tion is on signal bridges. A typical method of using this open cable construction is shown in one of the pictures of the article on "Color Light Signals on C. & N. W." appearing elsewhere in this issue. It will be noted that the cable is made up of individual wires tied with marlin hooked to a messenger wire. The cable is carried on the top chord of the bridge and from there drops down to each signal and the relay box. The decking on the lower chord of the bridge protects the cable from the direct blast of locomotives passing under. Trunking has always been objectionable as it is impossible to keep cinders and moisture out which causes deterioration of the wires. Conduit tends to rust unless it is kept well painted and is liable to contain moisture which causes deterioration of the conduit and wires. In addition the open cable is the least expensive method and besides making the life of the wires longer, places them in a position where they can readily be inspected.

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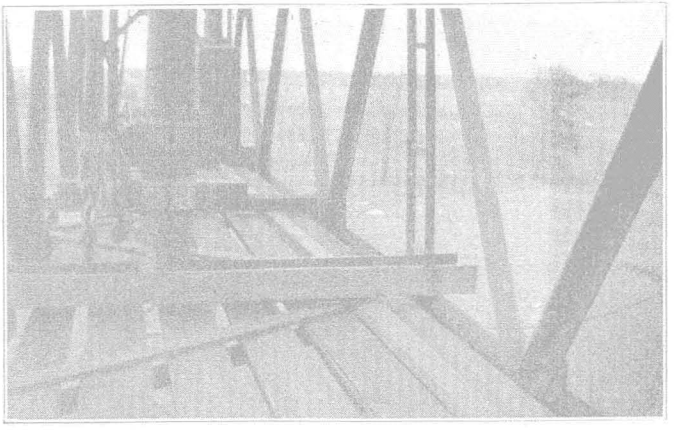
Assistant Signal Engineer, Chicago & North Western.

Third Answer

FOR carrying wire on overhead signal bridges the use of wooden trunking is one of the methods. The trunking can be laid so that the capping is practically flush with the floor on the lower chord of the bridge, as shown



Wooden Trunking in Service on Interlocking Signal Bridge

in the illustration herewith. However, if the trunking is laid over the planking on the bridge it can be run along the side out of the way. Additional wires can easily be run in wooden trunking when the need arises. When shooting trouble the defective wire can be located without much difficulty.

Comparison Between the A. P. B. System on Signal Track and Overlap Circuits

"What are the characteristics of the A. P. B. system for single track as compared to the overlap circuits?"

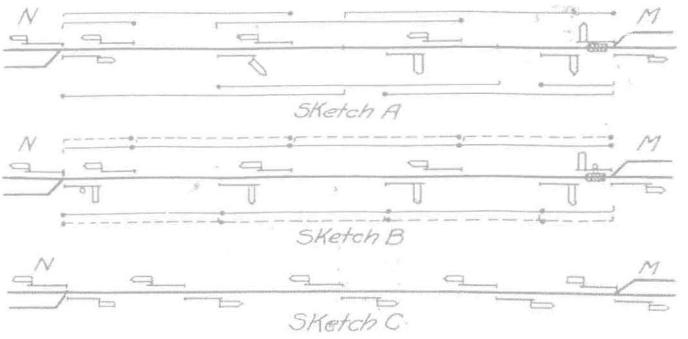
Answer

A COMPARISON of detailed circuits does not answer this question. A. P. B. circuits require more relays and consequently more local wiring, but less line wire than the overlap system. However, this additional material provides more flexibility and gives other offsetting advantages. The fundamentals common to both may be considered characteristics of each, but the comparative characteristics are those in which they differ.

The outstanding difference between A. P. B. and overlap circuits for single track is that for head-on protection A. P. B. blocks from siding to siding, whereas overlap blocks to or laps the second opposing signal.

Sketch *A* shows a typical overlap layout with the controls for head-on protection and Sketch *B* the same layout with A. P. B. head-on controls shown by full lines. When operating trains by signal indications with these two schemes it is seen that after a train leaves *M* with overlap signaling the leaving signal at *N* indicates clear for some little time, whereas with A. P. B. circuits the signal at *N* indicates stop.

