EDITORIAL COMMENT

Route Control Interlocking—A New Signaling Development

A SIMPLIFIED type of interlocking control, in which the switches and signal for a complete route are all controlled by the operation of two buttons, has recently been developed and the first installation was placed in service on the New York Central on September 23; while a second plant, effecting similar results in control, is now under construction on the Baltimore & Ohio Chicago terminal. In this new type of interlocking machine, the control equipment is incorporated as a part of an illuminated track and signal diagram on a panel forming the face of a cabinet. The lining up of a route involves merely the operation of a button at the point on the diagram where a train is to enter the plant and the operation of another button at the place where the train is to leave. The engineers of the manufacturers and of the railroads are to be complimented for developing this route control interlocking in a form that is adaptable to American railroad track layouts and operating practices.

Basis of New Development

On first thought, this idea of operating a couple of buttons to line up a complete route through a complicated track layout seems a far cry from early conventional interlocking practice, with a separate lever for each switch and signal, with complete mechanical locking between levers to enforce sequence of operation, and with electric locks on levers, all of which had been for years considered necessary to ensure safety. Basic improvements, as well as various developments in past years have aided in making possible the new route type interlocking control, so that an explanation of some of the steps which may have contributed to this new system are of interest at this time. The examples cited are typical and not necessarily inclusive of all plants of the types mentioned.

One of the early steps in the direction of route control in the United States, which constituted a departure from the idea of operational sequence by separate levers, was taken on the Great Northern in 1921, when a plant was installed at Bridge 8, Wis., which involved derails and signals at a gauntlet over a bridge. A two-position lever was used to line up the derails and to establish the signal controls for each track, the direction selection of the signals being approach-controlled. In 1922 this was followed by a plant at State Line, Wis., also on the Great Northern, in which the operation of a lever to the left controlled a route for one direction, and operation to the right lined up the route for the opposite direction. This plant included two crossovers, using four three-position levers to control eight routes.

Approaching the problem from another angle, the experience gained in the design and operation of centralized traffic control demonstrated two things. First, it had been shown that track-circuited control of approach, route, and detector locking could be effected in the field without necessarily using electric locks on levers. As a matter of fact, some roads had for years used various forms of electric circuit interlocking in the field, in addition to the electric lever locks. A second point was that protection insuring the proper positioning of switches and the proper clearing of the signal for a route, as well as assurance that signals for conflicting routes could not be cleared, could be effected by the interconnection of circuits controlling relays and also by the use of three-position levers. Thus, these features effected the result formerly accomplished by mechanical locking.

Other Early Steps

Some of these new practices, accepted for use on extended C.T.C. installations, were soon adopted for the control of more complicated track layouts in interlocking areas. A plant at Detroit, Mich., on the Michigan Central, that was placed in service early in 1929, utilized interlocked desk levers, with electric locks, for the control of switches, but the signals in the plant were controlled by push buttons, set in the track diagram at locations corresponding to the respective signals in the field, as described on page 128 of the April, 1929, issue. About 1930, another development was made to which the term all-relay interlocking was applied as descriptive of a plant using a machine with miniature levers or buttons, having neither mechanical locking nor electric-lever locks, with all interlocking between functions, as well as features such as approach, route, and detector locking, effected electrically by inter-connection of the control and indication circuits. Two plants typical of the early development of the all-relay type are: (a) The Rock Island plant at Blue Island, Ill., described on page 61 of the February, 1930, issue; and (b) the Big Four plant at Linndale, Ohio, described on page 323 of the September, 1930, issue.

Another factor bearing on the development of route interlocking was the successful operation of automatic interlockings in which complete through routes could be selected, even where power-operated switches, crossovers, and movable-point crossing frogs were involved. For example, in a Great Northern plant installed at Wayzata, Minn., in 1927, including a crossover between two main tracks and a junction turnout switch, complete routes were selected for the four through movements on the two main tracks as well as for the movement from the branch line to the eastward main track. This left only one route, westward from the westward main, through the crossover and junction switch to the branch line, to be selected manually. At an installation made in 1925, involving one switch, a locomotive was equipped with

intermittent train control apparatus operated in conjunction with a wayside receiver, so that the engineman, by pushing a button, could effect selection of the diverging route. In other such plants, a control button is located at a wayside station, by means of which the diverging route selection is set up. The Great Northern plants are described on page 324 of the September, 1928, issue, and page 363 of the December, 1932, issue.

