Three Situations

I. S. Jones

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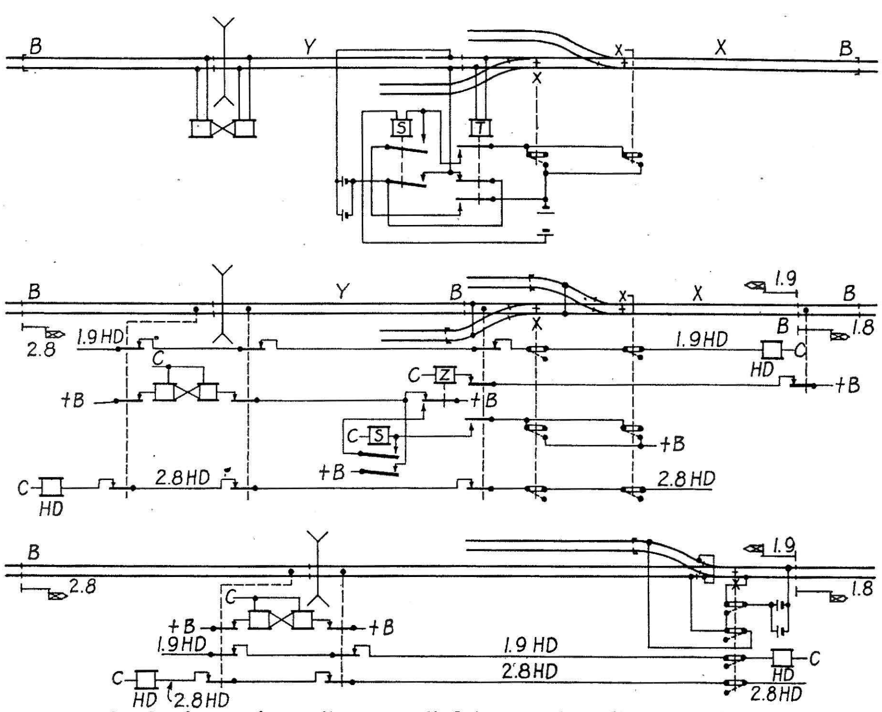
The accompanying diagram shows two types of circuits designed to prevent false operation of a crossing signal for a train pulling out of a passing siding switch located in the ringing section receding from the crossing. Both have been used successfully, and I believe they give adequate protection.

In the first sketch, with a train coming out of the siding or spur, the switch is thrown, picking up the stick relay which shortens the ringing section to back of the frog. The stick is held up as long as track circuit X is shunted, and prevents false operation of the crossing signal by the receding train.

If after the train pulls out on the main track, the switch is placed normal and the train moves toward the crossing, the signal will start to operate as soon as track circuit Y is shunted. Local conditions should govern but usually at the reduced speed this should be sufficient. To gain a little distance, track circuit Y could be started in the lead instead of back of the frog. A four-ohm stick relay operated on two cells of primary battery is satisfactory for this circuit.

The second sketch shows an application of this same type of circuit in automatic block signal territory. Circuits providing a ringing section beyond the next signal location are shown. A train coming out on to the fouling will operate the highway signal unless the switch is thrown first, but in other respects the operation is the same as in the first sketch.

The third sketch shows an arrangement used where the ringing section starts at an automatic signal which is located at the siding switch. When the switch is reversed, the track circuit comprising the ringing section is shortened to a point in the lead, and the train coming out of the siding does not cause a false operation of the highway signal. As the automatic block signal control circuits are broken through the switch circuit controller, no block signal protection is lost when the switch is reversed and the track circuit is shortened.



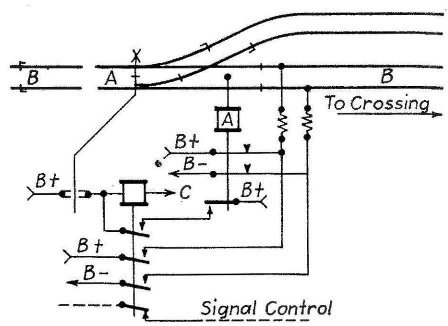
Circuits for track- or line-controlled layouts, including HD circuits

Circuits Require Special Maintenance

LeRoy Cone

Signal Draftsman, Chicago

Operation of crossing signals, while a train is leaving a siding receding from the crossing, can be prevented by the use of the circuit shown herewith. The operation is as follows: When the train is ready to leave the siding, the switch is reversed and the pick-up circuit of the stick relay is



closed, energizing this relay. This in turn closes the special feed for track circuit B in multiple with the normal feed, which is through track relay A.

After the train enters the track circuit and drops relay A, track circuit B is energized only through the stick relay. The holding circuit for the stick relay is closed through the track relay, and remains so as long as section A is occupied. The normal pick-up of the stick relay is broken by restoring the switch to normal. The train then passes out of section A, and when the track relay picks up, the stick relay is de-energized. Everything is then set for normal operation again.

This circuit may be used to operate a line relay in place of a relayed track section, as some engineers object to relayed track circuits. As the circuit at the crossing may be one of several types, it is not shown in the diagram. Circuits for preventing false operation of crossing signals should be maintained at the very highest possible standard because any circuit that will cut out part of the operating section is liable to fail to restore itself to normal, often creating a hazardous condition. Wherever it is possible, the automatic-signal control circuits should be broken through back contacts of the stick relay (shown dotted in the diagram) to check the operation of this relay.

Editor's note: Other answers to this question will appear in the March issue.