

Train-Order Signals at Interlockers

Confusion Eliminated by Using the Interlocking Signal as Train-Order Signal

CONFUSION on the part of enginemen between the indications given by the separate train-order signal and the interlocking signals at interlocking plants has been a contributing cause for serious accidents, such as that at Porter, Ind., on February 27, 1921. Before interlocking plants or automatic signals were installed extensively, the train-order signal was used universally to indicate to the engineman and train crew that train orders were to be delivered. As the roads began to install interlocking plants and introduced stretches of automatic block signals, no consideration was given to any modification in the use of the train-order signal in view of the other new equipment. As a result, the majority of the roads have continued the use of the train-order signal in its early form as a separate and distinct feature from the interlocking or automatic signals. However, as interlocking plants became more numerous and as automatic signaling was extended, several important roads have found that one set of signals is less confusing than two. Therefore where the train-order indication can be given by the interlocking or automatic signals the separate train-order signal has been abolished, thereby securing a minimum of signal indications. In view of the fact that accidents have been caused by a confusion of signal indications at interlockers and as progress very evidently demands a simplification of signal indications, the *Railway Signal Engineer* has collected data from numerous roads regarding this phase of signaling for the benefit of those interested.

Many Roads Continue the Use of the Separate Train-Order Signal

Of the 42 representative roads that furnished definite answers 28 are following the regular practice of using a separate signal for train orders, while 12 roads are using the home interlocking signal as a train-order signal. At least one important road is using the advance automatic signal as a train-order signal at interlocking plants on double track.

These figures show a large preponderance in favor of separate signals, but if the data are considered in the light of the signaling in service, the proportions are

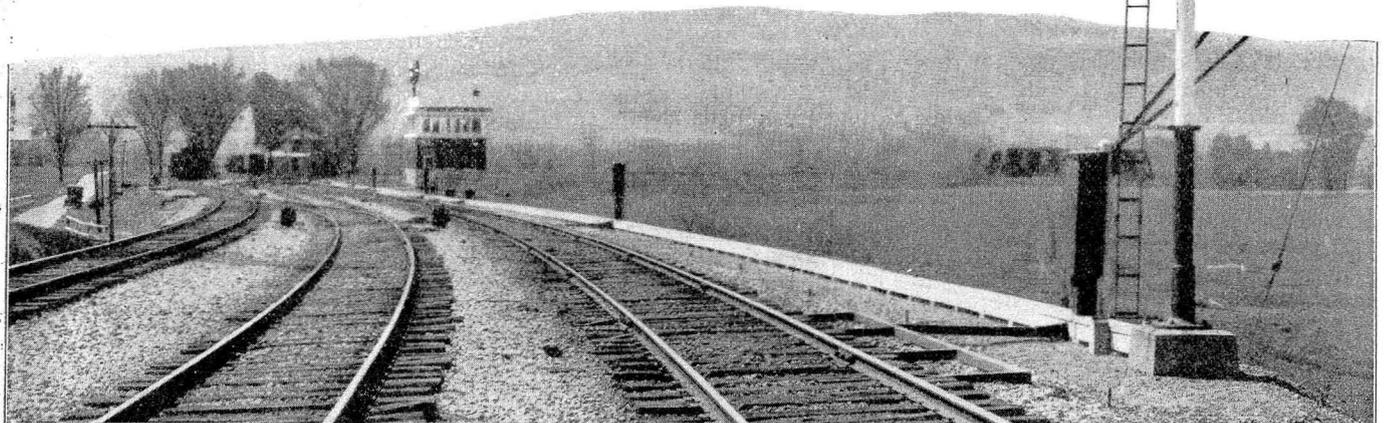
decidedly different. In the signal section of the American Railway Association the votes assigned to each representative road are fixed by the amount of signaling in service on the respective lines. The 29 roads using a separate train-order signal control a total of 210 votes, while the 12 roads using the home interlocking signal control 198 votes. The one road using the advance interlocking automatic signal for train orders controls 10 votes, which if added to the 198 would make 208 votes as compared to 210. Therefore the proportions are practically equal.

Reasons for Separate Train-Order Signal

Aside from the fact that there is a strong tendency to continue the use of established practices, several important roads have advanced strong arguments for the continued use of a separate train-order signal at interlockers. The most important of these arguments presented by the roads may be summarized as follows:

1. A separate signal is necessary in order to give a distinct train-order indication.
2. To avoid delay on account of stopping trains at the interlocking home signal which would require the conductor to walk up to the tower to secure the written order.

