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Single Track Automatic Signals, Toronto, Hamilton and Buffalo Railway.

During the summer of 1911 the T.H. & B.R. began its first automatic block signal installation on 9 miles of track, from Kinross to Vinemount, Ont. In 1913 the automatic signaling was extended from Vinemount eastward to Welland, 26 miles, and in 1914 signals were installed on the west end from Hamilton to Brantford 25 miles. There remains approximately 16 miles of single track between Hamilton and Brantford which is not equipped with automatic block signals.

As shown in the accompanying map, fig. 1, the T.H. & B.R. forms a connection between the Canadian Pacific on the north and the New York Central Lines on the south. The track and signal arrangement of the Hamilton terminals, also the profile and alignment, are shown in fig. 2. Traffic is heavy, the average being 32 trains a day,

and serve as a reminder that a meet is to be made at this point. In fig. 9 train 1 is about to meet trains 2 and 4 at siding B. Train 1 enters the siding and proceeds into the next block under authority of a clear indication at signal 11. Signal 10 goes to clear as soon as train 1 enters the siding and switch is restored to normal position, and train 2 proceeds toward siding C. Fig. 10 shows the trains proceeding in their respective directions. When train 2 passes signal 8, signal 10 goes to caution and train 4 can advance on this indication. Intermediate switches are, in most cases, equipped with push-button indicators of the semaphore type, and normally indicate block is not clear. Before opening the main line switch trainmen are required by rule to press the push button; if conditions are

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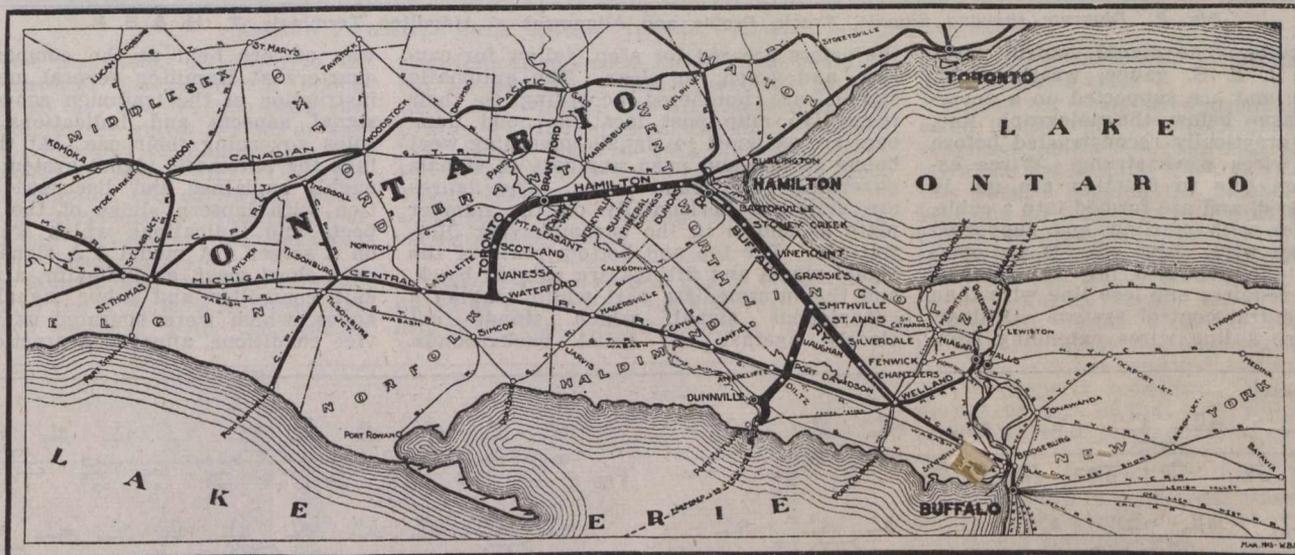


Fig. 1. Toronto, Hamilton and Buffalo Railway Lines.

and the maximum 52 trains a day, as follows:

Freight, westward ..	Aver. 6	Maximum 10
Passenger, westward	Aver. 10	Maximum 16
Freight, eastward ..	Aver. 6	Maximum 10
Passenger, eastward	Aver. 10	Maximum 16

Formerly trains were operated by the telegraph block or time interval system in connection with train order boards, and in some cases by standard semaphore train order signals. Trains following a passenger train were held at train order stations until passenger train was clear of the block, and a time interval of five minutes was maintained at train order stations between following freight trains. Train orders and instructions regarding train movements are transmitted by telephone, and there is a telephone at each passing siding so that trainmen can communicate direct with the dispatcher when occasion requires.

The system of signalling is the General Railway Signal Co.'s absolute permissive block system, in which the block for opposing trains is from siding to siding, and for following trains the block is from signal to signal as in double track signaling. Signals governing movements from passing

entered the block between sidings A and B, and is protected against opposing train 1 by absolute signal 5, which is in the stop position.

Fig. 5 shows the minimum spacing of following trains running under caution signals, and fig. 6 the minimum spacing of following trains running under clear signals. In both cases absolute signal 5 protects against opposing trains. There is also a caution indication for each stop indication.

Fig. 7 shows opposing trains 1 and 2 approaching meeting point at siding B, and illustrates one of the important features of the absolute permissive block system—the double distant or caution indication, signals 7 and 9, and signals 12 and 14, which affords maximum safety at meeting points, and insures proper signal indications. Owing to the arrangement of the control circuits it would be practically impossible for train 1 to pass signal 7 at clear and then find signal 9 at stop, or for train 2 to pass signal 14 at clear and then find signal 12 at stop. Absolute signals 10 and 11 protect against opposing trains.

Fig. 8 shows trains 1 and 2 at siding B. Permissive signals 9 and 12 are at stop

such that it would be safe to enter the main track, the indicator blade operates to the vertical position and indicates block is clear. If the block is not clear, the indicator blade remains in the normal position. This arrangement of de-energized switch indicators reduces to a minimum the chance of false clear indications. The push button operates two contacts, which make and break both sides of the energizing circuit. The resistance of indicators is 690 ohms.

Main line switches are equipped with model 5 switch circuit controllers through which, in some cases, the control circuits are broken, and in other cases the track circuits are shunted.

Track Circuits.—The length of track circuits varies considerably, according to the distance between successive signals; the average length is approximately 2,000 ft. and the maximum length about 4,000 ft. Ballast is rock and gravel, affording good drainage; ties are untreated oak and cedar; rail is A.S.C.E. 80 lb. and 100 lb.; all rail joints, including insulated joints, are of the continuous type; two 44 in. E.B.B. bond wires connect adjoining rails at each joint. The track battery consists of two cells of