Editorial Comment

Signal Maintenance Engineering

For purposes of analysis, the engineering of signaling projects may be divided into two categories: (1) to design the signaling arrangements, the aspects, and the controls which are best adapted to the requirements of train operation on the particular territory; and (2) to adopt materials and construction practices to constitute an installation which can be maintained to render satisfactory service at a reasonable operating expense. Some signal engineers may devote too much time to problems in the first category, and, therefore, the following discussion is to encourage more attention to questions under the second category, which has to do with materials, equipment and construction practices.

Signal engineers can sit in their offices and compare battery records, power bills and signal performance records, but the best means of acquiring a thorough knowledge of the results being rendered by equipment and materials is to make a detailed inspection in the field, and talk with the maintainers and supervisors to get the benefit of their individual experiences with equipment or construction practices on their territories.

Quite properly, the major concern of maintainers as well as supervisors is to care for the equipment on their territories. In other words, to produce the best results possible with that which is assigned to them. These men may have the ingenuity and industry to develop means of overcoming defects in materials or construction practices, but they may be hesitant in offering criticisms of standards of the railroad, or methods recommended by manufacturers. Thus, open conversations on these subjects, on the ground, may bring forth valuable suggestions. Observations on one road disclosed variations in maintenance methods on adjacent supervisor's territories. Both methods were producing good results, but a study of both could well be made to choose the best features of each, which, combined, would make for even better results.

On one road with more than 2,000 automatic signals in service, the signal engineer, in company with an inspector and the local supervisor, as well as maintainer of each section, personally inspects every signal and interlocking on the road every year. During such inspections, information is acquired concerning details of construction and maintenance which are causing trouble or extra work. These faults or defects are promptly investigated for the purpose of developing modifications in practice which will correct the objectionable features.

The experience embodied in the design and construction of signaling installations now being planned will be judged by the performance record, as well as maintenance and operating expenses, in years to come, but, if a signal engineer does not have an accurate knowledge of existing maintenance problems, as viewed on the ground, how can he correct construction practices to avoid these troubles on new installations in the future?

Choice of Interlocking Control Machines

With several forms of interlocking control machines and circuit systems available, signal engineers can apply that which is best adapted to requirements at a given location. The two principal types of interlocking machines are: (1) the older type, including mechanical locking between levers and electric lever locks; and (2) the so-called all-relay interlocking, including a panel-type machine, with no mechanical locking or electric lever locks, the interlocking, as well as electric locking, being accomplished by interconnections of circuits.

On inquiring among some signal engineers as to the relative advantages of these two types, some contend that mechanical locking and electric lever locks accomplish results which, in a panel-type plant, require numerous relays and much wiring. Furthermore, they also point out that mechanical locking will render satisfactory service for many years with a minimum of attention, as compared with relays which must be inspected and tested at specified intervals. On the contrary, a comment from another signal engineer was to the effect that, at various plants on this road, the mechanical locking, as well as various mechanical parts of the levers, had worn to an extent which necessitated renewals, and that he was replacing these machines with all-relay panel machines. On further inquiry, the signal engineer first mentioned, said that in some of the plants most recently installed with machines including mechanical locking and electric lever locks, he was providing also certain additional circuit networks and relays which, in part, duplicated the protection afforded by the mechanical locking and lever locks.

Another factor for consideration is the number of levermen required to operate interlocking machines at large terminals, while at smaller layouts the question is whether a man can operate an interlocking machine and also do other work, such as handle train orders. When using a conventional machine with mechanical locking, the towerman must operate the levers in a certain sequence, and, if the switches are operated by electric machines, the stroke of the lever cannot be completed until the switch is over and the indication returned to the tower. Thus, if a line-up requires the operation of very many switches, considerable time is required even by an experienced leverman who knows the exact sequence of manipulation.

In the meantime, a train approaching on another route may be required to stop and wait. Also, on account of the time required to change line-ups, the machines with mechanical locking are not adapted for the control of large terminal interlockings or of several layouts in approach to a terminal, because the prompt operation of the machine may require two or more levermen who must think as one man, an accomplishment which is rare.

On the other hand, in layouts where line-ups, including the operation of several switches, must be changed quickly to avoid delays to trains, the all-relay machines can be manipulated much faster than those with mechanical locking. This is true because a man seated before the panel of an all-relay machine can operate the controls for all the switches and signals without leaving his chair. With the illuminated track diagram forming a part of the machine panel, he can visualize the proposed train movements and thereby coordinate operations as a whole. Thus, because of the concentration of the controls on a relatively small panel, and the quickness with which the machine can be manipulated, one man can effectively control a large area, as for example the extensive double-end passenger terminal at Birmingham, Ala., as was explained in the December, 1943, issue of *Railway Signaling*. Similarly, one panel-type machine controls a stub-end terminal and the junctions located within several miles leading to the Canadian National terminal in Montreal.