Those advocating the use of the interlocking signal as the train-order signal meet the argument as given above; (1) by the statement that there seems to be no valid proof of the distinction between the two separate signal indications judging by the reports received on conflicting indications, which are noticeable at night especially. In the automatic



Typical Example of a Separate Train-Order Signal at the Tower Indicating Clear While the Home Interlocking Signal Is Indicating Stop

block signal territory, with particular reference to double track, argument (2) is of no consequence as a stop need be made for a "31" order only, and in automatic block territory the use of "31" orders is not frequent.

Arguments for the One Indication

The principal argument in favor of the use of the interlocking signal for a train-order signal is its simplicity and the elimination of any confusion of signal indication; as, for example, the engineer mistaking the "no-order" indication of the separate train-order signal for a proceed home interlocking signal indication and

standard practice in the future will be to provide the means of blocking trains by the use of home interlocking signals, and as early as possible, the few separate train-order signals we may have at interlocking plants will be removed."

No fixed rule can be used for the discard of the separate train-order signal. For example, the Southern Railway uses a separate train-order signal on single track, while the interlocking home signal is used for train orders on double track. Again on the Chicago & North Western a separate train-order signal is considered necessary in non-automatic territory due to the fact that if the home signal is used for both, the leverman can clear the signal without orders and might forget the block, thus leaving no protection, whereas, in automatic block territory trains are still protected by the automatic signals. In automatic block territory the home interlocking signal is used as a train-order signal on this road.

On the Chicago, Milwaukee & St. Paul at interlocking plants on double track equipped with automatic signals, the advance automatic signal is used as a train-order signal and carries a cast iron sign reading, "Train Order Signal." The sign is 20 in. square with 5 in. raised letters painted white on black. This signal is located beyond the crossing opposite the home signal for the opposite direction. In order to prevent any confusion of signal indications with that of the home signal this automatic train-order signal is so interconnected electrically as not to permit it to assume the proceed position except when the home signal is clear or the track circuit between the home signal and the train-order signal is occupied.

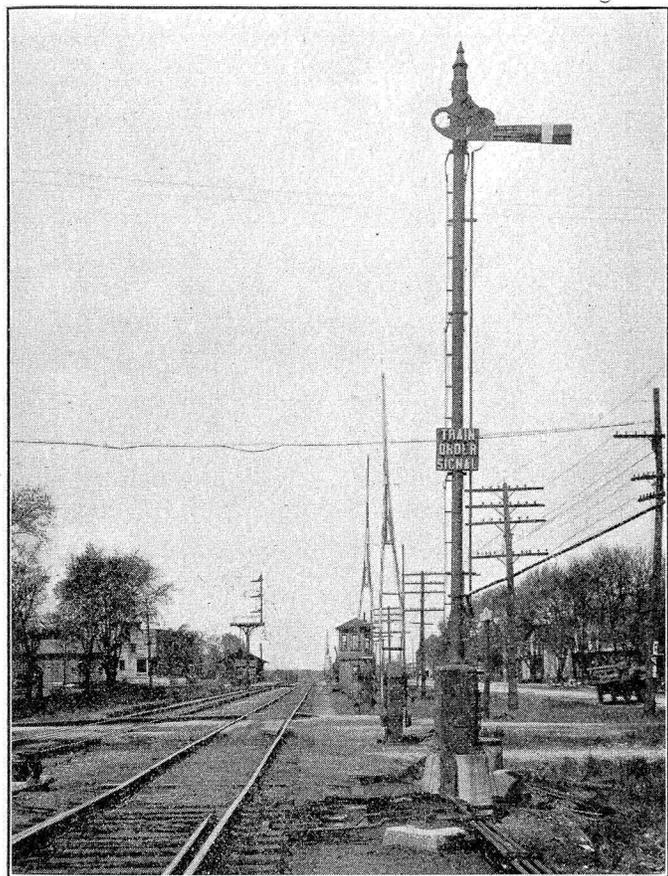
Methods of Using Separate Train-Order Signal

The majority of those roads using a separate train-order signal follow the method of operation given in the standard A. R. A. rules 221, 221A or 221B. However, some roads hold the signal normally at danger and require that the engineer actually see the signal cleared, otherwise he must stop to inquire for orders. One road has a special rule which reads as follows:

"When a train approaching a train-order office has reached a point where the train order signal is entirely visible and not to exceed one quarter of a mile therefrom, the engineer will give four short sounds of the whistle; if there are no orders for the train, the signal must be changed to 'proceed.' Enginemen will acknowledge this change by two short sounds of the whistle, or, if the signal is not changed to 'proceed,' give one short sound. If there are no orders for the train, the signal must be held at 'proceed' until the rear end of the train has passed 200 ft. beyond the signal, when it must again be changed to 'stop.' Should the signal be found in the 'proceed' position, however, enginemen will bring the train to a stop before passing the signal, even if it is afterwards changed, get a clearance card explaining the improper position and report the occurrence to the chief train dispatcher from the next open-order office where a stop is required."

On only five roads using a separate train-order signal is the train-order signal interlocked with the home interlocking signal so as to prevent the train-order signal being at proceed without the home signal also being at proceed. The Chicago, Milwaukee & St. Paul; the New York, Chicago & St. Louis and a few other roads interlock the train order signal electrically with the approach and distant signals so that the distant signal will show "caution" with the train-order signal at "stop." The Boston & Maine follows this practice at a few plants. On the Missouri Pacific the train-order signal levers are interlocked mechanically in the machine with the interlocking signals.

As it is generally recognized that there is danger of the proceed train-order signal indication being mis-



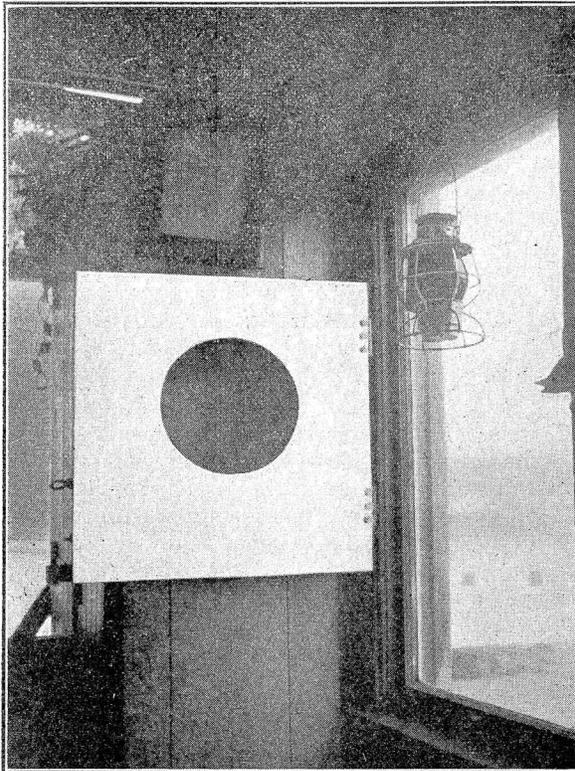
On the C. M. & St. P. the Advance Automatic Signal at Leaving End of Interlocking Is the Train Order Signal

therefore over-running the interlocking signal. Another argument expressed by several roads is that a separate signal is not necessary, and can very well be eliminated. The situation is summed up very well in the remarks received from the Baltimore & Ohio as follows:

"For at least 20 years the Baltimore & Ohio has strenuously opposed the installation of separate train-order signals at interlocking plants. Our standard practice for at least 15 years has been to utilize the home interlocking signals and thus avoid the possibility of misreading signal indications. It is felt that there is no necessity for a separate train-order signal either in automatic signal territory or at interlocking plants. Automatic signals, where it happens to be necessary to arrange them for combined use, can be used very readily, in fact, we have a number of such points where the signals are so arranged by using two arms, the lower arm being for permissive operation.

"It is our opinion that such signals as separate train-order signals, when not arranged so as to indicate stop when the crossing is to be used by a conflicting train, are a menace to safe operation. The Baltimore & Ohio

taken for a clear home interlocking signal, the roads have used various methods of placing the signals to secure a distinction of location at least. On the Buffalo, Rochester & Pittsburgh train-order signals have one light at the top of the mast. The interlocking and block signals have two lights, the indication light and the marker light, vertical lights for interlocking and staggered lights



Train-Order Indicator and Red Lantern as Used in C. & N. W. Tower

for automatics. In addition, an *effort* is made not to have these signals in line with each other.

On the Chicago Great Western the train-order signals are mounted on a lower pole than the home signals and unless due to some unusual condition are located immediately outside of the telegraph office. Home signals mounted on the higher pole and placed a considerable distance from the tower and to the right of the track governed do not conflict in any way with the train order signals.

