"All these attempts to establish a law of impact, and the assumption of such laws as given in the various bridge specifications, while undoubtedly indicating the unsettled knowledge of the subject, are nevertheless more or less valuable, and tend toward safe construction. It is to be hoped that in the near future a sufficient number of tests will be made to indicate in some definite manner which, if any, of the numerous assumptions are approximately correct."

GRAND TRUNK SIGNALING SYSTEM AT TORONTO.

There are several kinds of interlocking in use in the States and Europe, viz.: the Manual, the Electric, the Auto-Pneumatic, the Electro-Pneumatic, the Automatic-Electric, and the Hydraulic.

In Toronto, the Grand Trunk Railway has adopted the Manual system for working the switches and signals from Berkeley street to Queen's wharf, there being in that distance four cabins, comprising 187 levers in all. Illustrations are here given showing several features which have been introduced for the first time on any Canadian railway. The accompanying diagram represents the yard at the east entrance of the Union station. This cabin contains 66 levers, and is worked by three men during the twenty-four hours, in eight-hour shifts each.

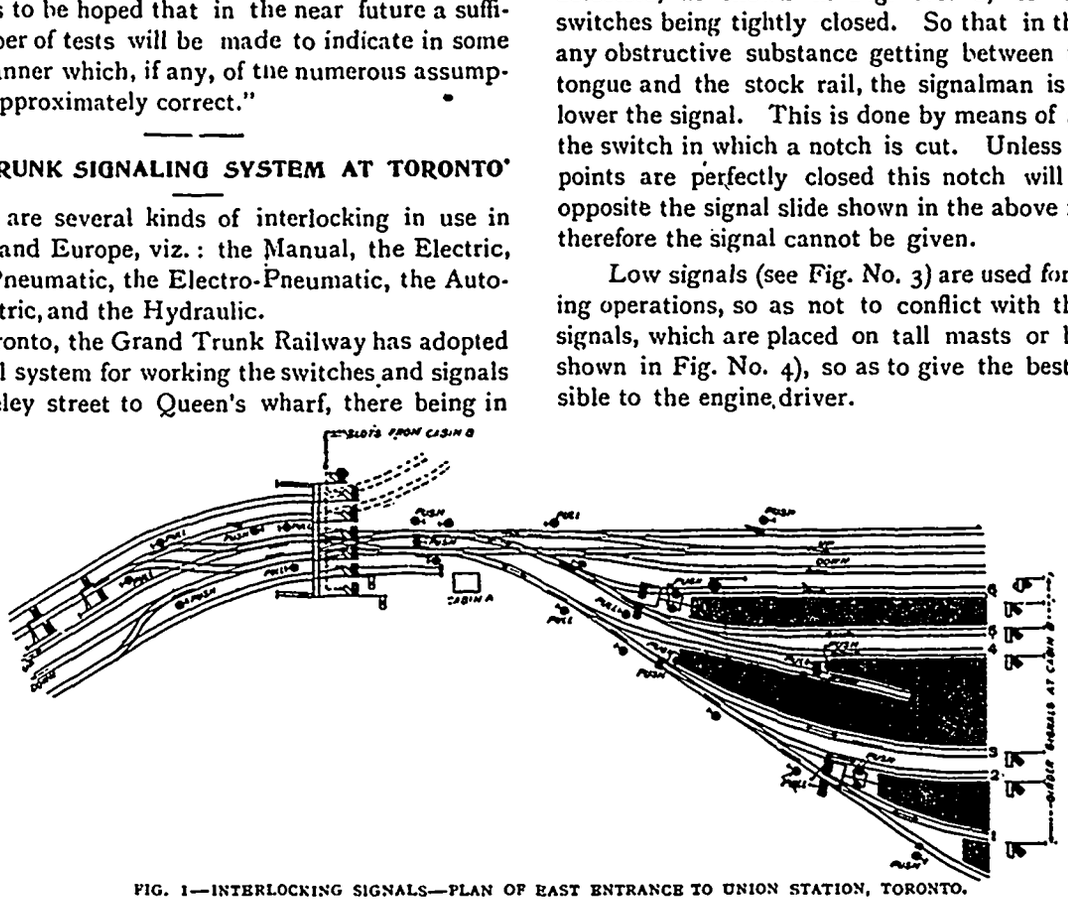

FIG. 1—INTERLOCKING SIGNALS—PLAN OF EAST ENTRANCE TO UNION STATION, TORONTO.

