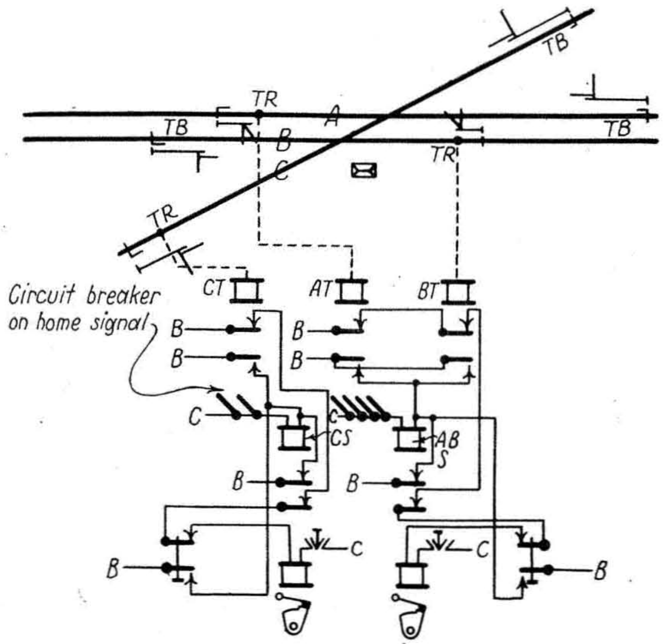
Electric Locking Protection at Interlockers Operated Without Derails

"When and where is electric locking needed to lock signal levers normal (normal release lock) in a plant operated without derails? How should such a lock be controlled?"

Circuit Scheme Employs Master Levers Electrically Locked

THE accompanying sketch of electric lever locking is based upon the standard practice of the Canadian National, Central region. The volume and character of the traffic at the crossing would determine whether or not electric locking such as indicated in the sketch



Typical Canadian National locking circuit for crossing operated without derail protection

would be needed. It can be seen from the circuit that master levers are used in order to lock one route against the other, one lever only being required for each road. While the circuit illustrated is for detector locking, it may be converted to approach or route locking by carrying the control of the electric lock to the approach signal or beyond.

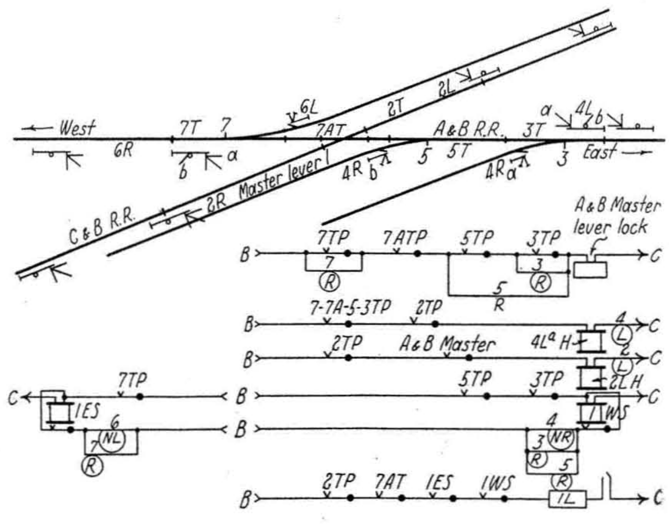
Toronto, Ont. TOM A. ALLAN,
Chief Signal Inspector, Canadian National, Central Region.

Recommends Use of a Master Lever for Each Road to be Locked Electrically by Master Relays—Operating Flexibility May Be Secured by Providing Release Lock on Such a Lever

WHERE a grade crossing interlocking is installed with derails, the interest of each road extends only to the derail protection on the other road. However, where derails are omitted each road at once becomes vitally interested in the signal arrangement on the crossing road. It cannot be denied that derails afford protection to a railroad crossing, but it is doubtful whether the protection, so afforded, is commensurate with the hazard introduced when installed in high speed tracks, especially when a great part of the protection so afforded can be accomplished by means of electrical devices and strict discipline.