Regardless of the measures taken the doubtful summary of the results obtained is expressed by the report of one road as follows: "We *endeavor* to keep the location of all signals such that there will be no chance for enginemen to misread or take one signal for another."

Use of Interlocking Signal for Train-Orders

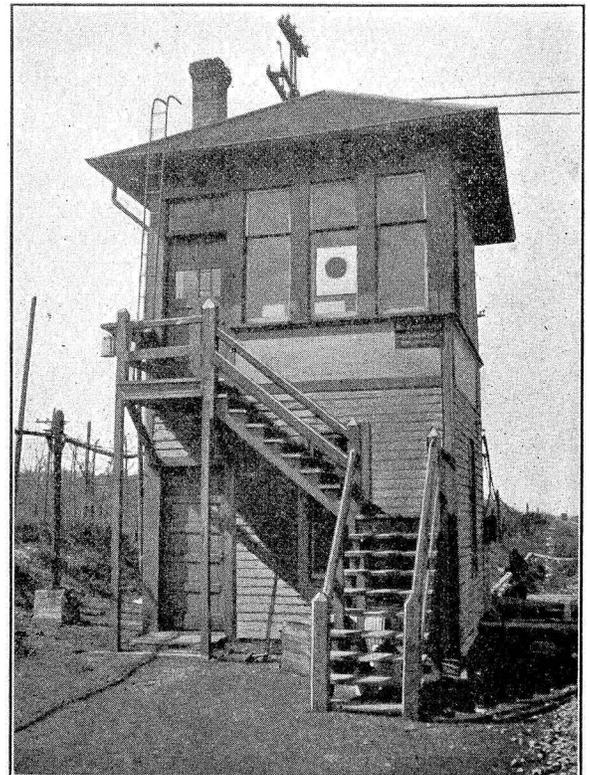
Roads using the home interlocking signal to stop trains for train orders at interlocking plants are the Erie, the Lehigh Valley, the Baltimore & Ohio, the Pennsylvania, the Chicago & North Western, the Delaware, Lackawanna & Western, the Cleveland, Cincinnati, Chicago & St. Louis, the Long Island and others. On the Lehigh Valley where no separate train-order signal is provided at an interlocking plant, the home signal of the interlocking plant is used as a train-order signal, in addition to which operators must display a red flag or a red light outside of the tower, to indicate to conductors and enginemen that the fixed signal is displayed for train orders in addition to its function as an interlocking signal. Clearance Card, Form T-511, must be issued

when the home signal is held in the stop position for following trains in addition to Clearance Card Form (A).

On the Chicago & North Western at an interlocking plant in automatic signal territory, "the home interlocking signal may be used to stop trains for train orders. A red disc or red flag by day or a red light by night so placed at the interlocking station that it may be seen from the train so stopped will indicate to enginemen and trainmen that there are train orders."

On another road the rule reads:

"Engineman finding a red signal displayed at the tower and home signal indicating 'Stop,' will acknowledge the signal displayed from the tower by two short blasts of the whistle.



Special Train-Order Indicator in Tower Window as Used in Conjunction with Home Signal on C. & N. W.

When the signal is acknowledged, the operator will, if other conditions permit, clear the home signal, permitting the train to pull up to the tower for orders. Trains will not leave towers where such signals are displayed without orders or clearance cards."

On the Pennsylvania the rule is as follows:

"When a train-order is to be delivered to a train, the fixed signal, the home block signal, or the home interlocking signal must be displayed at 'Stop' for the track and in the direction of the approaching train, a flag or light must be displayed in the place provided for the purpose, a red flag or light indicating '31' orders, a yellow flag or light indicating '19' orders. This combination of signals must be acknowledged by the engineman by two short sounds of the engine whistle."

Another large railroad system using the home interlocking signal for train-order indications uses the yellow flag for "31" orders also. The rule in this case is:

Rule 1024: "Where train-order signals are not provided at an interlocking plant, yellow flag by day and a yellow light by night displayed to an approaching train, in addition to the stop indication of the fixed signal, indicates there are train orders and will be acknowledged by two short sounds of the whistle. If after acknowledging signal by two short sounds of the whistle stop signal is not changed to proceed, it will indicate there are '31' orders and conductor must promptly report at signal station. If stop signal is changed to proceed it will indicate that '19' orders are to be delivered and train may advance to signal station but must not leave until orders have been received."