The all-relay panel-type machines with no machanical locking were developed some 18 years ago and have been installed quite generally for the past 15 years. The first all-relay interlocking including a panel control machine, without mechanical locking or lever locks, was installed in 1929 by the Rock Island Lines near Chicago. Another early all-relay plant was installed by the Big Four at Cleveland, Ohio, in 1930. Furthermore, in principle, the interconnections of circuits and types of machines are basically the same as used in centralized traffic control which has been installed extensively for 20 years.

Nevertheless, within the past several years some large terminal interlockings have been built or rebuilt to include machines with mechanical locking and electric lever locks, thereby involving complicated manipulation and either requiring more time to make line-ups or necessitating several expert levermen. To be specific, an all-relay interlocking could have been used in the interlocking installed in the Cincinnati Union Terminal in 1933, because three of the railroads involved, the Pennsylvania, the Big Four and the Baltimore & Ohio, had previously co-operated in the installation of an all-relay interlocking at Dayton, Ohio, and the Big Four had installed an all-relay plant at Cleveland.

After the burning of the tower at St. Louis Union Station in July 1940, there was an excellent opportunity to install an all-relay control as a means of facilitating operations and reducing the number of levermen and train directors. Instead, the replacement included a machine with mechanical locking and electric lever locks which was practically the same as the one previously in service. The decision to adopt this action was based, in part, on the hope that the plant could be replaced sooner, but 150 days expired before the interlocking was restored to service. Quite likely an all-relay control of either the route type or the entrance-exit type could have been installed within that time.

Signal engineers and operating officers contemplating the installation or reconstruction of interlockings at large terminals could well afford to visit the route-control all-relay plants on the Central of Jersey at Elizabethport, N. J., on the Baltimore & Ohio Chicago Terminal at Western avenue, the entrance-exit all-relay interlockings at Birmingham Union Station, the New York Central passenger station at Utica, N. Y., and the plants at the ends of the San Francisco-Oakland Bay bridge. Where track layouts and traffic do not necessitate the maximum facility in changing line-ups, the entrance-exit or route-type machines may not be required, but consideration should be given to the all-relay systems with panel machines, including levers or buttons for control of each switch or signal individually. Recent installations of this nature were made on the Southern and the Nashville, Chattanooga & St. Louis at Chattanooga, Tenn.; on the Delaware & Hudson at Mechanicville, N. Y.; on the Richmond, Fredericksburg & Potomac at Fredericksburg, Va.; on the Pere Marquette at Bay City, Mich.; and on the Boston & Maine at Manchester, N. H.—all of these installations having been explained in articles published in *Railway Signaling*.

KINKS

Rear Tray for Motor Cars

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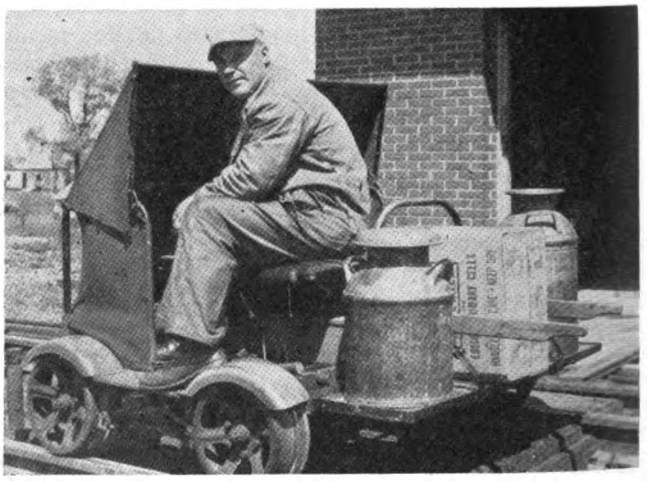
I HAVE designed and made an extra tray which I attach on the rear of my Fairmont motor car when I am hauling extra materials, such as primary battery renewals and cans of water. This tray is 14½ in. wide and 50 in. long. The outside edges are made of ¼-in. by 1½-in. by 1½-in. angle iron, with the one edge extending ½ in. up above the boards. This ½-in. rim prevents the water cans and boxes from falling off.

Under the 14½-in. dimension of the tray, there are three supports made of ¼-in. by 1¼-in. strap iron, and on the end toward the car, the ends of these straps are shaped to form hooks which fit over the edge of the angle iron of the frame of the motor car. The rear of the platform is supported by two chains. One end of each chain is bolted to a strap iron attached to the rear edge of the platform, and the other end is passed around the pipe at the level of the seat of the car. The chain is held by a bolt through links, and this idea permits adjustment, as required, to make the platform level or to slope it slightly to the motor car.



Motor car tray loaded with box and two water cans

When needed, this extra rear tray is a big advantage. Water cans and boxes can be loaded much easier on this tray than on the regular side trays on the car. Also if a train is coming, I can dump the boxes and water cans off to the rear easily. The handles, for lifting the car, slide out beyond this rear tray and, therefore, it does not interfere in this respect.