Referring back to the thought that there was a demand for a type of control for regular interlockings which would permit greater facility of operation and simplicity of manipulation than was possible with the machines using a separate lever for the control of each switch and signal, the next step was to utilize the schemes for electric circuit locking from the C.T.C. and all-relay interlocking fields and to recognize from the automatic interlocking field the idea of complete route control. Obviously, in a track layout including numerous crossovers and switches, involving selections of diverging routes, it would be advisable to use manual control for the selection of routes, as the Great Northern did at plants previously mentioned.

Route Control Abroad

Before continuing the discussion of developments in America, some mention should be made of the route type control used in Europe. In the route-lever system used for several years in France, mechanical locking was not used. Each lever controlled a route by energizing relays in groups to select the control of switches and signals. In a more recent installation made at Versailles-Chantiers in 1933, the number of levers was reduced by assigning a number of conflicting routes to each lever, which operates to several positions. Mechanical locking between levers is used, contacts for the control of the circuits being actuated by slide bars in the locking.

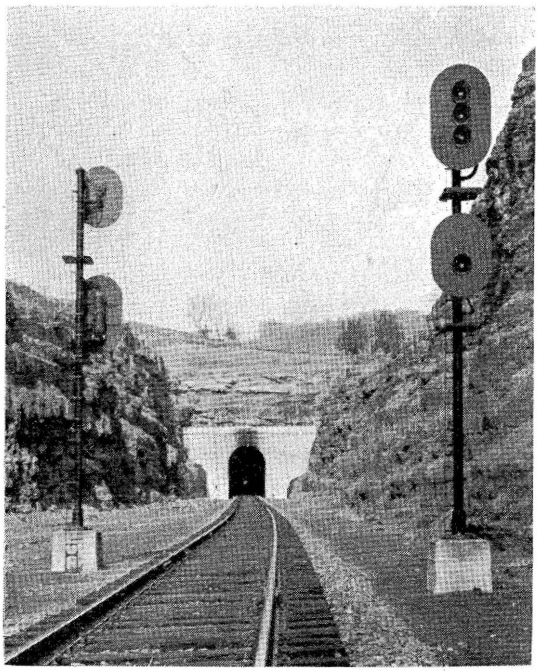
A different arrangement, more similar to the all-relay or C.T.C. control machines, was used in England at a plant installed on the London & North Eastern in 1933, where miniature non-interlocked levers were used. However, one lever was used for each route.

Now returning to the practice in America, it was evident that track layouts and methods of operation in this country require that routes be signaled for train movements in either direction on each track. Therefore, in complicated layouts, the total number of possible routes precludes the practicable application of a system with one route lever for each route, as used in the earlier French system or in the English plant. Likewise, in the Great Northern automatic plant, one button was required for the control of the one route that could not be selected automatically. In such a system, applied where a train approaching on a track might possibly be directed over two or more routes, an equal number of buttons would be required at the corresponding entering signal.

The solution of the problem to provide route interlocking, adaptable to complicated track layouts and American operating practices, has been the idea of using two route-control buttons, one at the point on the diagram corresponding to the signal controlling the entrance to the route and a second button at the place where the train leaves the controlled area. This idea reduces the number of control buttons to the number of tracks entering and leaving an interlocking area. Thereby, this total number of buttons is not determined by the number of possible routes because there may be a selection of routes within an interlocking.

With the all-relay interlocking, each switch is controlled by positioning the corresponding switch lever, and when the switches are lined, the operation of the signal lever not only clears the signal but causes the switches in the route to be locked, thus taking switch control away from the switch levers. With the route control, pushing the two buttons, in order, selects a circuit which causes corresponding positioning of the switches in the route; and, when the switches are over and locked in the required position, the signal control relay is energized and complete electric locking is established, the same as in an all-relay plant or in an automatic interlocking. In instances when a switch or a part of a normal route is already lined up for a different train, the operation of the two buttons will automatically select the alternate route, thus precluding any delay on this account.

Thus, within a comparatively brief period, since about 1921, interlocking has been developed so rapidly that the old conception of an interlocking machine as "an assembly of levers with connections so arranged that the movement of a lever or its unlocking preparatory to movement locks any or all other levers in the frame," no longer necessarily applies in so far as mechanical appearance is concerned, but nevertheless interlocking, in the form of circuit checking, is so used as to prevent "the giving of a conflicting or dangerous signal indication by mistake or inadventure." The simplicity of manipulation and the speed of operation of this new route-type of interlocking is so readily apparent that the saving in train stops and delays which can be effected in many busy interlocking layouts will undoubtedly warrant numerous installations of the new control system.



On the C. & O. near Hilldale, W. Va.