The signals and switches are so interlocked one with the other, as to prevent the signals being given for any other route than that for which the switches are set. The action of setting the switches itself locks the signals for conflicting routes at danger, and the signal for any route cannot be lowered until all the switches for that route are set right, and when the signal is pulled for that route all the switches are locked and cannot be moved until the signal has been put to danger.

To prevent the signalman throwing up the signal and moving the switches before the train is clear of them, the switches themselves are provided with bars which must rise above the top of rail before the switch can be thrown, this bar being of sufficient length to cover the longest wheel base.

In addition to this, the switches are provided with detectors, as shown in Fig. No. 8, to ensure the switches being tightly closed. So that in the event of any obstructive substance getting between the switch tongue and the stock rail, the signalman is unable to lower the signal. This is done by means of a rod from the switch in which a notch is cut. Unless the switch points are perfectly closed this notch will not come opposite the signal slide shown in the above figure, and therefore the signal cannot be given.

Low signals (see Fig. No. 3) are used for all shunting operations, so as not to conflict with the running signals, which are placed on tall masts or bridges (as shown in Fig. No. 4), so as to give the best view possible to the engine driver.

All signals are worked by wires, and the signal arms are so constructed that in the event of a breakage of the wire they will at once fly to danger. The switches are worked by gas-pipe run on anti-friction rollers (Fig. No. 5), and attached to the levers in the cabin by means of cranks.

The long-distance signals are supplied with wire regulators (Fig. No. 6), so that the signalman may adjust the length of the wires no matter how much they vary through difference in temperature, without having to leave his cabin.

As a means of communication between the signalmen in the various cabins train indicators are used (Fig. No. 7), on the dials of which are marked the various kinds of trains run on that section of the line. In this way the announcement of the trains is indicated from cabin to cabin.

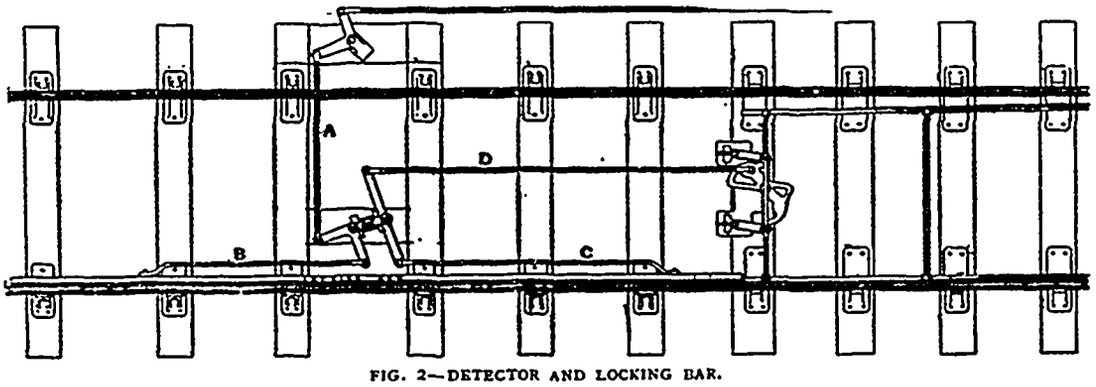

FIG. 2—DETECTOR AND LOCKING BAR.

At the crossing of one railway by another on the level, derails are placed in the track 50 feet from the home signal, and 500 feet from point of crossing, so that in case of a driver over running his signal, the engine