estimates for British tramways were therefore prepared from American and continental results. The following figures summarize a number of estimates made at this period ; the first table gives the figures for capital cost, and the second for operating expenses. The receipts were estimated at ιod per car mile.

|  |  |
| --- | --- |
|  | Capital cost per mile of single track. |
| Permanent way, including bonding | £5050 |
| Overhead equipment | 750 |
| Feeder cables | 400 |
| Cars at £700 each | 2100 |
| Car sheds, sundries and contingencies | 1200 |
| Total | £9500 |

|  |  |
| --- | --- |
| Operating expenses per car mile. | |
| Electrical energy | 1∙50d. |
| Wages of drivers and conductors | 1∙10 |
| Car shed expenses, wages and stores | 0∙55 |
| General expenses | 0∙90 |
| Repairs and maintenance | 1∙25 |
| Total | 5∙30d. |

The estimates gave reason to expect that electric traction would mean cheaper fares and more frequent services at a higher speed, resulting in a considerable increase in traffic receipts per mile and a substantial reduction of working expenses. The result of pioneer undertakings in South Staffordshire, Bristol and Coventry supported this expectation. Later experience, however, showed that the estimates were too optimistic. Taking the actual figures realized for the undertakings included in the above tables, the capital expenditure per mile of single track was £12,000 and the working expenses per car mile 6∙3d. The expectations as to gross revenue have been generally realized, but the increase in capital expenditure and working expenses over the estimates is typical of electric tram­ways in Great Britain. In the matter of wear and tear the estimates have also been too low. The reasons for the larger capital expenditure are (1) superior track construction, (2) more elaborate overhead equipment, (3) use of larger cars, (4) higher cost of road paving and other improvements imposed upon tramway undertakings.

According to the official returns of tramways and light railways for the year 1905-1906, there were 312 tramway undertakings in the United Kingdom, and 175 of these belonged to local authorities. Out of the total of 1491 m. of line owned by local authorities, 1276 m. are worked by these authorities themselves, and the remaining 215 m. by leasing companies. Local authorities working as well as owning their tramways made a net profit of £2,529,752, applying £663,336 to the reduction of tramway debt and £205,981 to the relief of rates, while carrying £623,617 to reserve and renewal funds. The following table summarizes the amounts expended by local authorities on electric traction :—

|  |  |  |
| --- | --- | --- |
| Year. | Municipalities. | £ |
| 1900 | 11 | 1,169,429 |
| 1901 | 18 | 2,748,873 |
| 1902 | 47 | 10,519,543 |
| 1903 | 61 | 14,644,126 |
| 1904 | 92 | 21,295,771 |
| 1905 | 115 | 27,876,320 |
| 1906 | 131 | 31,147,824 |
| 1907 | 131 | 35.965,920 |

The corresponding table for electric traction companies (including electric railways), detailing the amounts and proportions of ordinary preference and loan and debenture capital, is as follows:—

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Year. | Number of under- takings. | Ordinary capital. | Percent, to total. | Preference capital. | Percent. to total. | Loan and Debenture capital. | Percent. to total. | Total. |
| 1896 | 17 | *£* 5,041,375 | 83 | £  412,776 | 7 | *£*  630,521 | 10 | *£*  6,084,672 |
| 1897 | 30 | 6,584,147 | 88 | 124,850 | 2 | 727,376 | 10 | 7,436,173 |
| 1898-1899 | 51 | 9,793,234 | 68 | 1,640,780 | **11** | 2,972,126 | 21 | 14,406,140 |
| 1899-1900 | 66 | 11,770,777 | 60 | 3,834,761 | 20 | 4,033,992 | 20 | 19,639,530 |
| 1900-1901 | 75 | 14,558,076 | 55 | 5,904,998 | 23 | 5,686,785 | 22 | 26,149,859 |
| 1901-1902 | 125 | 19,748,965 | 50 | 9,748,891 | 24 | 10,024,327 | 26 | 39,522,183 |
| 1903 | 126 | 21,600,056 | 49 | 11,170,319 | 25 | 11,296,714 | 26 | 44,067,089 |
| 1904 | 156 | 33,491,604 | 54 | 13,219,487 | 22 | 14,895,418 | 24 | 61,606,509 |
| 1905 | 159 | 36,949,069 | 47 | 22,853,948 | 29 | 19,410,384 | 24 | 79,213,401 |
| 1906 | 170 | 38,130,981 | 41 | 25,206,988 | 27 | 29,522,581 | 32 | 92,860,550 |
| 1907 | 173 | 53,034,778 | 45 | 30,642,266 | 26 | 34,372,411 | 29 | 118,049,455 |

