

considered—as a railway must necessarily be, whether a double or single line—as a thoroughfare for the conveyance of railway traffic. From a reference to the table in question, it will be seen that the average cost of renewals per mile varies from an average maximum of £418.18 per mile during the ten years, in the case of the London, Brighton, and South Coast Railway, to a minimum of £190.80 per mile in the case of the North British; while the tonnage of goods and minerals per mile in the latter case is just double that of the London, Brighton, and South Coast. In another case, that of the Lancashire and Yorkshire Railway, with a maximum tonnage of 41,678 tons per mile of goods and mineral traffic, the average annual cost of renewals is only £291.07 per mile, very little above the average. Again, in the case of the London and North-Western, with the large tonnage of goods and minerals of 26,493 tons per mile, the average cost of renewals is as much as £335.95 per mile, as compared with the North-Eastern Company's average of only £236.26 per mile, with its heavy tonnage of 36,004 tons per mile of goods and minerals. Next comes the London and South-Western, with its average cost of renewals much above the average—namely, £319.47 per mile, with the smallest average of 6,735 tons per mile. It is clear, therefore, that we must look for something more than the mere weight of tonnage to account for the exceptionally large cost of renewals of the permanent way of some of the principal British railways, and there is everything to indicate that it is mainly due to the greatly increased weight and speed of the passenger traffic which has occurred since the introduction of the better and much more durable material of steel rails, and partly to the increased weight and speed of the goods and mineral traffic. In this connection it will be as well to advert to the cost of the maintenance and renewal of the permanent way at the period almost immediately preceding the first introduction of Bessemer steel rails in the early 'sixties, particulars of which were furnished to the author by the chief executive of nine of the principal British railway companies at the time of the reading of his paper on the "Maintenance and Renewal of Permanent Way" at the Institution of Civil Engineers in 1866, a copy of which statement is given in the accompanying Table I. Side by side with this is given, for

Table I.—Maintenance and Renewals of Permanent Way of Nine Principal British Railways.

Railway.	1847 to 1865.		1865 to 1875.		1897 to 1906.		
	Average Miles Open.	Average Amount of Renewals per Mile.	Average Cost per Mile.	Average Cost per Mile.	Average Miles Open.	Average Cost in Ten Years.	Average Cost per Mile.
L. & N. W.	755.6	1,906,859	253.36	307.53	1933.4	6,495,262	335.95
N. Eastern	662.0	867,576	131.05	232.01	1658.9	3,918,235	236.26
Midland	546.6	775,750	141.92	311.26	1455.3	5,165,796	354.96
L. & S. W.	315.6	288,661	93.59	254.41	921.5	2,943,896	319.47
Gt. Northern	276.6	392,992	141.57	299.88	928.8	2,203,875	265.91
Lanc. & Yorkshire ..	255.4	768,924	301.07	397.07	465.2	1,645,094	291.07
S. Eastern & Chatham	248.8	439,099	173.23	257.05	618.4	2,131,896	344.74
L., B. & S. C.	180.6	219,514	121.51	239.33	448.6	1,875,982	418.18
M. S. & L. & Gt. Central	160.2	85,760	53.53	271.29	500.7	1,721,845	318.39
Total and Averages ..	3,401.4	5,796,135	170.40	285.53	8930.8	28,101,881	314.66

the purpose of comparison, the average annual expenditure and cost per mile of the renewals during the first ten years from 1865 to 1875 after the adoption, or partial adoption, of steel rails, and also of the present cost of the renewal expenditure of these nine railways as obtained from the returns of the fifteen British railways alluded to.

The total cost of the renewal of these nine principal railways with iron rails during the eighteen and a-half years prior to 1865, with an average aggregate of 3,401 miles of way, only amounted to £5,796,135, and to an average of

£170.40 per mile of way. It rapidly increased during the first ten years, after the first partial introduction of steel rails, to £285.53 per mile, partly owing, no doubt, to the high price then of steel rails. Notwithstanding the great subsequent reduction in the price of steel rails to a lower figure than even the best iron rails, the expenditure in the renewal of way on these nine principal railways has, however, now reached an amount of £28,101,881, and £314.66 per mile of railway, during the short space of the last ten years—a five-fold increase in amount and now double the cost per mile in renewals—the mileage of these nine railways having increased from 3,401 to 8,930.

The development of railway traffic since the introduction of steel rails has been enormous, as the few figures given in Table II. testify:—

Table II.—Railways in United Kingdom.

Years.	Miles Open.	Gross Receipts.	Working Expenses.	Net Receipts.	Passengers.	Goods and Minerals.	Carriages and Wagons.
		£	£	£	No.	Tons.	No.
1907	23,108	21,548,923	76,609,194	44,839,729	1,259,481,315	515,887,116	810,416
1860	10,433	27,766,622	13,187,368	14,579,252	163,435,678	89,857,719	195,650
Inc.	12,675	93,782,301	63,421,826	30,260,470	1,096,045,637	426,029,397	614,766

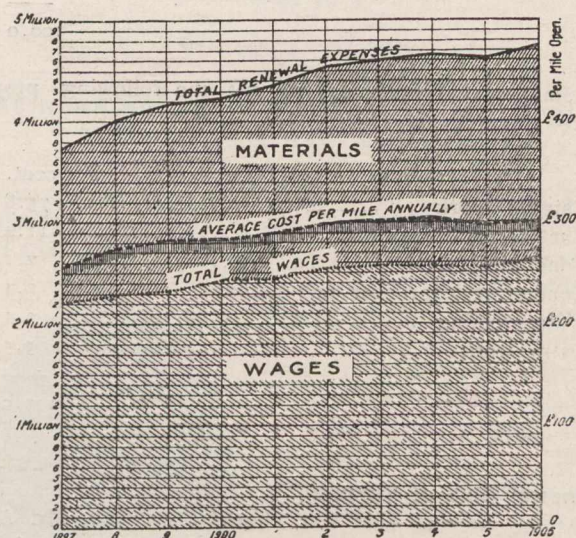


Fig. 1.—Ten Years' Permanent Way Renewals of 15 Principal British Railways.

While the mileage during the last forty-seven years has only a little more than doubled, the working expenses have increased nearly sixfold, the number of passengers carried has increased nearly sevenfold, the tonnage of goods and minerals carried has increased nearly fivefold, while the number of carriages and wagons has only increased threefold; no doubt a considerable portion of the increase of the permanent way expenses is mainly due, as already stated, to the very large increase in the weight and speed of the passenger traffic, and partly to the very large increase in the tonnage of goods and mineral traffic, and also in some degree to its somewhat increased speed.

That the much greater strength and durability of the high-class of steel material of which Bessemer steel is the type, has largely contributed to the exceptionally rapid growth, not only of railway traffic in this country, but of its trade and commerce generally, there can be no question. No more striking recognition of this could better be given than was recently so felicitously afforded by the King in the handsome tribute His Majesty paid to the late Sir Henry Bessemer,