The advantage gained is that after a train gets into



Sketches Showing Control Limits

the block at *M* all opposing traffic is stopped at *N*, saving stops of opposing trains between sidings with the consequent flagging and backing up into the clear, possible with the overlap system. The circuit characteristics are also in favor of the A. P. B. system for following moves, as each signal displays a proceed indication as soon as the train has passed the signal in advance (see the dotted control lines for following moves in Sketch *B*), but the overlap arrangement does not permit a following move until the overlap is cleared; the spacing for following and head-on moves being the same.

The A. P. B. circuit characteristics would also make it possible, if conditions were advantageous, and they often are, to signal this stretch differently by using double intermediate locations, as in Sketch *C* without losing any protection or operating advantage, but allowing a large saving in initial cost, as fewer battery shelters and a great deal less wire for line drops (about one-half) and possibly for track connections would be needed for this arrangement as compared to Sketch *B*.

The A. P. B. system provides information, which is not available with overlap signaling, as follows:

The operator at a station can tell that a train has left the next adjacent siding. This information when passed along to the dispatcher furnishes a basis for changing meets, if desired.

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Electrical Engineer of Signals, Northern Pacific.

Approach Locking Circuit Dependent on Signal Position

"What kind of an approach locking circuit has been designed that is dependent on the position of the home and distant signals? What are the advantages?"

Answer

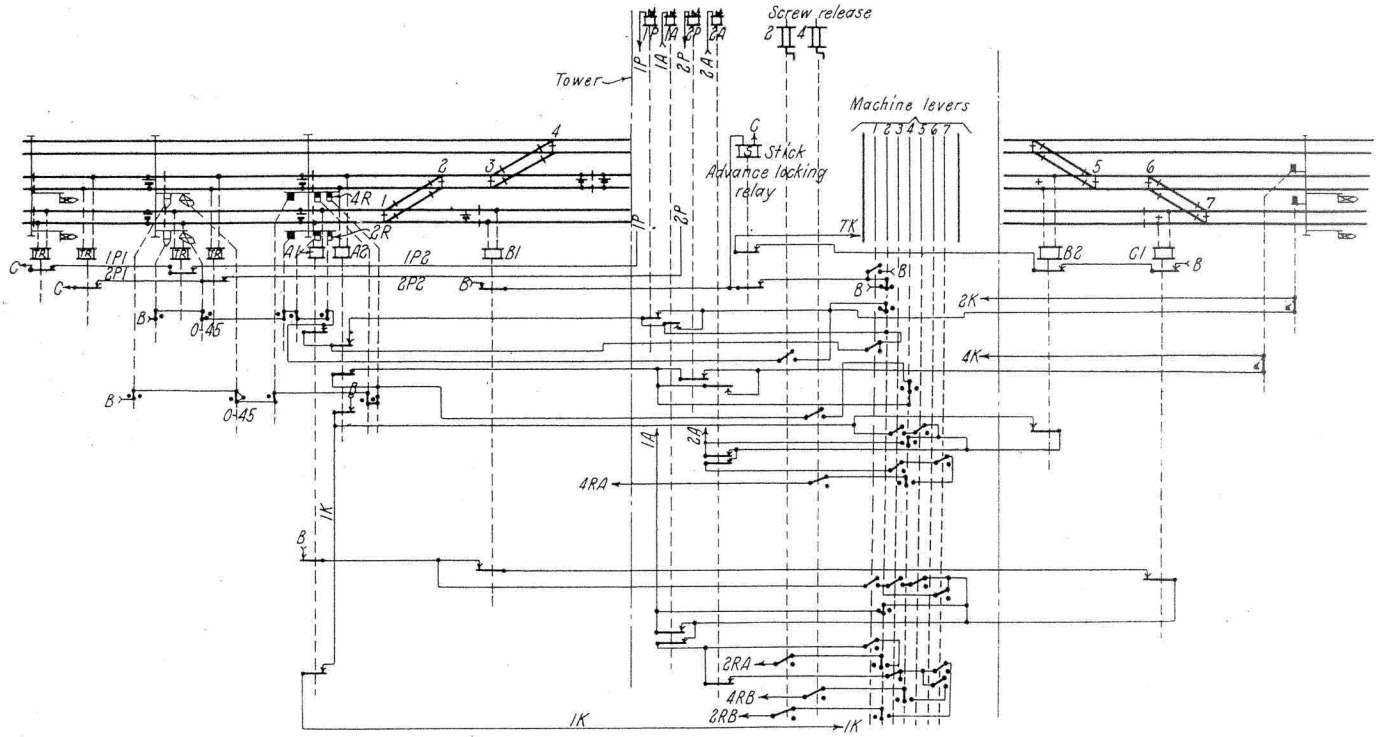
THE sketch shows how approach locking is accomplished, dependent on the position of the home and distant signals. The circuit applies to electro-pneumatic interlocking equipped with the proper devices for electric locking. The instrument used to accomplish this is the approach indicator which is practically the same as the block indicator, except that it has a red disc instead of a small semaphore arm. This approach indicator is wired up as a straight indicator, that is, it is not a stick indicator, and is controlled through certain relays on each track, in automatic sections. The control for the

