What's the Answer?

Loss of Shunt

"When designing the circuits for an automatic interlocking at a railroad crossing, what is a good way to prevent the possibility of the lineup being transferred from one road to the other by reason of a momentary loss of shunt of a track circuit by the train which first established its route?"

Circuit Arrangement

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The accompanying illustration shows a simplified circuit scheme, taken from U. S. & S. Co. typical circuit TE3OA9, whereby a loss of shunt on an approach circuit will not allow a conflicting signal to be displayed, should a train occupy a conflicting approach section at the time the loss of shunt occurs. The circuit, as simply described below, also offers a protection against a momentary loss of shunt on a track section between home signals, as well as preventing a change of route should a momentary opening of the track circuit, just mentioned, occur after a proceed signal has been displayed.

The "loss of shunt" principle on the approach circuit is embraced in the approach stick relay ASR, and the "loss of shunt" or "open circuit" on the detector sections, is in the slow-release, slow-pickup route locking relay RLR, acting in conjunction with the polarized route relay RR, the polar contacts of which must select the route. In this medium, the route selection becomes a mechanical check, as the polar contact, of course, is in one position or the other. As shown in the diagram, the last move was over track circuit 3T. Assume that a train approaches signal 1. Track relay A1TR drops, which opens the approach stick relay circuit 1ASR. Before signal 1 can clear, the polarized route relay RR must position its polar armature to the left, and the slow-release, slow-pickup route locking relay RLR must drop. When the approach stick relay 1ASR drops, battery for the polarized route relay circuit RR passes from the approach stick relay 4ASR to common over the 3-4TE contact, which positions the polar contact to the left. This in turn opens the circuit for the slow-release, slow-pickup route locking relay RLR, which would open immediately, except for the fact that it has a slow-release characteristic, made necessary by the fact that a contact is in the polarized route relay circuit RR. When the slow-release, slow-pickup route locking relay RLR drops, signal 1 will clear, and the control circuit for the polarized route relay RR will be opened.

Assume that a conflicting train occupies track section A3T. This drops the approach stick relay 3ASR, but the polarized route relay RR cannot change, because the route locking relay RLR is down, and cannot pick up because the approach stick relay 1ASR is open. Let it now be assumed that the train on track section A1T loses its shunt. Track relay contact A1TR closes, but the approach stick relay 1ASR cannot pick up because stick relay 1SR is open. Thermal relay 1ATER does start to heat, however, opening its checking contact in the 3-4 signal control. It will be noticed that signal 1 did not assume the Stop position, and the approach lighting did not become extinguished.

For descriptive purposes, let it be assumed that the "loss of shunt" persists until the thermal timing relay 1ATER closes its front contact. This will pick up the approach stick relay 1ASR which in turn will put signal 1 to Stop, pick up the red repeater relay 1RGPR and the route-locking relay RLR, cause the route relay RR to position its polar point to the right, and again open the route locking relay RLR, because the approach stick relay 3ASR is open.