The derail is a relic of the "link and pin and hand brake days" with their contemporary signaling when trains were liable to become parted, or control of the trains was dependent upon the train crews, rather than the enginemen. With modern equipment the greater majority of derailments in main tracks occur through a slight misjudgment on the part of the engineman and if no derail had been present, the train would have been stopped short of the crossing without any serious results. With the heavy motive power and equipment of today, a derailment entails needless delay and expense to slow moving trains, if not fatalities, due to engines upsetting and for high speed trains almost sure death for engine crews, if not to some of the passengers.

Where derails are omitted at grade crossings it is essential that the electrical protection be as complete as possible. This involves three principal features: First, operating distant signals located full braking distance from the home signals with approach or time locking. Second, the signals on each road arranged to assume the stop position with any route leading over the crossing on the opposing road occupied, to guard against the over-running of signals. Third, locking, to prevent a route being set up until previous moves through the crossing on the opposing route have been completed. The first of these is, of course, a part of any modern interlocking in high speed territory. The second is required only where derails are omitted while



Electric locking circuit for interlocker operated without derail protection

the derails themselves, where detector locked, accomplish the third.

The fulfilling of the second requirement is simple where only routes over the crossing are involved, but becomes more complicated when there are diverting routes to contend with. In the latter case, the circuit consists of a master relay for each road controlled over all track circuits that may be included in any route over the crossing on their respective roads. The control of the master relay is by-passed by contacts on switch levers for those track circuits included in diverting routes.

The third requirement is most readily accomplished by providing a master lever, the mechanical locking being so arranged as to require this lever to be set normal for one road and reversed for the other. Where there are three roads crossing, a three-position lever could be utilized and locked normal left and right respectively. The master lever should be locked through the master relays, so that if the crossing is not clear, the route cannot be changed, thus eliminating any possibility of a leverman setting up a route with the crossing occupied, and through error, flagging a train by a signal.

In general, the above arrangements will take care of the ordinary interlocking. However, it is possible to provide release locking for the master lever so that the route may be changed after a train has cleared the crossing, but still occupies the interlocking. The simplest way to accomplish this is through the use of route and release detector locking by means of directional selecting relays, such as is used for the release of switches.

Chicago. E. A. THOMAS,
Chief Signal Inspector, Pennsylvania.

When Derails Are Removed the Signal Levers Should Lock Mechanically

WE have installed interlocking plants or what might be termed traffic plants without derail protection, having switches and signals only. In such plants the switch levers, mechanically lock the signal levers in the normal position for all signals governing over conflicting routes. In plants where derails would be removed the locking performed by derail levers would be accomplished by the signal levers mechanically. I have had no instance where there was any necessity for locking signal levers normal by the use of an electric lock for this purpose. I am not able to give you any definite idea as to what I would do without knowing more of the actual layout of track and traffic conditions. Off-hand I would say that probably all necessary locking could be accomplished mechanically and it should not be necessary to lock signal levers normal electrically.

Springfield, Mo. I. A. UHR,
Signal Engineer, St. Louis-San Francisco.

Another A.P.B. Circuit Explanation

"How are single track signals controlled so as to discriminate between opposing and following trains?"

Simplified Written Circuits are Given for One Set of Signals Only With a Clear Description of the Stick Relay Directional Control Feature

IN an effort to make simplicity the keynote I have not attempted to describe any particular single-track signal system, but instead I have endeavored to bring out the safety features of absolute permissive block signaling so that a person with a comparatively limited knowledge of railway signaling practice could understand it. For this reason I have left out all details and refinements not essential to the understanding of the system. In general two main problems must be solved in the directional control of single-track signals, first, the prevention of train movements in a direction opposite to that of the trains entering the single-track territory and second, the provision of means for a second train to follow the first train with signal protection, the second train moving in the same direction as the first train.

