

In fact the selection of the system of block signaling was rivalled in importance only by that of the provision of the proper motive power. The traffic anticipated was unparalleled in history and the new problems thus confronted were many and difficult. Plans were devised to permit of a one-minute headway on express tracks and three-minute headway on the local tracks. After most careful consideration the Automatic Block Signal System was selected with all the switches both for the main line movements and yards to be operated by electro-pneumatic power from central points through interlocking towers. The cost of this complete system was at that time believed to be the largest single order ever given to a signal manufacturing company, and involved an expenditure for the complete system approximately one million, eight hundred thousand dollars. That this system permits of reasonable speeds and facilitates train movements over a most restricted trackage at absolute safety is beyond question.

The fact that a very large number of steam and electric roads throughout the world are adopting very extensively the use of modern block signal systems bears evidence of its value, not only to relieve the congestion but also to permit of a greater number of train movements over the same trackage without lessening the factor of safety in travel.

In United States (in round figures) over 40,000 miles of line are worked by the Manual Block Signal regulated by the telegraph; 3,300 miles by telephone and 850 miles by electric bells. The Control Manual Signals without the use of track circuits are in use on 3,000 miles, and 750 miles using track circuits at stations; 250 miles by controlled manual apparatus with continuous track circuits throughout the block section. 250 miles of railway is operated by electric train staff system and approximately 15,000 miles of road is operated by the automatic block system. Many roads have installed block signals to its passenger tracks only, while others have installations on both passenger and freight tracks. In view of the permissive feature of automatic block signaling some have considered it not good practice to signal single track roads, however, there is installed over 6,000 miles of single track automatic block signal in the United States operating to complete satisfaction.

Although block signaling is a comparative new art, the developments have been most rapid and remarkable. It is quite obvious that a new art develops new conditions both in requirements of operation and specifications of manufacture. It was found that the specifications in the manufacture of apparatus used for the telegraph, telephone, light and power, and kindred lines of electrical devices would not do for certain devices used in railway block signaling.

In the former arts the attendant is usually close at hand to take immediate care of the apparatus and plant under his control in cases of trouble. For example, should, during a storm, a wire break or become crossed with other lines (probably wires of the block signal system), the attendant immediately cuts out certain apparatus or shuts down the entire plant as the nature and seriousness of the case warrants and the trouble is repaired immediately or at least is investigated immediately. In railway signaling the conditions are dissimilar, usually the apparatus is isolated and many miles from the nearest attendant. A train involving an expenditure of one hundred thousand dollars and carrying several hundred passengers is speeding at seventy miles an hour. The lives of these passengers must not be permitted to hang in the balance by the mere breaking or crossing of wires, and the signal governing the movement of the train must assume the danger or stop position. This signaling apparatus has no human hand to care for it in such circumstances, but, however, must be designed and con-

structed and practically taught to take care not only of itself but to have a care for the hundreds of lives over which it is held as guardian during travel over the tracks it controls. This piece of mechanism is taught that it is better to stop a train when not necessary than not to stop a train when it is necessary. The first lesson it receives is obedience, and second punctuality and regularity. Its entire makeup is watched with care, and its behavior is always at stake. It is quite to be expected that when so much depends upon the faultless operation of this piece of mechanism, that the utmost care must be given in its manufacture.

In Canada we have stretches of track which warrant block signaling, and while no signaling has been done to speak of, it is considered that the Canadian railway management shall not lag behind their world-wide reputation as progressive and enterprising railroad builders when the merits of modern railway signaling are put before them. Should it be shown that the cost of the upkeep and maintenance of a complete installation of block signaling is less than the cost of the accidents, loss to rolling stock, betterments, payments in injury and death claims while the trackage is under low unit-earning capacity, is the factor of the materially increased unit-earning capacity on the same trackage, permitting of higher speeds and tonnage, comfort and safety in travel, a fair return for the payment of traffic insurance premiums.

#### GRADING WORK ON THE C. N. O. RAILWAY, TORONTO-OTTAWA LINE.

The Canadian Northern Ontario Railway has completed in the Province of Ontario a line from Toronto to beyond Sudbury, a line from Ottawa to Hawkesbury, which crossing the Ottawa River connects with Montreal and Quebec; and in the spring of 1910 they commenced their Toronto-Ottawa line. This last leaves the Toronto-Sudbury line about a mile north of Rosedale Station, working eastward to the north of East Toronto, and then down to Port Hope on Lake Ontario, following the shore line until Belleville is reached, it then strikes in a north-easterly direction to Ottawa.

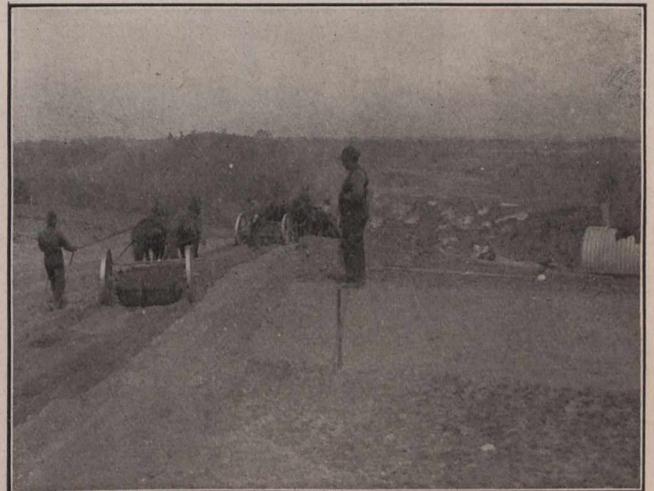


Fig. 1.  
Wheel Scrapers.

As far as the line is now constructed, the grading has been common excavation, and because of the nearness of the line to the lake front the rivers and streams have been crossed at their largest points, necessitating some very large fills and bridges. For most of the grading, slusher scrapers were used, and, for the larger fills, or where the haul was long, wheelers, as shown in Fig 1.