

naturally insist upon an oversight of that department. In the case of a recent strike at Winnipeg one faithful old employee had but a year to serve before becoming eligible for benefits, but he was forced to walk out and lose a life pension.

An interesting table compiled by the Bureau of Railway Statistics gives the proportion of compensation of United States Railway employees to gross earnings and operating expenses and of operating ratio ten years, 1899 to 1909, as follows:

	Ratio Compensation of Labor to		Ratio of Operating Expenses to Gross Earnings.
	Gross Earnings.	Operating Expenses.	
1909 ... ..	41.00%	62.06%	66.12%
1908 ... ..	43.38	62.33	69.67
1907 ... ..	41.42	61.41	67.53
1906 ... ..	40.02	60.79	66.08
1905 ... ..	40.34	60.40	66.78
1904 ... ..	41.36	61.07	67.79
1903 ... ..	40.78	61.65	66.16
1902 ... ..	39.28	60.58	64.66
1901 ... ..	38.39	59.27	64.86
1900 ... ..	38.82	60.04	64.65
1899 ... ..	39.81	61.04	65.24
Increase 1899 to 1909	3.00%	1.65%	1.35%

The significance of this statement is that, in spite of all the labor-saving devices and economies of operation—reduced grades, modified curves and more efficient equipment—adopted by the railways during the past decade, the proportionate cost of labor to earnings and to expenses has increased. The fact that it has been above 40 per cent. persistently since 1902 proves that labor continues to receive its full proportion of the receipts of American railways.

### RAILWAY SIGNALING.

J. A. Whyte.

Railway block signaling systems are primarily devised to facilitate the operation of trains over congested trackage, and to permit of higher speeds without sacrificing the factor of safety in travel. This short talk shall be more confined to that part of railway signaling which has more to do with the engineering practice, namely, fixed signals. By a fixed signal is meant a signal of fixed location to indicate conditions affecting the movement of a train.

Signaling systems could be divided into three general heads, namely, "Manual Block System," "Controlled Manual Block System," and "Automatic Block Signal System." The "block" in signaling practice refers to a stretch of track of a defined length into which trains are admitted by a fixed signal located at its entrance end. The "block signal" is a fixed signal located at the entrance end of a block section for the purpose of admitting trains to the section it governs.

"The Manual Block System" comprises a system of consecutive blocks or stations, the signals in which are moved by hand upon the information received by telegraph, telephone, or by other means of communication.

"The Controlled Manual Block System" comprises a system of consecutive blocks or stations, the signals in which are controlled by or through the agency of electricity, compressed air, fluids or gases, and so designed and con-

structed that the signals cannot be made to display a "clear" or "proceed" indication without the co-operation of the signal man at both ends of the block or station.

"The Automatic Block Signal System" comprises a series of consecutive blocks, the signals in which are controlled and operated automatically through the means of electrical track circuits by the presence of a train into, through, and out of the block section to which the signals are connected, and worked by the agency of electricity or pneumatic power.

It is considered impractical to predict with certainty the ultimate traffic conditions of a particular stretch of track and the signaling system to be adopted must be designed to take care of all traffic demands expected to arise within a reasonable period of years, also to have sufficient flexibility to permit of convenient additions to meet the increased traffic which may develop.

After deciding the system best suited to meet the requirements the tracks are laid out into blocks to secure the greatest number of train movements at determined speeds consistent with economical operation and safety. The length of the blocks are determined by the traffic conditions at determined speeds, governed by the minimum braking distances on varying grades at determined speeds consistent with economical train operation. The proper spacing of signals and the headway thus arrived at gives the capacity and earning power of the particular trackage signaled, and the comparative ratio between the unit cost per block-mile and the earning capacity per train block-mile-year determines the commercial value of the block system adopted. Block signaling might be safely termed "Railway Traffic Assurance," and the cost of the maintenance and up-keep of the block system called the "Premiums."

The question might be asked: Do the railways receive a fair return in payment of the "Traffic Insurance Premiums?"

In England the steam roads have comparatively short mileage and obviously very heavy traffic. As the traffic increased they found themselves face to face with serious problems. They increased their trackage until some other economical means for facilitating train operation had to be devised as their right of way unfortunately had bounds. It was thus found compulsory to devise means whereby they could increase their train movements on the same trackage without lowering the factor of safety in travel. The English roads have consequently been the pioneers in the use of block signaling systems.

The Controlled Manual Block System without the use of track circuits are now very extensively used in England and by it enormous train movements under terrific speeds are permitted with almost perfect safety in travel.

According to the British Board of Trade report on railway accidents in Great Britain during the fiscal year 1909, only one passenger was killed in a train accident, and in fact excepting this accident which happened on July 2nd, 1909, none were killed in this way in twenty months. The number of train accidents total twenty-one. The number of employees killed total eighty-two, and the passengers injured three hundred and ninety. This is a remarkable and most creditable report when fully considering the density of traffic, number of passengers carried and the English fogs, and speaks well for the English discipline of the railway employee and the efficiency of the block signaling system. Do the English roads receive a fair return for the payment of the traffic insurance premiums?

It is known that during the developments of the New York Subway Rapid Transit Service, the successful and efficient operation of this undertaking very largely depended upon the adoption of a proper system of block signaling.