

## INTERLOCKING AND SIGNALLING.

**E. W. OLIVER, B.A.Sc., C.E. (TOR.),**  
Canadian Northern Railway System.

It is not the purpose of this paper to go into a detailed analysis of the subject of signalling, as such would require much more space than is available under the existing conditions. It would require volumes to discuss in detail that subject from its inception, early in the last century, down to the present day, with its various forms, as used by the principal railways of Europe and America, and even beyond in countries where a few years ago railroads did not exist.

It has been deemed more advisable to set forth with some detail the conditions of interlocking and signalling required at grade crossings of railways in this country. These conditions have been largely moulded by the various regulations issued by the Board of Railway Commissioners of Canada. This Board was constituted by the Federal Government in the Railway Act of 1903, with powers to control the detail of railway construction and operation, and to settle all disputes arising therefrom. It will thus be noted that the powers of this Board are exceedingly large and its duties require the continual attention of its five members and the staff of experts in the various departments.

Prior to February, 1904, the date when the Board of Railway Commissioners assumed office, the procedure in the matter of railway crossings was exceedingly vague. It was largely a matter of stealing a crossing and taking the matter of maintenance to the Railway Committee of the Privy Council for settlement. Generally speaking, some agreement was attempted between the companies, with the senior company dictating the terms, and having it afterwards ratified by the Railway Committee. Such arrangement, however, resulted in endless strife in many cases, and little, if any, attempt at the standardizing the interlocking plants erected. These conditions are now greatly improved, and in general, the Board of Railway Commissioners have issued regulations which tend toward the proper basis of crossing agreement and the installation of adequate equipment of interlocking to protect the travelling public and company rights.

It is particularly desired that this paper shall be an attempt to discuss the subject from the conditions as we meet them in Canada at the present time, and reference will be made from time to time to various plants installed within the past two years, in order to give a clear conception of conditions peculiar to local conditions.

### Requirements for Crossing Privilege.

Within the past ten years the number of miles of railway in operation in Canada has increased from 16,550 miles to 22,452 miles, or nearly 36 per cent. Such wonderful development has resulted in 81 additional grade crossings, making a total of 315, as well as under and over crossings. In that section of the country lying between the eastern boundary of Manitoba and the Rocky Mountains, under or over crossings are exceptional on account of the flatness of the country. In Ontario and the Eastern Provinces greater opportunity is afforded for grade crossing elimination, although it is not always found to be feasible.

Before construction of a railway is commenced, it is necessary to first file with the Minister of Railways a route map, in triplicate (preferably on a scale of six miles per inch) which defines, within one mile on each side, the country proposed to be traversed. A copy of this, certified by the Minister, is then forwarded to the Board of Railway Commissioners, who approve all subsequent plans. The right of way plans and profiles are then submitted to the Board, who approve the location if same is made within the mile limit of the route map. If this location crosses the line of another railway it is necessary to prepare a plan and profile in triplicate showing both lines for a distance of two miles on each side of the crossing.

The Board can then issue an order approving these plans with whatever conditions are made necessary in the particular case. The orders set forth the details of interlocking re-

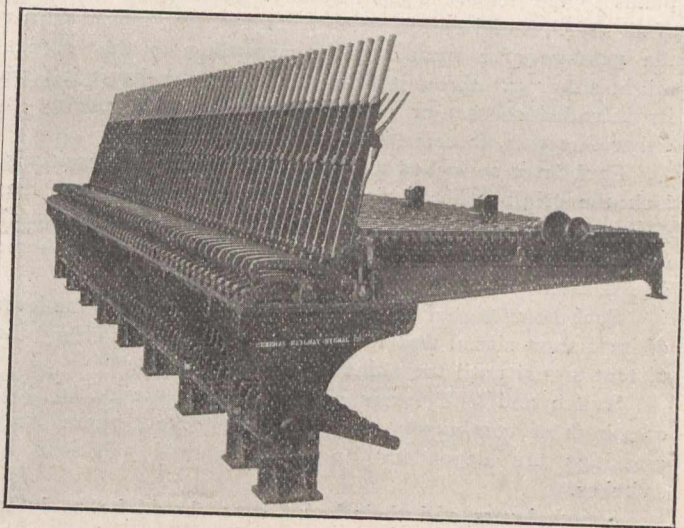
quired, and generally the time allowed for the operation of work trains over the diamond, before the plant is in full working condition, is specified.

In the case of a branch or main line of one railway crossing one another line of the same company, conditions are somewhat different. The Board, within the past month, has ruled that the approval of such a crossing is not necessary, and unless conditions are extraordinary, interlocking plants are not required, providing the operation on both lines is under the control of one despatcher. It is reasonable to suppose, however, that such ruling will be reversed within the near future as such is hardly in accordance with the accepted principle of the Board to safeguard public travel under all conditions.

### Principles of Interlocking.

The fundamental idea of interlocking is to eliminate as far as possible the human agency of operating signals at a crossing, and thus produce as near as possible an absolute protection to the travelling public and the property of interested companies.

An interlocking plant consists of a group of levers concentrated at a central point for operating certain switches and



**Fig. 1.—60-Lever Interlocker for Beacon Park, Mass.**

signals, and so arranged as to interlock such levers and make it impossible to give "clear" signals for conflicting routes. The advantages derived therefrom are safety, facility of operating and saving in cost of manual labor employed.

A description of the original mechanical machine will give not only the method of operation peculiar to itself, but also a general idea of the principle of interlocking as used in all machines. The machine may be small in size, that it, may have but few levers, sufficient to properly protect a single track grade crossing; or it may be to take care of a crossover between the tracks of a double-track road. Or, on the other hand, the machine may be a large one, with many levers, sufficient to handle any combination resulting from several roads crossing one another and provide for necessary transfer tracks; or it may be for handling a large classification yard, a large passenger terminal, or a combination of any of the above. It, therefore, follows, that the size of the machine depends entirely upon the arrangement of the tracks which it is to govern.

A general view of the machine levers is set forth in Fig. 1. The levers, it will be noticed, are provided with latches, which, in the case of the lever locking machines, perform the duty of keeping the lever in the normal of reverse position; but in latch locking machines, the type in general use, it locks and unlocks all other levers. A lever which is to lock certain levers and release certain other levers must complete all its locking functions before the beginning of its stroke, and must not accomplish its releasing or interlocking functions until after its stroke is completed. This principle is the fundamental one in preliminary interlocking.

The spring latch affords the means by which it is possible to meet these conditions; and it is now invariably used to actuate the interlocking mechanism. The result is that