The financial results achieved by electric traction companies are summarized in the next table:—

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Year. | Number of companies. | Aggregate capital. | Average ordinary capital. | Average preference capital. | Average loan and debenture capital. | Total average. |
| 1899-1900 | 24 | *£*  9,056,332 | %  3∙87 | %  5∙56 | %  4∙64 | %  4∙37 |
| 1900-1901 | 37 | 15,021,137 | 4∙27 | 5∙53 | 4∙57 | 4∙65 |
| 1901-1902 | 62 | 28,322,117  35,479,296 | 4∙07 | 4∙44 | 4∙53 | 4∙29 |
| 1903 | 64 | 4∙31 | 5∙11 | 4∙47 | 4∙57 |
| 1904 | 77 | 48,789,525 | 4∙13 | 4∙81 | 4∙53 | 4∙41 |
| 1905 | 90 | 61,273,986 | 3∙79 | 4∙92 | 4∙39 | 4∙33 |
| 1906 | 117 | 77,202,373 | 3∙47 | 4∙81 | 4∙18 | 4∙13 |
| 1907 | 118 | 99,315,028 | 2∙87 | 4∙25 | 4∙38 | 3∙78@@1 |

The total expenditure on tramways and light railways (omitting railways—main, branch and suburban) was £15,195,993 in 1896 and £58,177,832 in 1906.

One effect of the increased cost of expenditure per mile of track is to discourage extensions of rural and inter-urban lines where the traffic is not heavy. Proposals have been made to adopt the “ rail- less trolley ” (used in some places on the continent of Europe) for such extensions. In this system the cars run on ordinary wheels and take power from overhead trolley wires. But so far no such arrangement has been put into practice in Great Britain, and out- lying districts are generally dealt with by petrol or steam motor vehicles, running as feeders to the tramways and railways. The future commercial development of tramways lies more in the economics in working than in growth of track mileage. Owing to the enormous volume of traffic a very slight alteration in one of the items of expense or revenue produces a large result in the aggregate. The addition of ½d. per car mile to revenue or a corresponding reduction in expenses would, on the 240 millions of car miles run in 1905-1906, result in a gain of about £500,000 per annum, which is equal to nearly 1 % on the entire capital expenditure in respect of tramways and light railways. The tables given above show that the yield upon the capital invested in electric traction is not high. The effect of increased capital expenditure has been accentuated by reductions in fares. In 1886 the average fare per passenger was 1∙61d. and in 1896 it was 1∙31d., falling in 1906 as low as 1∙10d. Some systems carry passengers over 2½ m. for one penny, workmen being carried twice the distance for the same sum. Halfpenny fares are repre- sented as a boon to the working man, but they have been abandoned as a failure after several years’ trial on several systems, and in Glasgow it is found that halfpenny fares contribute only 20∙4% of the early morning traffic, while the penny fare contributes 72∙3 % of that traffic. The general manager of the Birmingham Corporation tramways reported against halfpenny fares on the basis of his ex­perience as general manager of the London County Council tramways that all the halfpenny passengers there are carried at a loss. The adjustment of fares, and stages to their proper value is a question now carefully studied by tramway managers along with many problems of economy in working. The close adjustment of the service to the fluctuations in traffic is one source of economy which is being more seriously considered. Many systems have adopted top covers to cars in order to carry more passengers during wet weather. The adoption of these covers is not popular in fine weather; it adds to the weight and wind-resistance of the cars, thus increasing current consumption, and it adds to the cost of construction and maintenance. Economy in electrical energy is, in its broader aspects, secured by purchasing current from an outside source in preference to generating it at a special station. The average cost per unit of electricity tor all tramway undertakings in the United Kingdom is 1∙06d., but one tramway company which purchases its energy from a large power company pays only o∙85d. per unit. In its narrower aspects economy in current may be secured by reducing waste car mileage—that is to say, eliminating the running of cars at times and places where they are not required for an adequate service. Saving may also be effected by supervision of the driving of the cars, since the difference of as much as 20% has been noted between different drivers. One tramway manager secured substantial improvement by merely marking on the trolley standards the position which the controller handle should occupy in passing each point. The limitation of stops is an- other source of economy, the average cost per stop on a system having been found to be 0∙17d. A slight increase in the maximum speed of tramcars would

@@@1 Average reduced owing to inclusion of Metropolitan and Metropolitan District raiIways’ capital.