

A locomotive having cylinder 17 inches diameter and 24 inches long, with four coupled driving wheels of 62 inches diameter over the tires, made the run over the entire distance, completing the work of one division each day, with a freight train of a weight corresponding to its capacity. The fuel was of the same quality, and was accurately weighed, and the trials took place at a time of year and time of day when the variation of atmospheric conditions was inconsiderable. The intention was to compare the cost of working upon the various divisions, and no effort was spared to ensure accuracy in the result.

The following table gives the particulars:—

DIVISION WEST TO EAST	Miles apart.	Differences in altitude of terminals, feet.		Lift between terminals, feet.		Cars per train.		Tons per train.		Coal in lbs. per mile.	
		East.	West.	East.	West.	East.	West.	East.	West.	Per Train.	Per Ton.
Sarnia & Stratford	80	57	937	2135	494	346	57.75	34.30	.1169	.0993	.1081
Stratford & Toronto	88	39	305	275	448	315	48.07	42.57	.1076	.1352	.1214
Toronto & Belleville	113	5	100	110	489	345	44.20	43.52	.0904	.1262	.1083
Belleville & Brockville	95	230	300	47	617	345	45.24	46.76	.0751	.1050	.0900
Brockville & Montreal	125	345	565	225	541	344	56.62	36.86	.1166	.1160	.1133
Montreal & Richmond	76	796	989	1935	446	344	63.77	28.23	.1431	.0822	.1126
Richmond & Island Pond	71	389	389	2435	563	344	41.56	50.22	.0738	.1461	.1099
Island Pond & Gorham	58	787	787	2435	563	344	41.56	49.45	.0616	.1526	.1071
Gorham & Fortland	91										

The cars were loaded going eastward and empty westward, in consonance with the general direction of traffic. It will be noticed that the consumption of fuel per ton per mile is fairly proportional to the lift in feet. In cases where this rule does not obtain, excessive curvature, the assistance of a pilot engine, or a longer run between stations, reducing the percentage of coal used in firing up, may be said to account for the difference.

The variation in the rate of consumption is from 1 to 2.3 in connection with eastbound, and 1 to 1.85 with westbound trains. In August, 1882, arrangements were made under which the Grand Trunk and Great Western Railways were cemented into one system under Grand Trunk management. Each company owned a line from the west to the Niagara frontier, and also to Toronto. Owing to representations made by myself, it was decided to make use of the Great Western line, which with its lower gradients runs nearer to the level of the lakes, for eastbound "through" freight traffic, and to convey the westbound business, consisting largely of empty or return cars, by way of the main line of the Grand Trunk, which rises in the neighbor-

hood of Stratford to an elevation of 1,000 feet. Thus the partial effect of a double line of railway was secured, and the easiest gradients were made use of for the heaviest trains.

The new, or what has been since called, "circular" system went into operation September, 1883, and the first three months gave the following results:—

	October 1st to December 31st.			
	Western Division.		Central Division.	
	1883.	1882.	1883.	1882.
Coal tons	18,365	20,669	33,878	32,484
Train miles	505,821	550,170	794,608	827,037
Cars	10,432,390	10,315,884	19,466,668	19,747,683
Cars per train	20.6	18.7	24.5	23.9
Coal, lbs., per train mile	72.61	75.14	85.27	78.56
Coal, lbs., per car mile	3.52	4.01	3.48	3.29

The two divisions, viz., the Western and Central, met at Toronto and the figures show how the former, working under the "circular" system, compared with itself when under the old system, and with the Central division, upon which the system remained the same. It will be seen that while the coal requirements per car per mile increased on the Central division, due to various causes applicable to both, by six per cent., they decreased on the Western division by twelve per cent., thus effecting a saving of over 2,500 tons, and a very much larger saving, if it is, as it reasonably may be, assumed that the then prevailing conditions would have warranted the rate of increase which obtained upon the Central division. It is an interesting fact that while the empty engine mileage westward advanced by 37 per cent. on the Central, the advance was 18 per cent. on the Western division, showing the advantage of a better balancing of traffic under the "circular" system. The desirability of low grade railways is of course understood, but a greater regard for the cost of operation, especially in the matter of fuel, would often prevent the construction of lines of railway which are destined from their inception to be unprofitable ventures. It may be safely asserted that the great increase which has taken place within comparatively recent years in the haulage power of locomotives has reduced the rate of coal consumption per unit of work (one ton to one mile). The train mile, that most unreliable standard of work measurement, has in the past unquestionably been the means of encouraging the use of small engines, and thus of interfering with economical operation.

It may, however, be doubted whether improved service in the form of more roomy coaches, frequent trains, and more rapid transport induced by keener competition, has not more than absorbed the savings which might otherwise have been effected. The old 40-foot coach has expanded into the 55-foot car of to-day, with its wash and smoking rooms and other conveniences not thought of twenty-five years ago, so that its weight has been added to, without material or proportionate increase of carrying capacity. The calls upon the locomotive boiler for steam to warm the cars, to apply the brakes, to ring the bell, and to signal the train, could only be effectually responded to by a more frequent resort to the coal bin, and these calls must of necessity be intensified with an increase in the rate of train speed. To reduce the drain upon the boiler, the