This completes the 3HR circuit,

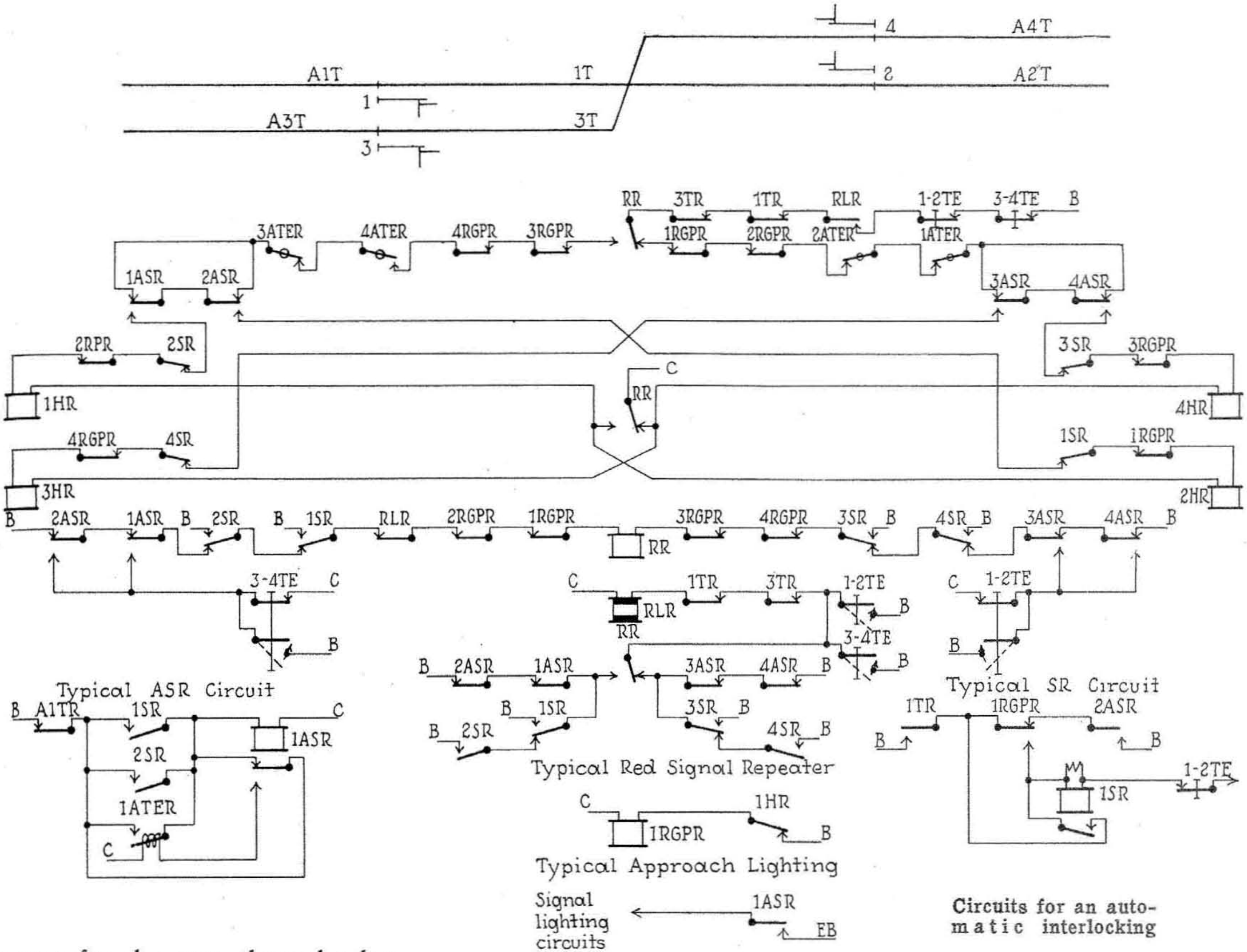
To Be Answered in a Later Issue

(1) What kind of wiring distribution do you use up the legs of signal bridges and across to the signals, i.e., (1) insulated wires or cables in metal conduit, (2) aerial cables made up of individual insulated conductors with tape and braid, (3) aerial manufactured cables on messengers, (4) cables with outer protection similar to that for underground use, run in clamps on the bridge?

(2) How can torque tests be made to determine the safety of operation of a-c. relays of the geared types?

(3) On a road which now uses automatic block signals with red as the Stop-and-Proceed aspect, yellow for Approach and green as Clear, what, in your opinion, could be adopted as the most simple fourth aspect considered from the engineman's standpoint?

If you have a question you would like to have someone answer, or if you can answer any of the questions above, please write to the editor.



Circuits for an automatic interlocking

except for the open thermal relay checking contact 1ATER which will not close until the thermal relay has cooled off entirely. Thus, a loss of approach shunt does not put a Clear signal to Stop until after a certain time has elapsed, and a conflicting signal cannot clear until a further lapse of time. A change of route caused by momentary loss of shunt on the detector circuit is protected by the slow pick-up principle in the route locking relay RLR. A change of route, caused by a momentary opening of the detector circuit, is protected by the difference in timing between the slow-release relay SR and the slow pick-up route-locking relay RLR.

For descriptive purposes, let it be assumed that the track relay 1TR opens with signal 1 clear and track section A3T occupied. This puts signal 1 to Stop and picks up the 1SR, which would pickup the RLR except for the open track relay contact 1TR. When the route-locking relay RLR is open, the polarized route relay RR cannot change.

Let it be further assumed that the track relay 1TR again picks up. This will cause signal 1 to again clear, and until stick relay 1SR drops, energize the slow-pickup relay RLR. As soon as the red repeater relay 1RGPR drops, the RR circuit is open, so no change of route could occur while the stick relay 1SR is still up. However, let it be assumed that the red repeater relay 1RGPR is slightly slow in dropping. Under such a condition the release time of the stick relay 1SR is much quicker than the pickup time of the RLR relay, hence 1SR drops before the pickup of RLR, thereby preventing the RLR relay from picking up and causing the route relay RR to change the route.

Rectifier Fed Track Circuits

What are the advantages and disadvantages of an extensive installation of d-c. track circuits using d-c. relays fed from rectifiers exclusively?

Not on Long Territories

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The important advantage of using a rectifier to feed a d-c. track circuit, using a d-c. relay, is that the battery, ordinarily required, can be eliminated. The serious disadvantage of such practice, however, is that in case the a-c. power for feeding the rectifiers is interrupted, the track circuits are out of service until a standby source of a-c. power can be cut in, or until the normal source of a-c. is restored to service. On extended territories of automatic block signaling, additional failures of a-c. power may be caused by lightning trouble, and by failures of the a-c. power distribution line, which may result from sleet storms, high winds blowing trees on the line, etc.

In my opinion, therefore, the use of track circuits fed by rectifiers without battery, would not be practicable, especially on extended territories, be-