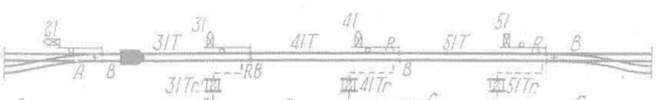


Fig. 1

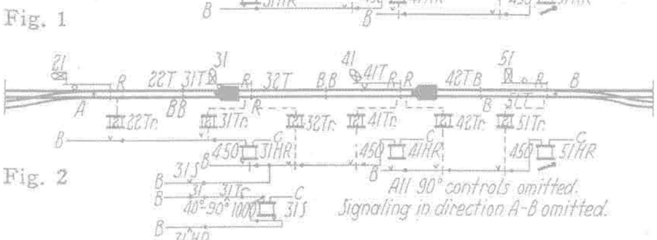


Fig. 2

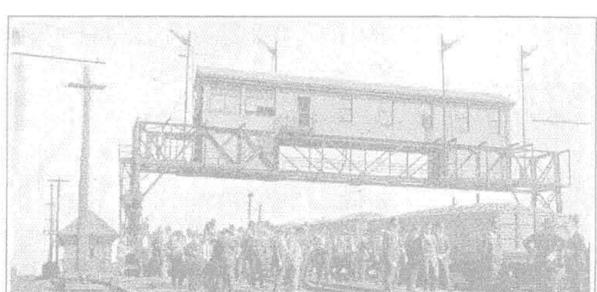
Written circuits for single-track A. P. B. signaling—For simplicity only one set of signals are shown

Problem 1 (*See Fig. 1*). Prevention of opposing moves is accomplished by cascading the home control relays of the signals so that as soon as a train enters single track in the direction *A* to *B* home relay *31HR* on the first opposing signal (No. *31*) is de-energized, due to track relay *31TR* dropping. Home relay *31HR* dropping opens the circuit of home relay *41HR* and *41HR* in turn opens the circuit of home relay *51HR*, in this manner dropping all the home relays and putting the signals to stop all the way through to the end of the single track. A single track block system could be operated in this manner, but would have the disadvantage that signals behind a train would remain at stop, thereby preventing one train following another. It is, therefore, imperative that means be provided to clear the signals behind the train so that following moves can be effected.

Problem 2 (*See Fig. 2*). Provision for following moves in the direction *B* to *A* is accomplished by taking steps to pick up the home relay of the signal behind the one governing the block occupied. To do this the track circuit is cut in two sections of approximately equal length and battery is fed from the center toward both ends. When the first train passes signal *31* in the direction *B* to *A*, stick relay *31S* is picked up through a contact on the signal circuit breaker which is closed in the 90 to 40 deg. position of the signal and track relay *31TR* down. This will occur only when the train is moving from *B* to *A*, as when the train is moving from *A* to *B* signal *31* will assume the stop position when the train hits track circuit *22T*, and *31TR* will not drop until some time after the signal has assumed the stop (or zero degree) position, and this will prevent the stick relay from picking up. Thus it will be seen that the stick relay is picked up for a movement in one direction (following movement only) but does not pick up for a move in the reverse direction. When the stick relay is picked up a front contact on the stick relay bypasses the contact on relay *31HR* which is open due to relay *31TR* being down, and feeds positive battery back on the line, picking up relay *41HR* and permitting signal *41* to assume the caution position for a following train. The stick relay will stay picked up as long as relay *31HR* is down, that is until train passes signal *21* entirely.

It is thus seen that a train moving in a direction *A* to *B* puts signals *31*, *41*, *51* to stop for opposing moves, while a train moving in a direction *B* to *A* will pick up the bypassing stick relays and allow another train to follow. Another complete set of signals, of course, would be necessary in the direction *A* to *B* and all signals must be wired with a stick relay like the one at signal *31*, but for the sake of simplicity these and all 90 deg. controls are omitted.

Cincinnati, Ohio. OSCAR E. MILLER,
Circuit Engineer, Big Four.


Hump yard switching tower on bridge