approach indicator extends back to the first automatic signal in the rear of the distant signal for the interlocking.

In this layout I have shown how advance locking is accomplished as well as approach locking when necessary to lock the routes over which *2Ra, 2Rb, 4Ra* and *4Rb* govern. Tracing the circuit for signal No. *2Ra* the lock circuit is put through a contact on *A1* track relay and that locks No. *2* lever until the relay *A1* picks up which would be at the fouling point of No. *1* switch. When the train gets off section *A1* the signal lever can be put normal to release the locking on No. *2* lever.

Tracing the circuit for *4Ra* signal you will note the lock circuit is put through a contact on *A2* track relay, and it is necessary that this relay be picked up in addition to the approach indicator being picked up, or the block indicator *2A* opened, before the lever can be put normal. When the train gets off track section *A2*, the signal lever can be put normal releasing the mechanical locking, but in this case *B2* track relay is opened and that locks No. *5* and *7* switch levers electrically. If the conditions we will need this circuit complete, even if these contacts are open. Consider for instance when there are two trains on No. *1* track, the first train has a clear signal for the straight track and is just approaching the home signal *2R*. The second train has passed the automatic signal at which the approach locking starts, and it is desired to send this train over No. *2* track. The approach indicator will not pick up after the first train as the second train will hold it open and this will prevent us from changing the route after the first train, but the cut around is placed on the back points of the block indicator which is opened when the first train passes the home signal, and will not close until the signal lever is put normal. It is then possible to put the lever normal and line up for No. *2* track.

With the circuits as arranged in this layout, we have the entire route locked up after the signal has been given and the train has opened the approach indicator and the only way it can be changed is through the screw release or by the train itself. You will note the signal



Circuit Diagram of Approach Locking Circuit Which Is Flexible Enough to Accommodate Traffic at a Busy Interlocking Plant

train was going to take the crossover to No. *1* track, the same condition would apply as for the straight track: the signal lever would be locked up until after the train passed off section *A2* and then *B2* relay would keep the switches locked up.

In approach locking we use the indication lock circuit and put it through the contacts of the approach indicator, so that as soon as this indicator is opened it will lock the lever from being put back to the normal position, providing the signal *2R* has been reversed and cleared. If the indicator is clear and all the signals back to normal the lever can be put normal; but if a signal has been cleared and the approach indicator has opened, even though the signals are put to danger it will be impossible to restore the lever all the way normal because the circuit is not complete through the approach indicator. Just as soon as the indicator picks up it will close the circuit through the indication magnet and allow the lever to be restored to the normal position.

We find that it is necessary to cut around certain contacts in this indication lock circuit, because under certain control wires are put through the normally closed contacts and when the release is reversed it breaks the signal control as well as makes the lock circuit. This release cuts around all the contacts in the indication lock circuit except the circuit controllers on the signals. It should not cut around the circuit controllers on the signals, for we would not want to get the signal lever back normal unless all the signals were normal.

Approach locking is applied to interlocking signals to lock up a route after a train has accepted the distant signal. Where there is no approach locking a leverman can set up a route and give the signals, but after the train has accepted the signals there is nothing to prevent taking the signals away and changing the route. If the train did not stop before reaching the home signal an accident might happen. In order to prevent this change, the signal lever is locked so that it can only be restored far enough to put the signal to the danger position but not enough to release the mechanical locking.

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